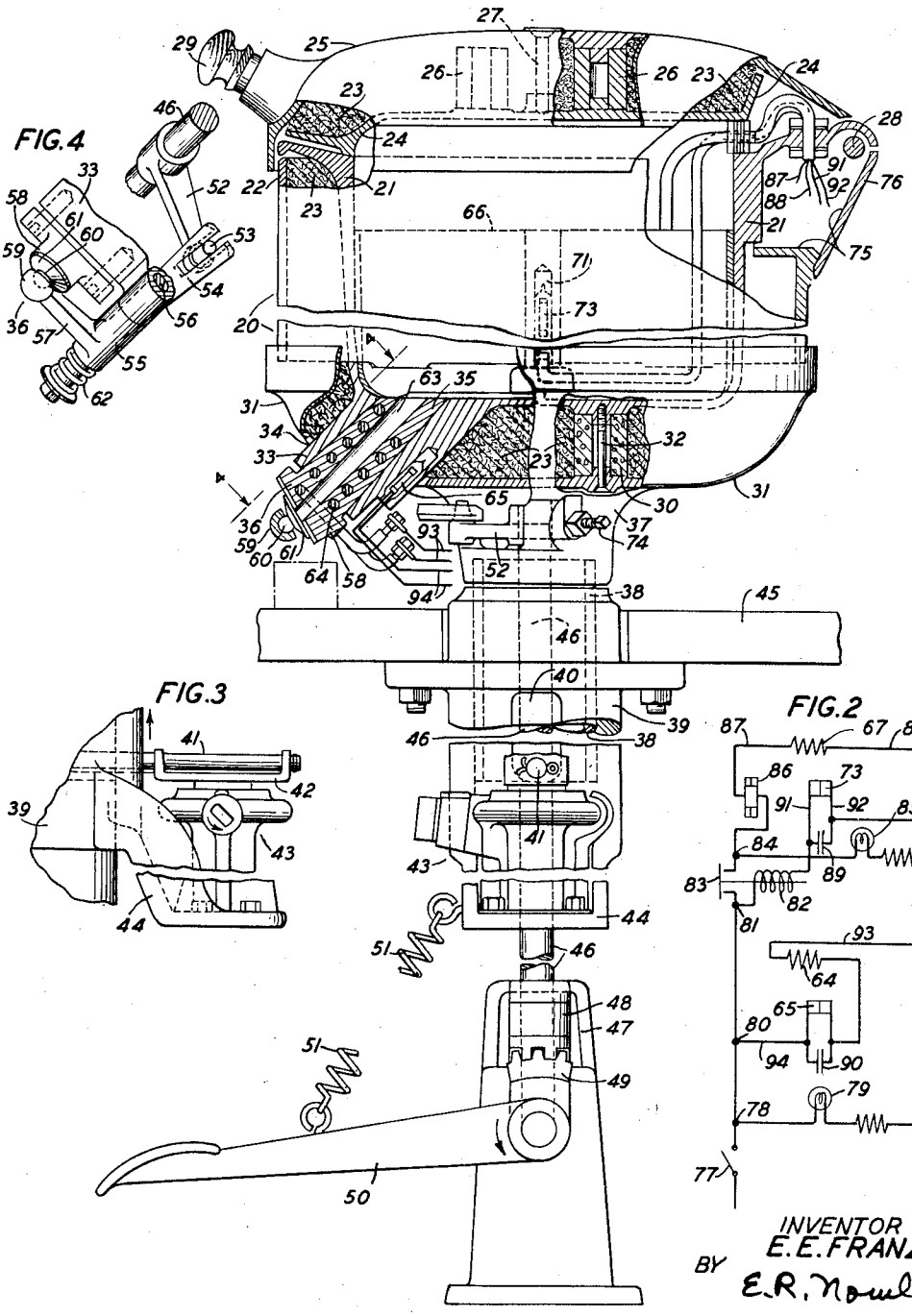
Jan. 27, 1942. E. E. FRANZ 2,271,188

MATERIAL DISPENSING APPARATUS

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FIG. 1



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MATERIAL DISPENSING APPARATUS

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FIG. 5

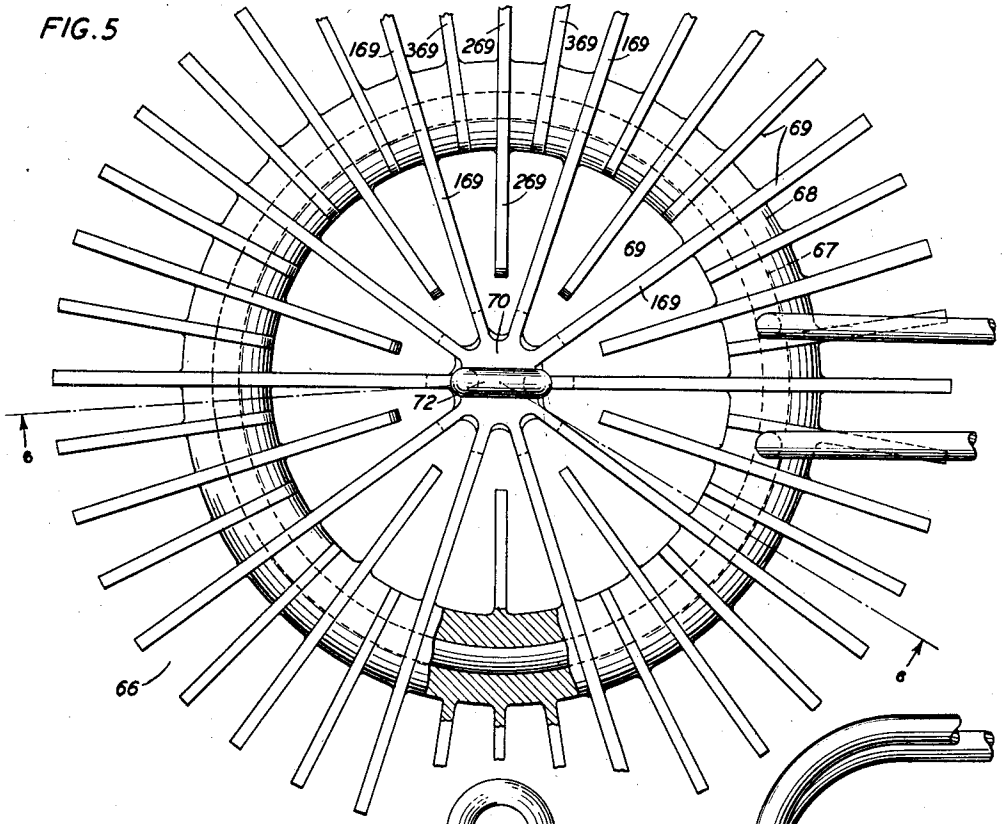
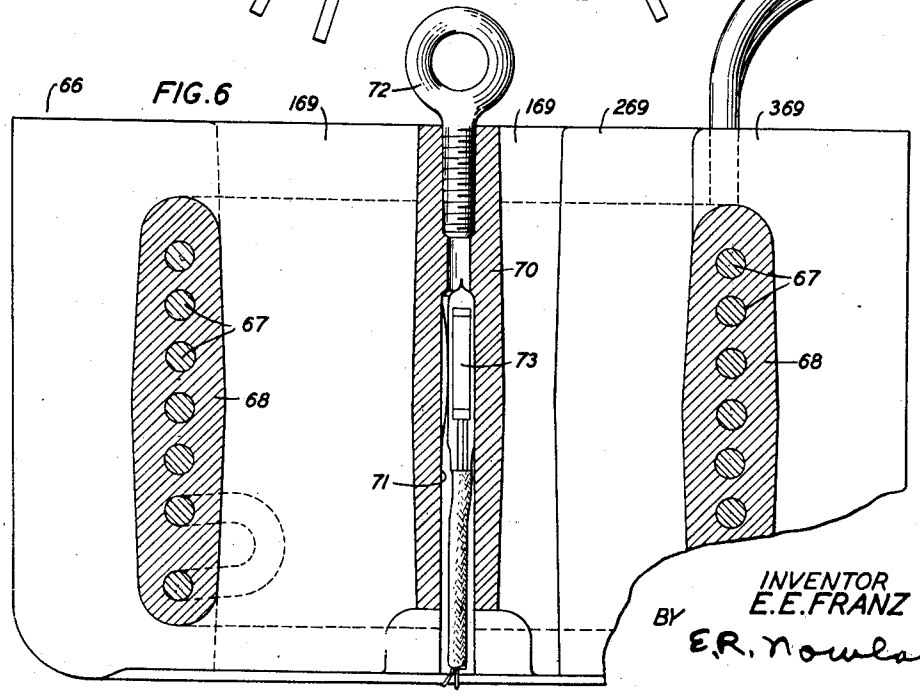


FIG. 6



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MATERIAL DISPENSING APPARATUS

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Application January 14, 1939, Serial No. 250,941

8 Claims. (Cl. 219—44)

This invention relates to material dispensing apparatus and more particularly to apparatus for melting and dispensing materials having physical characteristics analogous to asphalt, namely such as are practically solid at ordinary temperatures, may be melted to more or less viscous liquids, and generally have a low rate of heat conduction.

In the manufacture of many electrical articles such as coils, condensers and other units of electrical apparatus, the article, when mechanically completed, is placed in a container, "pot" or can of sheet metal, cardboard, molded ceramic, molded plastic, or other suitable material, into which is then poured molten "potting" compound to seal the article against the influence of the atmosphere and its changes. Such potting compounds have to be substantially solid at ordinary temperatures, are electrical insulators and also bad conductors of heat. This last characteristic, of being a heat insulator also, is ordinarily important in such electrical devices, as their electrical characteristics may be harmfully varied by rapid temperature changes. Many such potting compounds comprise asphalt or rosin or other tar-like or resinous substances as a principal ingredient, and must be melted and kept molten during the potting operation. Since the material is a bad conductor of heat, there is a difficult problem presented in the melting and maintaining molten of the compound. It is difficult to avoid "hot spots" and steep temperature gradients as the transfer of heat by conduction through the material is slow. Heat transfer by convection is also slow, for these tar-like substances when melted at temperatures at which harmful decompositions and distillations are avoided, are viscous and slow flowing. Temperatures must be carefully controlled and caused to rise as evenly as possible throughout the mass. Overheating causes the production of vapors which create fire hazards as well as hazards to health, and which are accompanied by undesirable changes in the composition of the compound. Another problem in connection with the use of these potting compounds is that of dispensing the usually sticky, dark colored and viscous molten liquid in accurate amounts and without smearing and dripping.

An object of the present invention is to provide an apparatus for melting, retaining molten, and dispensing materials having physical characteristics like those of asphalt, tar, rosin and the like, which apparatus shall be simple, safe, accurate and reliable in operation.

With the above and other objects in view, one embodiment of the invention may comprise a tank to hold molten material and an electrically energized heating unit therein having an annular body of metal with radial fins to carry heat by metallic conduction from the body into substantially all parts of the tank, and a hollow metallic member integral with one or more of the fins and within the annular body, in combination with an electrical temperature control device located within the hollow member, the electrical heating element for the whole unit being disposed annularly within the annular body.

Other objects and features of the invention will appear from the following detailed description of one embodiment of the invention in an apparatus for dispensing potting compound, taken in connection with the accompanying drawings, in which the same reference numerals are applied to identical parts in the several figures, and in which

Fig. 1 is a side elevational view partly in section of an apparatus constructed in accordance with the invention;

Fig. 2 is a diagram of the electrical circuits pertaining to Fig. 1;

Fig. 3 is a detached detail view in front elevation;

Fig. 4 is a detached detail view as indicated by the line 4—4 of Fig. 1;

Fig. 5 is a detached enlarged plan view of the heating means; and

Fig. 6 is a sectional view on the line 6—6 of Fig. 4.

The embodiment of the invention herein disclosed is an apparatus for melting and dispensing compounds comprising a relatively large proportion of asphalt and intended to be poured molten into casings containing electrical coils, condensers and the like to form a moisture proof protection.

A main body, generally indicated at 20, consists essentially of a tank proper 21 and an exterior casing 22 surrounding and spaced from the tank, the space between the tank and casing being filled with a preferably non-combustible heat insulating material 23 such as rock wool, glass wool, asbestos or the like. A lid or cover proper 24 rests on the upper rim of the tank 21 and is provided with an exterior casing 25 supported on the lid 24 by means of rigid spacing members 26 and secured to the lid by a relatively slender metal screw 27, the space between the lid 24 and the casing 25 being preferably filled with the same insulating material 23. This whole lid structure is pivotably mounted at 28 on the casing 22, and is manipulable to open and close by means of a

handle 29 of wood or other suitable heat insulating material.

The tank 21 is, so far as possible out of metallic contact with the casing 22, there being a slight spacing, as shown in Fig. 1, between the upper rim of the casing and the everted flange at the top of the tank. Similarly, there is preferably no metallic contact or connection between the lid 24 and its casing 25 except for the slender and negligibly heat conductive screw 27.

The tank 21 is supported on a plurality of rigid members 30 of heat insulating material such as concrete, porcelain or the like which rest in turn on the bottom of a generally bowl-shaped base member 31, which also supports the cylindrical casing 22. The space between the floor of the tank 21 and the base member 31 is also filled with the material 23. The tank and the base member may also be secured together by means of one or more screws 32. A spout 33, integral with the tank 21, extends through an aperture 34 in the base member 31, the aperture being sufficiently large to allow the spout to be out of contact with the base. The spout bore tapers a little, widening from within outwardly, and in it is mounted the correspondingly tapering body 35 of a dispensing valve, generally indicated at 36.

The under face of the base member 31 is formed with an integral downwardly extending hollow boss 37 into which is secured, as by a threaded connection, a downwardly extending hollow shaft 38, which supports the base 31 and all the above described apparatus. This shaft 38 is vertically slidable in a guide housing 39 preferably secured as shown to a table, bench, or other appropriate support 45. The housing 39 has a vertical slot 40 on the side visible in Fig. 1, which serves to pass a supporting pin 41 fixed in the wall of the shaft 38 and extending radially out from the shaft to be carried in a yoke 42 secured to the ram of any suitable lifting device, such as the screw jack generally indicated at 43. The jack 43 is mounted and supported on a bracket 44 rigidly attached to the housing 39. Thus the housing 39, carried by the table 45, supports the jack 43, which adjustably supports the shaft 38 and everything carried by the latter; and thus the elevation of the dispensing valve 36 above the table 45 may be adjusted by operation of the jack.

A solid shaft 46 is coaxially positioned within the hollow shaft 38, and journalled at its upper end to be vertically movable with and rotatable with respect to the shaft 38, and passes down through a suitable aperture or journal in the floor of the housing 39 to be rotatably journalled in the top of a pedestal 47 mountd on the floor under the table 45. A collar 48 is keyed on the shaft 46 so that the shaft may slide through the collar but must rotate therewith. The collar is provided at its lower edge with integral gear teeth meshing with a sector rack 49 rigidly secured to or integral with a foot lever or treadle 50 pivoted on the pedestal and yieldingly held in an up position by a spring 51.

Near its upper end, the shaft 46 has a short lateral lever 52 rigidly attached to it, which extends out through an appropriate aperture in the hollow boss 37. A vertical pin 53, best shown in Fig. 4, mounted in the outer end of the lever 52 enters between the arms of a yoke arm 54 of a bell crank lever 55 journalled on a stub shaft 56 rigidly mounted on the spout 33 of the tank 21. The other arm 57 of the bell crank lever extends across and moves parallel to the plane terminal face of the nozzle 58 of the valve 36, and is formed with an integral cup 59 partly enclosing a corresponding ball 60 formed on the outer side of a flat disk-like closure member 61 slidable on the plane terminal face of the nozzle 58. A compression spring 62 serves to press the whole lever 55 along on the shaft 56 and so exerts pressure through the lever arm 57 and the cup 59 on the ball 60 to keep the closure 61 firmly although slidably against the nozzle.

Downward pressure on the outer end of the treadle 50 effects rotation (clockwise as seen from above) of the shaft 46 through the gearing 49, 47. This turns the lever 52 and, through the pin 53, the lever 55 and so causes the closure 61 to uncover the end of the passage 63 through the valve body 35. When the desired quantity of material has poured from the valve, releasing the treadle 50 to the influence of the spring 51 allows the closure 61 to slide over the exit of the passage and stop the flow. Preferably, the disk-like closure member 61 is formed with bevelled edges lying closely against the flat nozzle end to help cut the stream of usually viscous liquid cleanly. Adjustable lock-nutted stop screws 74 are mounted in the boss 37 to limit the motion of the lever 52 and thus keep the closure 61 from being moved off the nozzle.

Preferably the valve body 35 is provided with a helical electrical heating element 64 surrounding the passage 63 and serving to prevent undue chilling of molten material held in the passage. Preferably also the body 35 contains within its wall a self acting temperature responsive circuit controlling device 65 (e. g. a make and break thermostat or other equivalent device) to maintain the valve body temperature at a predetermined optimum range. To this end the device 65 may be connected in series with the resistance heating element 64 as indicated to break the power circuit through the latter when the temperature rises too far and reestablish the circuit if the temperature falls below the desired minmum.

A principal heating unit, generally indicated at 66, is located within the tank 21, and is best shown in Figs. 5 and 6. A preferable construction generally for this unit 66 is a doubly helically wound electrical heating element 67 having a radiator of suitable conducting material such as an aluminum alloy cast thereon. Heating elements such as 67 are well known commercial products and need no particular description here.

The body of aluminum or other suitable heat conductor cast around the element 67 has an annular body 68, enclosing the helix 67, and a plurality of integral radial vertical fins 69 extending both inwardly and outwardly from the body 68. Certain ones, 169, of these fins extend outwardly to the same distance as all the other fins and inwardly to a common vertical integral axis member 70. Midway between each two fins 169 is a fin 269 extending inwardly toward but not to the member 70. Midway between each fin 169 and a next fin 269 is a fin 369 extending outwardly only from the body 68. As already indicated, the outward exteriors of all three types of fins are equally long. These parts are so arranged and proportioned that the roots of each fin 169 and its next neighboring fin 269 on the inner vertical wall of the body 68 are substantially the same distance apart as the tips of the outwardly extending parts of any two neighboring fins, while the tips of the inwardly extending parts of the fins 269 stand midway be-

tween two fins 69 at a point where the latter are the same distances apart as the outward tips of any two neighboring fins. Thus no point within the volume of the tank occupied generally by the heater 66 can be more than half this distance from some surface portion of the heater.

The central axial member 70 has a vertical bore 71 therethrough, the upper end of which is closed in any suitable manner, preferably by means of a ring-bolt 72 which may also serve to lift the heater out if necessary for any reason such as repairs or cleaning. A self-acting temperature responsive circuit controlling device 73 is also housed in the bore 71 which may be similar to the device 65 in construction.

At the rear of the tank casing there is a chamber 75 conveniently located below the lid pivot 28 and between the tank and the casing, in which several devices comprised in the electrical circuits of the apparatus may be conveniently housed, the chamber being accessible from the rear through a cover plate 76 removably mounted on the casing in any suitable way not shown, but preferably not in direct contact with any part of the tank. None of the several electrical devices housed in the chamber 75 are shown in Fig. 1 to avoid unnecessary complexities in the drawings as the precise construction of these devices, which are well known, is no part of the present invention; but these devices are all schematically shown in the diagram of Fig. 2.

As illustrated, electrical power is brought to the apparatus through a main switch 77, ordinarily conveniently located outside but near the apparatus and passes to a branch point 78 where a side circuit leads through a pilot or tell-tale lamp 79. The main circuit leads on to a branch point 80 from which a side circuit leads through the temperature responsive control device 65 housed in the body 35 of the valve 36 and then in series therewith through the heating coil 64 embedded in the valve body 35, and so to ground. From the branch 80 the main circuit runs on to a branch point 81, whence a side circuit leads in series through the operating winding 82 of a relay 83 and the temperature responsive control device 73 (housed in the axial bore 71 of the main heating unit 66) to ground. From the branch point 81, the main circuit leads through the contacts of the relay 83 to a branch point 84, where a side circuit runs through a second pilot or tell-tale lamp 85 to ground. From the branch point 84, the main circuit finally leads through a temperature responsive control device 86, and, in series therewith, through the lead 87 and the main heating element 67 and the lead 88 to ground.

There may also be condensers 89 and 90 respectively shunted across the devices 73 and 65 to quench any sparking at the contacts of the devices 73 and 65 when they operate to break the circuits through them.

The condensers 89 and 90, the relay 83 with its winding 82 and the temperature responsive device 86 are all preferably housed in the chamber 75, the device 86 being secured on or sunk into a wall of the chamber formed by an integral part of the tank 21 to be controlled by the temperature of the tank, the leads 87 and 88 of the main heating element 67, the leads 91 and 92 of the device 73, and the leads 93 and 94 of the valve heater and control being all brought into the chamber for proper interconnection.

In a given case in actual practice, the tank 21 with the heating unit 66 in place within it, had a capacity of 3½ gallons, and was used to melt straight unmixed asphalt for use in potting electrical condensers. The asphalt is broken into convenient sized lumps and piled on the heating unit 66 as high as will not interfere with closing the lid. The power control 73 is set to open and break the power circuit at 450° F. while the safety control device 86 breaks the power supply at 500° F. and does not reestablish the power circuit until the tank wall temperature has fallen to 350° F. Thus the normal working temperature of the unit 66 is about 450° F. At this temperature the weight of the lumps of asphalt pressing down on the hot narrow blades or fins of the unit causes the asphalt to be sliced into pieces which slide down between the fins, when more lumps may be added at the top. No part of the sliced asphalt between the blades can be further from some hot surface of the unit than half the distance between the outer tips of any two neighboring fins. Hence, in spite of the fact that heat transfer by conduction through asphalt is very slow and heat transfer by convection is almost nonexistent, the asphalt is melted with such speed, because of the shaping and arrangement of the fins, that, starting cold, the apparatus will melt a tank full, 3½ gallons, in 45 minutes; and when in continuous operation will melt and deliver 10 gallons per hour.

It is found that the arrangement of the heating unit 66 with radial fins and with the central member or post 70, wherein the body 68, the fins and the post 70 are all integral, and the temperature responsive heat control device 73 is housed in the post 70, effects the result that the temperature of the entire metal body of the unit is uniform substantially in all parts, no part of the heating unit body being normally hotter or colder to any material extent than the post 70 when the apparatus is in a normal state of operation. Thus, because of the equable distribution of heat throughout the mass of molten compound by the unit there can be no development of overheated spots in the compound, for the members of the heating unit are distributed too uniformly throughout the molten mass and are themselves maintained at too uniform a temperature to permit of any part of the molten material becoming overheated.

The masses and exposed areas of the spout 33 and valve body 35, and the heat transfer capacity of the heating coil 64 are so proportioned that normally the coil cannot heat the valve beyond 500° F., while the control device 65 is set to open the circuit through the coil when the valve body is at a temperature of 445° F.

While the embodiment of the invention herein disclosed has been described in specifically limited terms and as applied to a specifically limited use, it is only illustrative and may be modified and departed from in various ways without departing from the spirit and scope of the invention as pointed out in and limited only by the appended claims.

What is claimed is:

1. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, comprising a tank and a heating unit in said tank, said heating unit comprising a plurality of vertical fins extending substantially throughout the area of the tank and the upper edges of the fins forming a grille for the reception of ma-

terial to be melted, and a heat generating member in heat conducting relation to said fins.

2. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, comprising a tank and a heating unit therein, said heating unit comprising an annular heating element and a plurality of vertical and radially disposed fins in heat conducting relation to said heating element and extending substantially throughout the area of the tank, the upper edges of said fins forming in effect a grille for the reception of material to be melted, said tank having a charging space for material above said fins.

3. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, comprising a tank and a heating unit therein, said heating unit comprising a central body, a heating member spaced from and surrounding said body, and a plurality of vertical fins in heat conducting relation to said heating member and body, the fins extending substantially throughout the area of said tank and the upper edges of the fins forming a grille for receiving material to be melted.

4. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, comprising a tank and a heating unit therein, said heating unit comprising a central body, a heating member spaced from and surrounding said body, and a plurality of vertical fins in heat conducting relation to said heating member and body, the fins extending substantially throughout the area of said tank and the upper edges of the fins forming a grille for receiving material to be melted, in combination with a temperature control device housed within the central body and responsive to the temperature thereof to regulate the heating effect of the heating member.

5. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, and comprising a tank to hold material to be melted, and an electrically heated heating unit positioned in the tank, the heating unit consisting of an electrical heating element and a heat transmitting and radiating shell of metal thereon consisting of a body enclosing the element, a second body apart from the said first named body, and a plurality of heat-conducting vertical fins extending between and integral with the two bodies and forming a grille for receiving material to be melted.

6. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, and comprising a tank to hold material to be melted, and an electrically heated heating unit positioned in the tank, the heating unit consisting of an annular electrical heating element and a heat transmitting and radiating shell of metal thereon consisting of an annular body enclosing the element, a second body apart from the said first named body and located in the center thereof, and a plurality of heat-conducting vertical fins extending between and integral with the two bodies and forming a grille for receiving material to be melted.

7. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, and comprising a tank to hold material to be melted, and an electrically heated heating unit positioned in the tank, the heating unit consisting of an electrical heating element and a heat transmitting and radiating shell of metal thereon consisting of a body enclosing the element, a second body apart from the said first named body, and a plurality of heat-conducting vertical fins extending between and integral with the two bodies and forming a grille for receiving material to be melted, in combination with a temperature responsive circuit control device housed within the second named body and electrically connected to the element to control the supply of power thereto.

8. Apparatus for melting and dispensing material solid at normal temperatures and having the peculiar physical characteristics of asphalt, and comprising a tank to hold material to be melted, and an electrically heated heating unit positioned in the tank, the heating unit consisting of an annular electrical heating element and a heat transmitting and radiating shell of metal thereon consisting of an annular body enclosing the element, a second body apart from the said first named body and located in the center thereof, and a plurality of heat-conducting vertical fins extending between and integral with the two bodies and forming a grille for receiving material to be melted, in combination with a temperature responsive circuit control device housed within the second named body and electrically connected to the element to control the supply of power thereto.

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