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[54] **ADJUSTABLE CATALYTIC HEATER AND REPLACEABLE WICK ASSEMBLY THEREFOR**

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[52] **U.S. Cl.** **431/324**, 431/315, 431/329, 431/241

[51] **Int. Cl.**.....**F23d 3/18**

[58] **Field of Search**.....431/241, 315, 320, 431/324, 329, 326, 344

[56] **References Cited**

UNITED STATES PATENTS

2,441,242	5/1948	Harkins	431/324 X
3,343,586	9/1967	Berchtold et al.	431/241
3,457,021	7/1969	Gladden et al.	431/350 X
3,042,108	7/1962	Boij et al.	431/323

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[57] **ABSTRACT**

A catalytic heater is provided with a wick assembly which can be replaced when necessary and which permits the heat output of the heater to be varied. An elongated wick is secured within a generally cylindrical support tube, and an attaching collar extends radially outwardly from the support tube for removably securing the support tube and wick to the catalytic heater. The lower end of the wick extends into the fount of the heater, and the upper end of the wick extends into the vapor collection space of the combustion head of the heater for supplying fuel to the vapor collection space by capillary action. A tubular sleeve is slidably received by the upper portion of the wick, and the sleeve is movable by lever means between a raised position in which most of the wick within the vapor collection space is covered by the sleeve and a lowered position in which most of the wick within the vapor collection space is exposed. The combustion head is removably secured to the fount by a tubular connector to permit replacement of the wick and support tube when desired.

15 Claims, 14 Drawing Figures

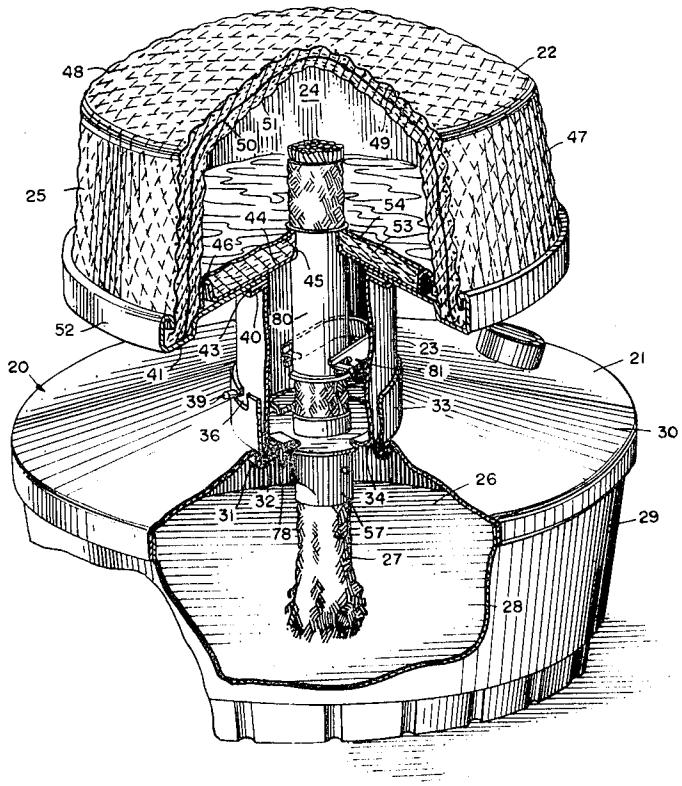
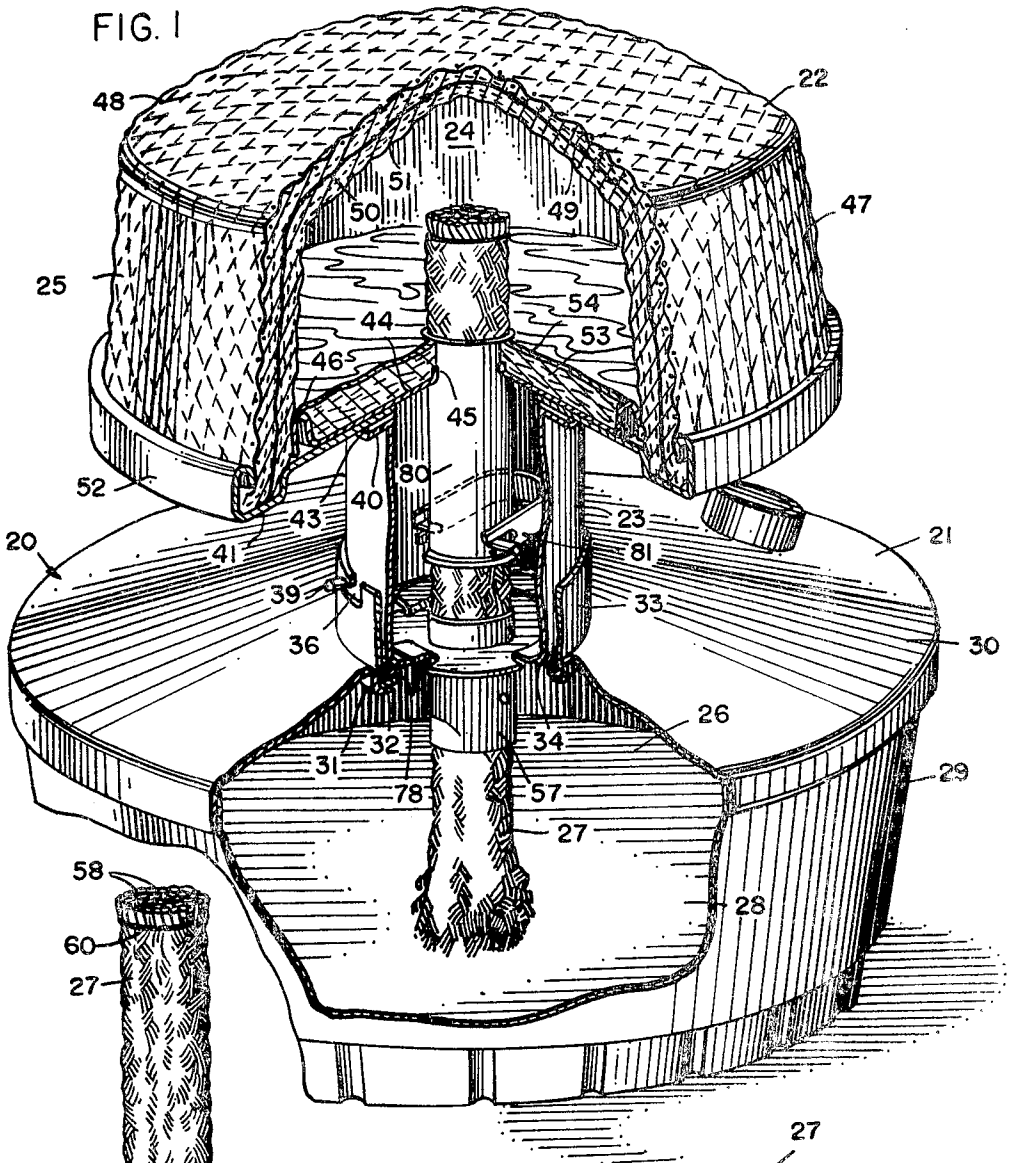


FIG. 1



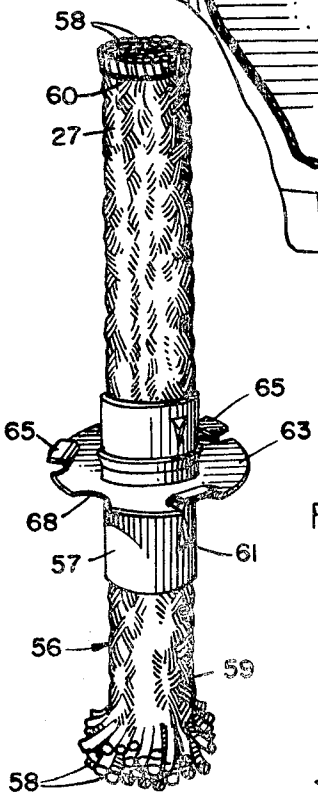
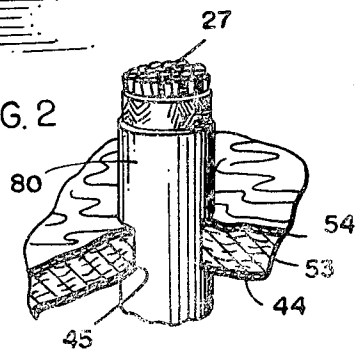


FIG. 3

FIG. 2



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FIG. 5

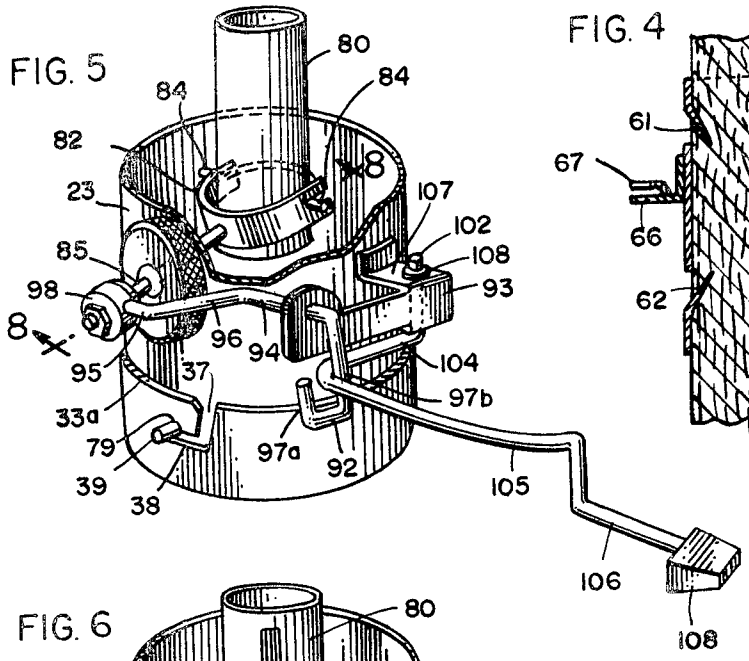


FIG. 4

FIG. 6

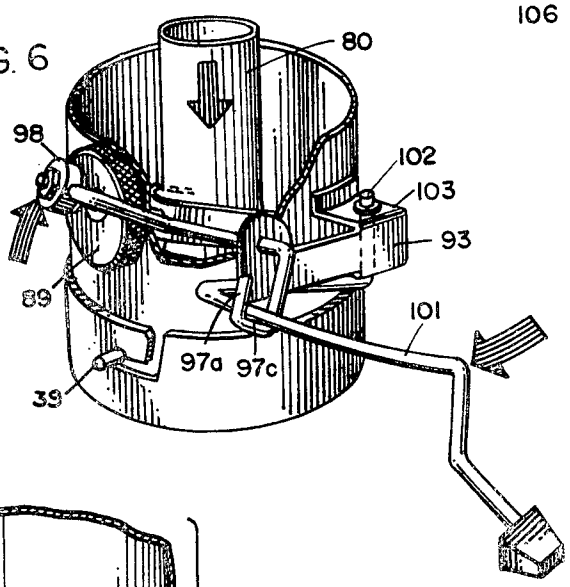


FIG. 7

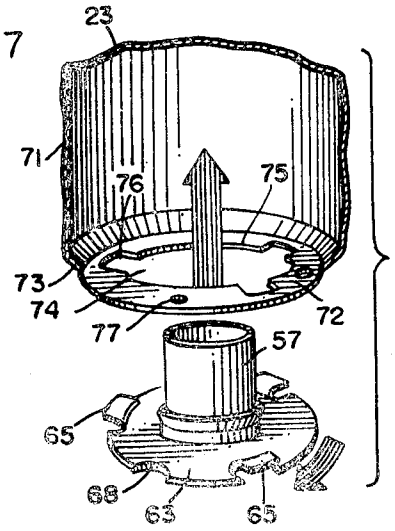
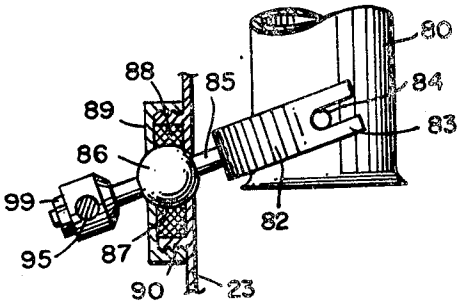


FIG. 8



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FIG. 9

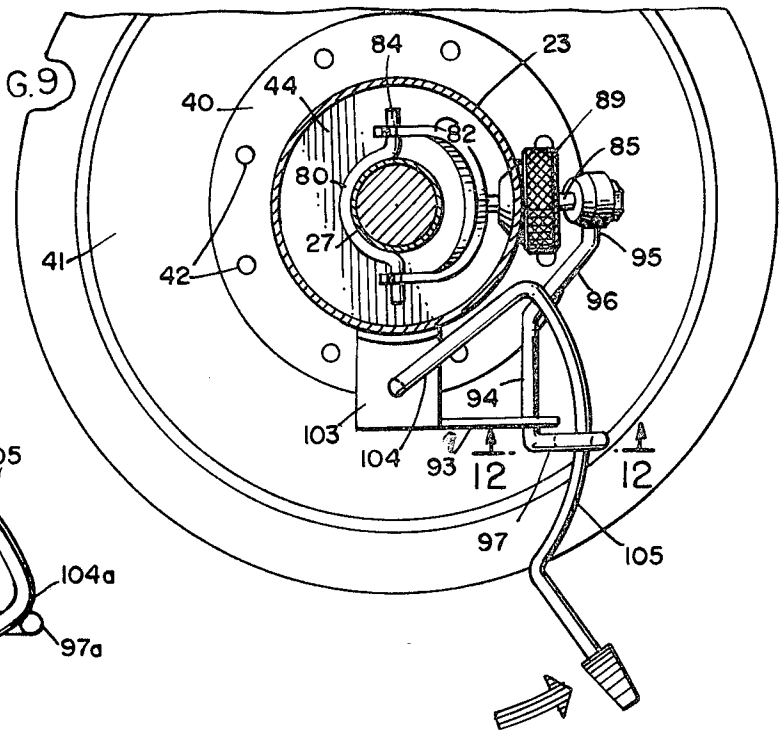


FIG. 14

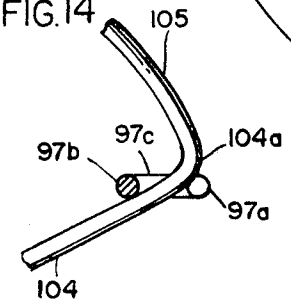


FIG. 11

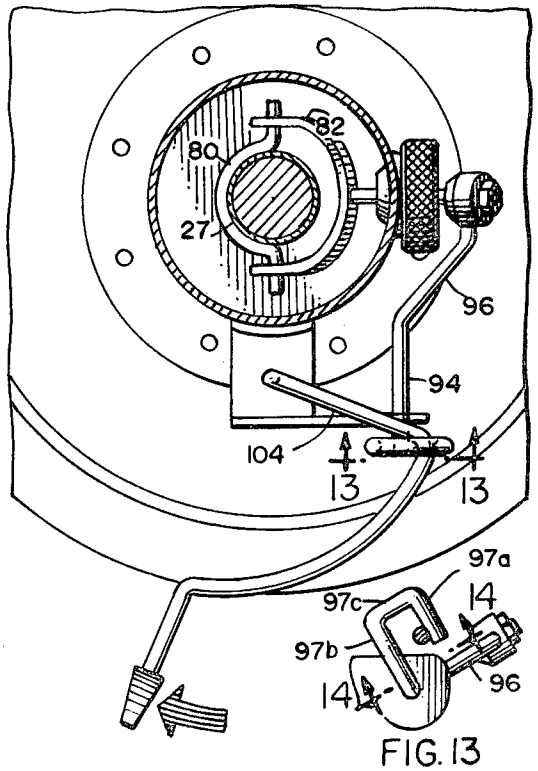


FIG. 13

FIG. 10

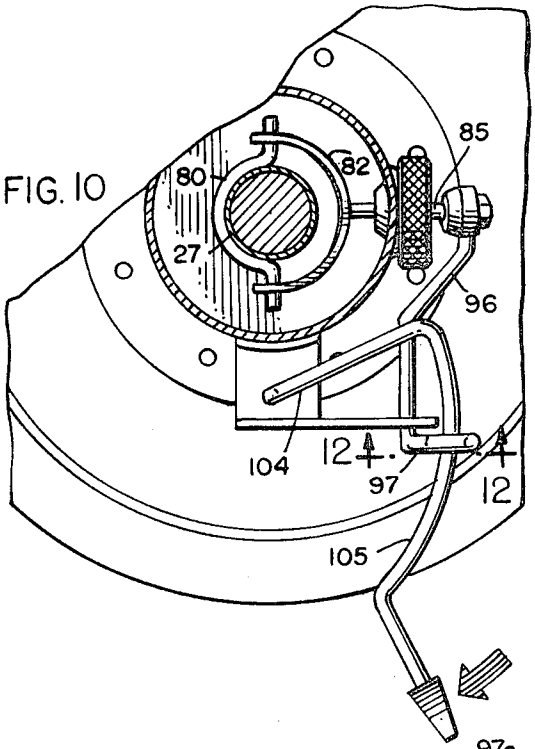
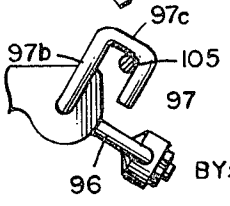


FIG. 12



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ADJUSTABLE CATALYTIC HEATER AND REPLACEABLE WICK ASSEMBLY THEREFOR

BACKGROUND

This invention relates to catalytic heaters of the type described in U.S. Pat. Nos. 3,457,021 and Re.26,976. More particularly, this invention relates to a variable heat output catalytic heater and a replaceable wick assembly therefor.

An improved catalytic heater is described in U.S. Pat. No. Re.26,976. This heater is capable of sustaining a substantially uniform high rate of fuel consumption from full fuel charge to empty. U.S. Pat. No. 3,457,021 discloses a similar catalytic heater which is provided with means for controllably and selectively varying the heat output.

Maximum efficiency is obtained from this type of heater if a fuel is used which does not contain tetraethyl lead compounds, oil, kerosene, or other material which may decompose or fractionate under the high temperatures maintained in the combustion head. Such compounds may deposit on the wick, and the wick may eventually become so covered and embedded with these compounds that the efficiency of the heater will be seriously impaired. Heretofore, the wick assembly was relatively permanently positioned within the heater, and replacement of the wick was generally performed at the factory rather than by the user.

SUMMARY

The invention provides a replaceable wick assembly for a variable heat output catalytic heater. The wick assembly is removably secured to the tubular connector which mounts the combustion head on the fount, and the tubular connector is itself removably secured to the fount. Adjustability of the heater is provided by a sleeve which slides up and down over the upper portion of the wick, and the wick assembly can be easily removed when desired by disconnecting the tubular connector from the fount and disconnecting the wick assembly from the tubular connector. The wick assembly can therefore be replaced quickly and relatively inexpensively. When the wick is positioned within the heater, it is maintained in a fixed position with the lower end thereof contacting the bottom of the fount and the upper end thereof spaced the optimum distance from the catalytic element. Heat adjustment is obtained by moving the sleeve as desired over the upper end of the wick to expose more or less of the surface area of the wick to the vapor collection space within the combustion head. The sleeve is moved axially by lever means pivotally mounted within the tubular connector, and actuating means are provided for pivoting the lever means and for releasably locking the sleeve in the raised position for minimum heat output and in the lowered position for maximum heat output.

DESCRIPTION OF THE DRAWING

The invention will be explained in conjunction with an illustrative embodiment shown in the accompanying drawing, in which

FIG. 1 is a perspective view, partially broken away, of a catalytic heater embodying the present invention;

FIG. 2 is a fragmentary view of a portion of FIG. 1 showing the wick sleeve in a raised position;

FIG. 3 is a perspective view of the replaceable wick assembly;

FIG. 4 is a fragmentary longitudinal sectional view of the wick assembly;

Flg. 5 is a fragmentary perspective view, with the wick assembly removed, of the heat adjusting means;

FIG. 6 is a view similar to FIG. 5 showing the heat adjusting means in another position;

FIG. 7 is a fragmentary perspective view showing the method of attaching the wick assembly, the wick being omitted for clarity;

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 5;

FIG. 9 is a sectional view taken through the tubular connector of the heater looking toward the combustion head showing the actuating arm releasably locking the wick sleeve in the lowered position;

FIG. 10 is a view similar to FIG. 9 showing the actuating arm in an intermediate position;

FIG. 11 is a view similar to FIGS. 9 and 10 showing the actuating arm releasably locking the wick sleeve in the raised position;

FIG. 12 is a fragmentary sectional view taken along the line 12—12 of FIG. 9;

FIG. 13 is a fragmentary sectional view taken along the line 13—13 of FIG. 12; and

FIG. 14 is an enlarged fragmentary sectional view taken along the line 14—14 of FIG. 13.

DESCRIPTION OF SPECIFIC EMBODIMENTS

Referring now to FIG. 1, the numeral 20 designates generally a catalytic heater which is generally of the type described in U.S. Pat. No. Re.26,976 and U.S. Pat. No. 3,457,021. The heater includes a base housing 21, a combustion head 22, and a tubular connector 23 which extends between the combustion head and the base housing. The combustion head 22 provides an enclosed fuel vapor collection space 24 and includes a porous catalytic combustion element 25 which is in vapor transfer relation with collection space 24.

The base housing or fount 21 provides a reservoir 26 for a liquid fuel, and the reservoir is of the open or unpacked type. A capillary action wick 27 contacts the bottom wall 28 of the fount and extends upwardly through the tubular connector and into the vapor collection space of the combustion head. The base housing includes a generally frusto-conical side wall 29 which extends upwardly from the bottom wall 28 and a top wall 30 which is provided with a central opening defined by a circular, downwardly extending flange 31 which terminates in a radially inwardly extending annular rim 32. A generally cylindrical attaching sleeve 33 is received by the central opening in the top wall 30, and the sleeve includes a radially inwardly extending annular bottom wall 34 which abuts the inwardly turned rim 32. The cylindrical sleeve 33 and the annular wall 34 are suitably secured, respectively, to the flange 31 and the rim 32, as by welding.

The upper portion of the attaching sleeve 33 is provided with a plurality of circumferentially spaced generally L-shaped slots 36, each of the slots having a mouth portion 37 (FIG. 5) extending generally downwardly or vertically from the upper edge 33*a* of the sleeve and a generally horizontally extending portion 38. In the particular heater illustrated the attaching sleeve is provided with three slots 36 spaced about 120° apart, and, as will be explained more fully hereinafter, the tubular connector 23 is releasably secured to the

attaching sleeve by means of radially outwardly extending pins **39** which are received by the slots.

Still referring to FIG. **1**, the upper end of the tubular connector **23** terminates in a radially outwardly extending flange **40** which is secured to the bottom wall **41** of the combustion head by a plurality of rivets **42** (FIG. **9**). An annular insulating gasket **43** is interposed between the flange **40** and the bottom wall **41** to reduce heat transfer from the bottom wall to the tubular connector and to prevent vapor leakage. The bottom wall **41** does not extend inwardly beyond the tubular connector, but a combustion head stiffener plate **44**, which is also secured to the bottom wall **41** by means of the rivets, is provided with a central opening defined by an upwardly turned rim **45**. The outer periphery of the stiffener plate terminates in an upwardly extending U-shaped flange **46**.

The catalytic combustion element **25** has a generally frusto-conical side portion **47** and a somewhat dome-shaped top portion **48**, and the catalytic element includes an outer screen **49**, a catalyst layer **50** adjacent the screen, and a backing layer **51**. The catalytic element extends downwardly adjacent the U-shaped flange **46** of the stiffener plate and is secured to the bottom wall **41** by a generally L-shaped peripheral clamping flange **52**. A layer **53** of non-combustible insulating material is positioned over the stiffener plate and covered by a heat-reflecting layer **54** of metal foil. If desired, a suitable protective cover can be positioned over the combustion head and hingedly secured to the base housing.

Referring now to FIGS. **3** and **4**, the numeral **56** designates generally a replaceable wick assembly for the heater which includes the elongated, generally cylindrical wick **27** and a wick support tube **57**. The wick **27** can be formed of many different materials and have various cross-sectional shapes while achieving the objects of the present invention. Preferably, however, the wick is formed of non-combustible fibers or filaments **58**, such as fiber glass, and a woven outer tube **59** of a suitable non-combustible material which encloses the tightly packed, vertically extending filaments **58**. The upper end of the wick may be tightly wrapped with one or more wraps **60** of asbestos mantle yarn, and the woven outer tube **59** may be cut adjacent the bottom end of the wick, or may terminate short of the bottom end of the wick, to permit the ends of the filaments **58** to be relatively loosely arranged adjacent the bottom of the fount.

The wick support tube **57** is secured to the wick to prevent axial movement of the wick therein by staking or lancing the wall of the support tube inwardly into the wick to pierce the outer woven tube **59**. In the particular embodiment illustrated, two pairs **61** and **62** of axially spaced stakes are used, each pair extending in generally opposite axial directions to firmly anchor the wick.

A generally circular and planar attaching collar **63** extends radially outwardly from the wick support tube and is secured thereto by means of an axially extending perimetric flange **64**. Three tabs **65** are provided around the periphery of the collar by punching the collar at generally equally spaced portions along the outer periphery thereof. Each tab includes a generally upwardly extending portion **66** and an outwardly extending generally planar portion **67** which extends generally parallel with the plane of the collar. The periphery of the collar may also be provided with a vent notch **68**.

As can be seen best in FIGS. **1** and **7**, the tubular connector **23** includes a generally cylindrical side wall **71** and a transversely extending bottom wall **72** which are joined by a downwardly and inwardly extending frusto-conical wall **73**. The bottom wall **72** is provided with central opening **74** having a circular periphery **75** of a diameter less than the diameter of the periphery of the attaching collar **63**, three outwardly extending notch portions **76** for receiving the tabs **65**, and one or more pressure-equalizing holes **77**. The outer periphery of the notches **76** are spaced from the center of the opening **74** a distance slightly greater than the radius of the tabs so that the wick support tube **63** and the tabs **67** can be inserted through the opening **74** in the tubular connector. The attaching collar is larger than the opening **74**, and the straight portions **67** of the tabs **65** are advantageously spaced from the plane of the collar a distance slightly greater than the thickness of the bottom wall **72** of the tubular connector. The wick assembly **56** can therefore be releasably secured to the tubular connector by inserting the tabs **65** through the notches **76** and then rotating the wick assembly to position the tabs over unnotched portions of the bottom wall **72**. The wall **72** would then be positioned between the end portions **67** of the tabs and the outer periphery of the collar **63**, and the wick assembly would be secured against axial movement. The circular periphery **75** of the central opening **74** has a radius greater than the distance of the upwardly extending portions **66** of the tabs, and this periphery restrains axial movement of the wick assembly. For purposes of clarity the wick is not shown in FIG. **7**, but it is to be understood that the wick is secured within the wick support tube **57** when the wick assembly is secured to the tubular connector.

The tubular connector is in turn releasably secured to the base housing by means of the pins or projections **39** which cooperate with the L-shaped slots **36** in the attaching sleeve **33**. The cylindrical wall **71** of the tubular connector has a diameter slightly less than the inside diameter of the attaching sleeve, and a rubber O-ring **78** provides both insulation and a vapor seal between the tubular connector and the housing. The outside diameter of the O-ring is slightly less than the inside diameter of the attaching sleeve **33**, and the O-ring is supported by the inwardly extending annular wall **34**. The tubular connector is attached by inserting the projections **39** into the mouth portions **37** of the slots and then rotating the tubular connector relative to the attaching sleeve to bring the projections into the horizontal portions **38** of the slots. As the tubular connector is moved downwardly to bring the projections **39** into alignment with the slot portions **38**, the O-ring **78** is compressed by the frusto-conical wall **73** of the tubular connector and forced against both the attaching sleeve **33** and the annular bottom wall **34** at the juncture thereof. If desired, the slots **36** may also be provided with a slightly upwardly extending end portion **79** (FIG. **5**) into which the projections **39** are biased by the resilient O-ring to prevent inadvertent removal of the tubular connector. When the connector is to be removed, it need only be forced slightly downwardly and then rotated relative to the base housing.

A generally cylindrical wick sleeve or cover **80** is slidably received by the upper portion of the wick and extends slidably through the central opening in the combustion head stiffener plate **44**. The inside diameter of

the sleeve is just slightly greater than the diameter of the wick, and the outside diameter of the sleeve is just slightly less than the diameter of the upwardly turned inner rim 45 of the stiffener plate.

The sleeve 80 is supported by a lever assembly designated generally by the numeral 81 in FIG. 1 for axial sliding movement between a lowered position illustrated in FIG. 1 and a raised position illustrated in FIG. 2. The lever assembly 81 includes a generally U-shaped yoke 82 (FIGS. 5 and 8) having a pair of slotted ends 83 which slidably receive a pair of diametrically opposed outwardly extending pins 84 on the sleeve 80. A lever arm 85 is secured to the yoke and extends through an opening in the tubular connector 23. The lever 85 is pivotally mounted for movement in a generally vertical plane passing through the axis of the wick by means of a ball and socket mounting shown in FIG. 8. A ball fitting 86 is carried by the lever arm and is rotatable in a spherical socket 87 provided in a ring 88. The ring is secured to the tubular connector by a cap 89 which is threadedly secured to an externally threaded projection 90 on the tubular connector. The ball 86 also projects slightly through the openings provided in the tubular connector and the cap 89.

Referring now to FIGS. 5 and 6, the lever arm 85 is pivotable by a crank 92 which is rotatably supported by a bracket 93 secured to the tubular connector. The crank includes a generally straight central portion 94 which extends through the bracket 93 generally perpendicularly to the lever arm 85 and in general alignment with the ball and socket mounting therefor (FIG. 9). A first end portion 95 is offset from the central portion 94 by an angled portion 96 and extends generally parallel with the central portion. The other end of the crank terminates in a generally U-shaped end portion 97 which extends generally perpendicularly from the central portion. The end portion 95 is secured to the lever arm 85 by an annular fitting 98 and a nut 99, and the U-shaped end 97 is rotatable in a plane generally transverse to the central portion 94 by an actuator arm 101. Rotation of the U-shaped end rotates the central portion 94, thereby swinging the end portion 95 through an arc to pivot the lever arm 85 in a generally vertical plane.

The actuating arm 101 includes a generally vertically extending end portion 102, a relatively straight portion 104 extending generally perpendicularly from the end portion 102, an arcuately extending lever portion 105 which lies in a generally horizontal plane, and an outwardly extending end portion 106. The vertically extending end portion 102 extends through a pair of vertically spaced support legs 107 for the bracket 93 and is prevented from being withdrawn therefrom by a washer 108. The outer end portion may be provided with a knot 109.

The end 102 of the actuating arm is rotatably supported by the support legs 107 to permit swinging movement of the arcuate lever portion 105 in a generally horizontal plane. As the arcuate portion 105 is swung to the left as viewed in FIG. 5, it engages one of the side portions 97*a* of the U-shaped end of the crank arm and rotates the U-shaped end clockwise to swing the yoke 82 downwardly, thereby sliding the sleeve 80 downwardly over the wick. Similarly, when the arcuate portion 105 is swung to the right as viewed in FIG. 5, it engages the side portion 97*b* of the U-shaped end of the crank arm and causes the sleeve 80 to be moved upwardly with respect to the wick. For purposes of clarity, the wick has been omitted from FIGS. 5 and 6, but it will be understood that the sleeve 80 slides over the outside of the wick between the lowered and raised positions illustrated in FIGS. 1 and 2.

The sides 97*a* and 97*b* of the U-shaped end portion of the crank are spaced apart a distance greater than the thickness of the arcuate portion 105 of the actuating arm, and the arcuate portion passes between the side portions of the U-shaped end as the actuating arm swings in a horizontal plane. However, as the arcuate portion continues to swing toward the left as viewed in FIGS. 5 and 6, the bottom portion 97*c* will eventually rotate into engagement with the arcuate portion 105, and further movement of the crank arm and the actuating arm will be prevented. Similarly, as the actuating arm is swung to the right as viewed in FIG. 5 the straight portion 104 will eventually contact the side portion 97*b* of the crank.

FIGS. 9–11 are sectional views taken through the tubular connector looking toward the combustion head which illustrate the actuating means for raising and lowering the wick sleeve 80 in various positions. In FIG. 9, the actuating arm has been swung the maximum amount in the counterclockwise direction to pivot the outer end of the lever arm upwardly and to position the wick sleeve 80 in its lowered position. FIG. 10 illustrates the actuating arm in an intermediate position, and FIG. 11 illustrates the actuating arm rotated in the clockwise direction the maximum amount to move the wick sleeve to the raised position.

Referring now to FIGS. 9 and 12, as the arcuate portion 105 of the actuating arm is swung in a counterclockwise direction as viewed in FIG. 9, the bottom portion 97*c* of the U-shaped end of the crank will eventually rotate upwardly to engage the arcuate portion. Further swinging movement of the arcuate portion in the counterclockwise direction will be restrained by the bottom portion 97*c*, and the arcuate portion will become wedged between the side portion 97*a* and the bottom portion 97*c* at the juncture thereof as shown in FIG. 12. By applying force to the outer end of the actuating arm, the arcuate portion can be frictionally locked in the position illustrated in FIG. 9 by the forces exerted thereon by the side portion 97*a* and bottom portion 97*c* of the U-shaped end, which are exerted in generally perpendicular directions. The wick sleeve can thereby be releasably locked in the lowered position in which the upper end of the sleeve extends just beyond the heat-reflecting foil 54 in the combustion head to expose substantially all of that portion of the wick which extends into the vapor collection space. This lowered position of the wick sleeve is suitable for starting the catalytic heater and for providing maximum heat output.

The arcuate portions of the actuating arm can be disengaged from its frictional retention with the U-shaped end of the crank by exerting a clockwise force on the end of the actuating arm as shown in FIG. 10. As the arcuate portion swings in a clockwise direction it engages the side portion 97*b* of the U-shaped end portion and causes the wick sleeve to move upwardly. Continued swinging movement of the arcuate portion will eventually bring the straight portion 104 of the actuating arm into engagement with the side portion 97*b*. Further swinging movement of the actuating arm will therefore be restrained since the straight lever arm ex-

erts a substantially outward force on the side portion **97***b*. However, if a relatively sharp jerk is applied to the actuating arm as the straight portion **104** approaches the side portion **97***b*, the elbow **104***a* (FIG. **14**) formed by the juncture of the straight portion **104** with the arcuate portion **105** will pass outwardly between the sides of the U-shaped end of the crank, and the actuating arm will thereby be releaseably wedged or lodged between the two side portions. The wick sleeve will thereby be releasably locked in its uppermost position. The actuating arm can be released from its engagement with the crank by exerting a slight positive force in a counterclockwise direction as viewed in FIG. **11** to move the elbow inwardly between the two side portions of the crank.

The operation of the heater is apparent from the foregoing description. The heater is assembled by inserting the upper end of the wick sleeve **80** through the central opening in the combustion head stiffener plate **44** and positioning the pins **84** thereof in the slotted ends of the yoke **82.** The wick assembly is then secured by inserting the upper end of the wick through the wick sleeve and into the vapor collection space and then rotating the wick assembly to disalign the tabs **65** on the attaching collar and the slots **76** in the bottom wall of the tubular connector. The tubular connector is secured to the base housing by inserting the projections **39** through the slots **36** and then rotating the tubular connector relative to the housing. The O-ring **78** not only provides a vapor seal between the housing and the tubular connector, but it provides insulation between these parts to reduce the amount of heat that might otherwise be conducted from the combustion head to the fuel reservoir through the tubular connector. When the tubular connector is secured to the base housing, the vent notch **68** (FIG. **7**) in the attaching collar will be aligned with one of the vent openings **77** in the bottom wall of the tubular connector to communicate the fuel reservoir with the combustion head through the space between the rim **45** of the plate **44** and the sleeve **80** so that the fuel reservoir is maintained at substantially atmospheric pressure.

The assembled heater is shown in FIG. **1,** and the length of the wick is such that the bottom end thereof contacts the bottom wall **28** of the base housing. The outer woven tube **59** of the wick may be slit adjacent the bottom of the wick to permit the filaments **58** to spread into contacting and conforming relation to the bottom wall **28.** The fuel will therefore continue to be withdrawn by the wick until the reservoir is empty.

The length of the upper portion of the wick is such that the upper end of the wick is positioned in the vapor collection space intermediate the domed top **48** of the combustion head and the heat-reflecting surface **54.** Since the wick remains stationary within the vapor collection space, the upper end thereof can be positioned relative to the catalytic combustion element to provide optimum operating characteristics.

When the heater is being started or when maximum heat output is desired, the actuating arm is rotated to slide the wick sleeve to the lowered position illustrated in FIG. **1.** In this position, the upper end of the wick sleeve is positioned just above the heat-reflecting surface **54,** and substantially all of the wick which extends into the vapor collection space is exposed. A liquid fuel is drawn from the reservoir by capillary action and is evaporated on the exposed outer surface of the upper portion of the wick within the vapor collection space, and the amount of fuel supplied to the vapor collection space is therefore dependent upon the amount of surface area of the wick which is exposed. After the heater is started, the rate of vaporization of fuel from the upper portion of the wick may be varied as desired by moving the wick sleeve **80** axially relative to the wick to vary the amount of exposed surface area of the wick.

The sleeve may be sized relative to the wick to provide sufficient frictional force therebetween to hold the sleeve in the desired position. Alternatively, actuating arm **101** may be designed so that the end portion **106** thereof swings over the top wall **30** of the housing in frictional engagement therewith to hold the sleeve in position.

In the particular embodiment illustrated, a portion of the wick remains exposed even when the wick sleeve **80** is raised to its uppermost position as shown in FIG. **2.** The heater will therefore continue to operate, although at relatively low heat output, when the wick sleeve is in the raised position. The heater can be extinguished when desired by covering the combustion head with a snuffer cap having a shape corresponding to the shape of the catalytic heater. If desired, however, the actuating means for the wick sleeve could be constructed to position the upper end of the wick sleeve at or above the upper end of the wick when the wick sleeve is in the raised position to permit the heater to be extinguished by simply moving the actuating arm.

If the wick becomes clogged or embedded with carbonaceous material, lead deposits, or other products of combustion, the wick assembly can be quickly and easily replaced by the user. The tubular connector is first disconnected from the base housing by rotating the projections **39** into the mouth portions of the slots **36** and lifting the combustion head and tubular connector away from the housing. The wick assembly can then be removed by grasping the wick support tube **57** and rotating the tube to align the tabs **65** with the slots **76** in the bottom of the tubular connector. The wick assembly may then be withdrawn from the tubular connector and the wick sleeve for replacement with a new wick assembly.

In one specific embodiment of the invention, the wick was about three-fourths inch in diameter. About 1 inch of the wick was exposed when the wick sleeve was in the lowermost position and about one-eighth inch of the wick was exposed when the wick sleeve was in the uppermost position, and the heat output of the heater was thereby varied between about 5,000 B.t.u. per hour to about 3,000 B.t.u. per hour. Heaters having larger or smaller heat outputs can be provided, however, by varying the size of the catalytic combustion element and/or the size of the wick.

While in the foregoing specification a detailed description of a specific embodiment of the invention was set forth, it will be understood that many of the details herein given can be varied considerably by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. In combination with a catalytic heater having a base housing providing a reservoir for liquid fuel, a combustion head thereabove, an enclosed fuel vapor collection space, a tubular connector extending between the combustion head and the base housing, an elongated capillary action wick extending from the res-

ervoir through the tubular connector into the vapor collection space for liquid fuel transfer therethrough to the vapor collection space, the improvement characterized by a support tube for the wick secured to the heater within the tubular connector, anchor means for securing the wick within the support tube against longitudinal movement, a tubular sleeve slidably received on the wick above the support tube, the sleeve being slidable longitudinally betweed a raised position in which the upper portion of the sleeve extends into the vapor collection space to cover the majority of the portion of the wick which extends into the vapor collection space and a lowered position whereby the amount of surface area of the wick exposed to the vapor collection space can be varied, and means for moving the sleeve between the raised and lowered positions.

2. The combination of claim 1 in which the anchor means comprises portions of the wall of the support tube bent inwardly to engage the wick.

3. The combination of claim 1 including an attaching collar secured to the support tube and extending transversely outwardly therefrom, the attaching collar being removably secured to the tubular connector.

4. The combination of claim 1 including an attaching collar secured to the support tube and extending transversely outwardly therefrom, the attaching collar being removably secured to the tubular connector, the attaching collar including tab means and the tubular connector including a transversely inwardly extending bottom wall provided with a central opening therethrough for receiving the wick and slot means for receiving the tab means of the attaching collar whereby the attaching collar can be removably secured to the tubular connector by aligning the tab means thereof with the slot means and rotating the attaching collar with respect to the tubular connector to disalign the tab means and the slot means.

5. The combination of claim 1 in which the wick and support tube are generally cylindrical, an attaching collar secured to the support tube and extending radially outwardly therefrom, the collar being generally planar and having a generally circular periphery, circumferentially spaced portions of the collar being offset from the plane of the collar adjacent the periphery thereof to provide a plurality of circumferentially spaced tabs, the tubular connector including a transversely inwardly extending bottom wall provided with a generally circular central opening having a diameter greater than the diameter of the wick but less than the diameter of the generally circular periphery of the collar, the bottom wall being provided with a plurality of slots extending radially outwardly from the central opening therethrough and sized and arranged to receive the tabs on the collar, the tabs being spaced from the plane of the collar a distance at least as great as the thickness of the bottom wall whereby the attaching collar can be removably secured to the tubular connector by aligning the tabs on the collar with the slots in the bottom wall, inserting the tabs into the slots and rotating the collar with respect to the tubular connector to position the tabs above portions of the bottom wall adjacent the periphery of the central opening therethrough.

6. The combination of claim 1 in which the base housing includes a generally vertically extending generally cylindrical attaching sleeve and an annular support wall having a central opening and extending radially inwardly from the attaching sleeve, the tubular connector being generally cylindrical and being received by the attaching sleeve of the base, means for releasably securing the tubular connector and the attaching sleeve against relative axial movement, and gasket means between the tubular connector and the annular support wall for providing a vapor seal therebetween.

7. The combination of claim 1 in which the base housing includes a generally vertically extending generally cylindrical attaching sleeve and an annular support wall having a central opening and extending radially inwardly from the attaching sleeve, the tubular connector being generally cylindrical and being received by the attaching sleeve of the base, means for releasably securing the tubular connector and the attaching sleeve against relative axial movement, and gasket means between the tubular connector and the annular support wall for providing a vapor seal therebetween, the tubular connector including a generally cylindrical side wall, a radially inwardly extending annular bottom wall and an inwardly and downwardly extending wall joining the cylindrical side wall and the bottom wall, the gasket means comprising an O-ring having an outside diameter substantially the same as the inside diameter of the attaching sleeve on the base, the O-ring being forced by the inwardly and downwardly extending wall of the tubular connector against the juncture between the generally cylindrical attaching sleeve and the annular support wall.

8. The combination of claim 1 in which the base housing includes a generally vertically extending generally cylindrical attaching sleeve and an annular support wall having a central opening and extending radially inwardly from the attaching sleeve, the tubular connector being generally cylindrical and being received by the attaching sleeve of the base, means for releasably securing the tubular connector and the attaching sleeve against relative axial movement, and gasket means between the tubular connector and the annular support wall for providing a vapor seal therebetween, the means for releasably securing the tubular connector and the attaching sleeve including a plurality of circumferentially spaced projections extending radially outwardly from the tubular connector, the attaching sleeve being provided with a generally L-shaped slot for each of the projections on the tubular connector, each slot having a first portion extending generally downwardly from the upper edge of the attaching sleeve and a second portion extending generally transversely from the first portion whereby the tubular connector can be releasably secured to the attaching sleeve by lowering the projections into the first portions of the slots and then rotating the tubular connector to rotate the projections into the second portions of the slot.

9. The combination of claim 1 in which the wick and the support tube are generally cylindrical, an attaching collar secured to the support tube and extending radially outwardly therefrom, the collar being generally planar and having a generally circular periphery, circumferentially spaced portions of the collar being offset from the plane of the collar adjacent the periphery thereof to provide a plurality of circumferentially spaced tabs, the tubular connector including a generally cylindrical side wall, a radially inwardly extending annular bottom wall and an inwardly and downwardly extending wall joining the cylindrical side wall and the bottom wall, the bottom wall of the tubular connector being provided with a generally circular central open-

ing having a diameter greater than the diameter of the wick but less than the diameter of the generally circular periphery of the attaching collar, the bottom wall also being provided with a plurality of slots extending radially outwardly from the central opening therethrough and sized and arranged to receive the tabs on the collar, the base housing including a generally vertically extending generally cylindrical attaching sleeve and an annular support wall having a central opening and extending radially inwardly from the attaching sleeve, the inside diameter of the attaching sleeve being substantially the same as the outside diameter of the cylindrical side wall of the tubular connector, the tubular connector being rotatably received by the attaching sleeve, a compressible O-ring sealingly engaging the inwardly and downwardly extending wall of the tubular connector and the juncture between the attaching sleeve and the annular support wall of the base, and means for releasably securing the tubular connector and the attaching sleeve against relative axial movement.

10. The combination of claim **1** in which the means for moving the sleeve includes a lever arm extending through the tubular connector and pivotally mounted therein for movement in a plane extending generally through the axis of the tubular sleeve, the lever arm having one end thereof operatively connected to the tubular sleeve, a crank arm rotatably mounted on the heater and having one end thereof secured to the other end of the lever arm whereby rotation of the crank arm pivots the lever arm and moves the tubular sleeve axially.

11. The combination of claim **1** in which the means for moving the sleeve includes a lever arm extending through the tubular connector and pivotally mounted therein for movement in a plane extending generally through the axis of the tubular sleeve, the lever arm having one end thereof operatively connected to the tubular sleeve, a crank arm rotatably mounted on the heater and having one end thereof secured to the other end of the lever arm whereby rotation of the crank arm pivots the lever arm and moves the tubular sleeve axially, the other end of the crank arm being provided with slot means and being rotatable in a plane generally perpendicular to the axis of rotation of the crank arm at the rotatable mounting thereof to the heater, an actuating arm including an arcuately extending lever portion, the actuating arm being mounted on the heater for swinging movement of the lever portion in a plane generally transverse to the plane in which the other end of the crank arm rotates, the lever portion extending through the slot means of the other end of the crank arm whereby swinging movement of the lever portion rotates the other end of the crank arm.

12. The combination of claim **11** in which the crank arm includes a central portion which is rotatably mounted to the heater, said one end of the crank arm being axially offset from the central portion and extending generally parallel therewith, the other end of the crank arm extending generally perpendicularly to the central portion and having a generally U-shaped end to provide said slot means.

13. The combination of claim **11** in which the actuating arm includes a generally straight portion extending generally perpendicularly from the arcuate lever portion to provide an elbow, the generally straight portion being engageable with the other end of the crank arm as the lever portion swings in one direction to limit further movement of the actuating arm and the crank arm, the elbow being releasably lodgeable in the slot means to provide lock means for the crank arm for holding the tubular sleeve in one of the raised and lowered positions.

14. The combination of claim **11** in which the slot means has a bottom edge and a pair of side edges spaced apart a distance greater than the thickness of the arcuate lever portion, the length of the arcuate portion being such that a portion thereof is engageable with the bottom edge and one of the side edges of the slot means as the lever portion swings in one direction to limit further movement of the actuating arm and the crank arm, the arcuate lever portion being frictionally engageable with said bottom edge and one side edge for holding the tubular sleeve in one of the raised and lowered positions.

15. The combination of claim **10** in which said one end of the lever arm includes fork means extending about the tubular sleeve, pin means extending outwardly from the tubular sleeve, the fork means slidably receiving the pin means for raising and lowering the tubular sleeve.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,734,682 Dated May 22, 1973

Inventor(s) Randall L. May

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In column 9, line 9, "betweed" should be

--between--.

Signed and sealed this 1st day of January 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents