SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

RAD: 14-44560- -4 **FECHA**: 2015-05-16 23:33:00
DEP: 2020 DIRECCION DE NUEVAS CREACIONES **EVE:** 378 FASE NACIONAL INCLUIDO CAPITULO I
TRA: 11 PCT-PATENTE DE INVENCION CAPITULOS I Y II **FOLIOS**: 4
ACT: 430 REQUERSOLICITA

DIRECCIÓN DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogado(a)/Señor(a)
SILVANA MARÍA LÓPEZ DÍAZ

Asunto: Radicación: 14-44560- -4
Trámite: 11
Evento: 378
Actuación: 430
Oficio: 5379
Folios: 4

Patente de Invención	**X**			Patente de Modelo de Utilidad	
Vía Nacional					
Vía PCT (Fase Nacional)	**X**	Capítulo I	**X**	Capítulo II	
No. Solicitud Internacional	PCT/AU2012/001020				
Fecha de Presentación Internacional	31/08/2012				

Como resultado del examen de fondo realizado, con fundamento en el Artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se comunica:

1. Documentos estudiados

Descripción:	Rad. N° 14-044560-00000-0000	03/marzo/2014
Reivindicaciones:	Rad. N° 14-044560-00000-0000	03/marzo/2014
Dibujos:	Rad. N° 14-044560-00000-0000	03/marzo/2014
Prioridad:	AU 2011903572	02/Septiembre/2011

2. Análisis de la Prioridad

Se acepta la reivindicación de prioridad porque ésta solicitud fue presentada dentro del plazo establecido (Art. 9 D 486) y su contenido técnico corresponde con el de la prioridad reivindicada.

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3. Objeto de la invención

De acuerdo con lo establecido en el numeral 1.2.2.2 del Capítulo Primero del Título X de la Circular Única para efectos del examen de patentabilidad, se tendrá en cuenta la tasa pagada por el solicitante al momento de comenzar el examen para las reivindicaciones adicionales; esto es que cuando la solicitud contenga más de diez (10) reivindicaciones y no se haya pagado la tasa complementaria, sólo se estudiarán las cubiertas por la tasa pagada. Por lo tanto, se estudiaran las reivindicaciones 1 a 25.

Título de la solicitud: “Calentador eléctrico” (Fl. 1).

El problema planteado en esta solicitud, consiste en proporcionar un calentador eléctrico con el que se eviten los inconvenientes que presentan los convencionalmente utilizados, como la creación de zonas de calor relativamente pequeñas, incomodidades por el calor generado a las personas cerca al calentador, sobretodo en sus ojos y en su piel, entre otros.

Para resolver este problema técnico, la solicitud en estudio propone un calentador eléctrico que comprende un conector eléctrico, un elemento calefactor, un reflector adyacente al elemento calefactor, una cubierta adyacente al elemento calefactor, donde la cubierta se encuentra colocada de manera que el elemento calefactor se encuentra dispuesto entre dicha cubierta y el reflector.

El objeto de la presente solicitud se relaciona con la Clasificación Internacional de Patentes (CIP): F 24 C 7/04, F 24 H 3/00, H 05 B 1/00.

4. De la solicitud de patente

Titulo

El título no define en forma precisa el objeto de la invención. Se sugiere al solicitante modificar el título por uno que exponga dicho objeto, refiriéndose a las características constructivas de la invención, por ejemplo, “Calentador eléctrico con reflector y cubierta parabólica”.

Reivindicaciones (Art 30 D 486, Art 22 PCT)

El capítulo reivindicatorio no es claro porque:

- Las reivindicaciones 2 a 10 no pueden ser objeto de protección toda vez que la radiación electromagnética incidente y sus longitudes de onda no es una característica constructiva de la invención. De igual manera las expresiones: *“…para conexión a un suministro de corriente eléctrica…”, “…adaptado para la conexión eléctrica al conector (…) una primera longitud de onda…”, “…y adaptado para reflejar (…) en al menos una dirección de calentamiento…”, “…y para que el primer lado (…) primera longitud de onda.”* (reivindicación 1), *“…y adaptada para permitir (…) cubierta.”* (reivindicación 11), *“…que tiene una conductividad y emisividad (…) de 400ºC y 800ºC.”* (reivindicación 16), *“…para conexión a un suministro de corriente eléctrica…”, “… adaptado para conexión eléctrica (…) longitud de onda…”, “…y adaptado para reflejar la radiación electromagnética (…) una dirección de calentamiento…”, “…y para que el primer lado se entrecruce (…) longitud de onda…”, “y adaptada para permitir (…) cubierta…”, “…a fin de lograr las características deseadas de calentamiento.”*

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(reivindicación 22); describen funciones, efectos, ventajas o resultados a alcanzar, los cuales no son aspectos susceptibles de patente. Para mayor claridad, el producto reclamado se debe definir técnicamente mediante sus características estructurales. Se sugiere al solicitante eliminar las reivindicaciones y expresiones citadas.

- Las expresiones: *"sustancialmente"* o *"al menos una sustancialmente"* (reivindicaciones 14, 16, 19, 20 y 24), son imprecisas, por lo cual no permiten distinguir la invención del estado de la técnica. Se sugiere al solicitante eliminar las expresiones citadas.

5. Determinación del Estado de la Técnica

El estado de la técnica se determinó con base en la fecha de presentación de la solicitud de prioridad: septiembre 02 de 2011, y se encontraron los siguientes documentos que anticipan el objeto de esta solicitud:

Ítem	Documento	Título	Fecha de Publicación
D1	US 6'188.836	'Portable radiant heater with two reflectors'	13/Febrero/2001

El documento D1[1] divulga un calentador que comprende un elemento de calentamiento eléctricamente energizado a lo largo del eje vertical. Una primera superficie reflectiva es posicionada en la parte trasera del elemento de calentamiento. Un segundo reflector es posicionado en frente y cerca del elemento de calentamiento (resumen).

6. Examen de Patentabilidad (Art 14 D486)

Novedad (Art 16 D486)

La reivindicación 1 consiste en: "*Un calentador eléctrico caracterizado porque incluye: un conector eléctrico para conexión a un suministro de corriente eléctrica..."* (Ver página 21 del radicado Nº 14-044560-00000-0000).

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Características esenciales	D1
Calentador eléctrico caracterizado por:	Calentador eléctrico caracterizado por:
Un conector eléctrico.	Un elemento calentador que comprende un tubo cerámico (44) y un elemento eléctrico de calentamiento (45) dispuesto en el tubo (44), con conexiones eléctricas por medio del cable (45) (Fig. 1; Col. 3, líneas 47 a 52).
Un elemento calentador.	
Un reflector adyacente al elemento calefactor.	Reflectores (51) y (60) adyacentes al calefactor (Fig. 4).
Una cubierta adyacente al elemento calefactor, la cubierta tiene un primer lado y un segundo lado opuesto al primer lado.	Una cubierta (16) que incluye una base y una pared trasera vertical (18) (Fig. 1; Col. 3, líneas 13 a 15).
En donde la cubierta se encuentra colocada de manera que el	En donde la cubierta (16) se encuentra colocada de manera

1 https://www.google.com.co/patents/US6188836?dq=6188836&hl=en&sa=X&ei=N1k1VeWyHdPasATkx4HAAg&ved=0CBoQ6AEwAA

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elemento calefactor se encuentra dispuesto entre el primer lado y al menos un reflector.	que el elemento calefactor se encuentra dispuesto entre el primer lado y al menos un reflector (60) (Fig. 1).

De acuerdo con la tabla anterior, las características esenciales del calentador de la reivindicación 1 habían sido divulgadas previamente en el documento D1, por lo tanto, la materia reivindicada no es nueva.

Asimismo, el documento D1 divulga las características de las reivindicaciones dependientes así:

- Reivindicación 11: La cubierta (16) define una pluralidad de aberturas (19) cada una abriendo a través del primer lado y el segundo lado (Col. 3, líneas 13 a 16).

- Reivindicaciones 12 a 14: La cubierta se extiende sobre un área de cubierta total, y en donde las aberturas constituyen una parte del área total (Fig. 1; Col. 3, líneas 13 a 19).

- Reivindicación 15: Cualquier número de arreglos de agujeros específicos (19) de acuerdo a los estándares requeridos (Col. 3, líneas 15 a 19).

- Reivindicación 17: La porción 30 incluye un montaje (35) para el calentador y otro montaje (36) para el reflector (Col. 3, líneas 34 a 36).

- Reivindicación 18: El elemento calentador incluye un filamento calentado eléctricamente (45) (Fig. 1; Col. 3, líneas 47 a 52).

- Reivindicación 19: Los reflectores (51) y (60) son alargados, parabólicos y planos en sección transversal a lo largo de su longitud (Figs. 1 y 4).

- Reivindicación 20: La cubierta es alargada, parabólica y plana en su sección transversal a lo largo de su longitud (Fig. 1).

Ahora bien, el hecho de que la cubierta este fabricada en metal tampoco puede dar novedad al producto reclamado, toda vez que en el campo técnico de la solicitud es bien conocido que las cubiertas y en general los elementos que conforman los calentadores eléctricos pueden ser fabricados en metal[2]. En consecuencia, la reivindicación 16 no contiene características nuevas.

7. Conclusión

Los requisitos de Patentabilidad de la presente solicitud están afectados así:

Ítem	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	US 6'188.836	1, 11 a 20	Novedad/Nivel Inventivo

2 https://books.google.com.co/books?id=CbEgBQAAQBAJ&pg=PA93&dq=metal+housing+of+electrical+heaters+radiators&hl=en&sa=X&ei=6HQ1VaaOCoeXsAWstYHwCg&ved=0CDIQ6AEwAQ#v=onepage&q=metal%20housing%20of%20electrical%20heaters%20radiators&f=false

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En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta (60) días contados a partir del día siguiente de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Se invita al solicitante se sirva indicar, si así lo considera, su renuncia al término faltante de sesenta (60) días para dar respuesta a este requerimiento y presentarla por escrito.

Finalmente, se le recuerda al solicitante que si como respuesta a este requerimiento llegara a modificar el capítulo reivindicatorio y éste contenga más de diez (10) reivindicaciones, no pagará la tasa de modificación voluntaria pero sí la correspondiente al pago por reivindicación adicional.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única No. 10 de 2001.

JOSÉ LUIS SALAZAR LÓPEZ
Director de Nuevas Creaciones (c)

El anterior requerimiento fue notificado por fijación en lista, de fecha 2015-05-19

Elaboró: Monica Andrea Gutierrez Almonacid
Revisó: Sonia Andrea Diaz Pirazan

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US006188836B1

(12) **United States Patent**
Glucksman et al.

(10) **Patent No.: US 6,188,836 B1**
(45) **Date of Patent: Feb. 13, 2001**

(54) **PORTABLE RADIANT HEATER WITH TWO REFLECTORS**

(75) Inventors: **Dov Z. Glucksman**, Wenham; **Karl H. Weidemann**, Hull; **Robert E. Wolfe**, Holliston, all of MA (US)

(73) Assignee: **Appliance Development Corporation**, Danvers, MA (US)

(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: **09/273,621**

(22) Filed: **Mar. 22, 1999**

(51) **Int. Cl.**[7] **F24H 3/00**
(52) **U.S. Cl.** **392/376**; 392/423; 392/373
(58) **Field of Search** 392/376, 423, 392/425, 422, 374, 373, 375, 383; D23/335, 340

(56) **References Cited**

U.S. PATENT DOCUMENTS

670,905		3/1901	Pittman .	
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2,851,627		9/1958	Ferguson	313/114
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3,246,121		4/1966	Fannon, Jr. et al. .	
3,377,482		4/1968	Podany .	
3,394,886		7/1968	Budden .	
3,399,833		9/1968	Johnson	237/53
3,431,449		3/1969	Hundley	313/111
3,733,461	*	5/1973	Rohats	392/423
4,159,411		6/1979	Ellersick .	
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4,835,367		5/1989	Hoffman .	
4,929,866		5/1990	Murata et al.	313/500
5,437,001		7/1995	Chaney et al.	392/376
5,511,145		4/1996	Bailey et al.	392/355
5,561,735		10/1996	Camm	392/416
5,594,831		1/1997	Oparin et al.	392/421
5,677,983		10/1997	Oparin et al.	392/421
5,761,377		6/1998	Wolfe et al. .	

FOREIGN PATENT DOCUMENTS

382099	*	9/1923	(DE) .
820732	*	11/1951	(DE) .
577196	*	1/1994	(EP) .
895032	*	2/1999	(EP) .
761383	*	3/1934	(FR) .
885105	*	9/1943	(FR) .
968495	*	11/1950	(FR) .
581791	*	10/1946	(GB) .
603926	*	6/1948	(GB) .
9103915	*	3/1991	(WO) .

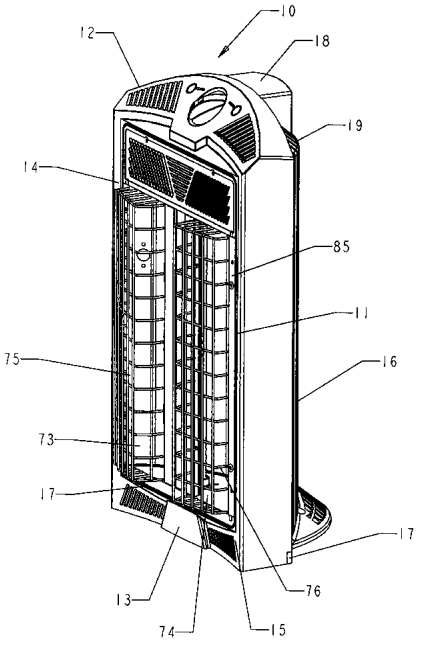
* cited by examiner

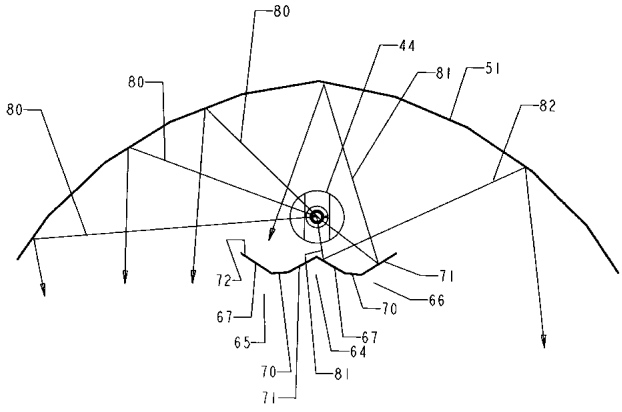
Primary Examiner—John A. Jeffery
(74) *Attorney, Agent, or Firm*—George A. Herbster; Pearson & Pearson

(57) **ABSTRACT**

A portable radiant heater comprises an electrically energized heating element extending along a vertical axis. A first, multi-faceted, concave reflective surface is positioned to the rear of the heating element. A second reflector is positioned forward of and in close proximity to the heating element. The first reflector directs radiant energy received directly from the heating element and indirectly from the second reflector forward with minimal radial dispersion.

7 Claims, 4 Drawing Sheets





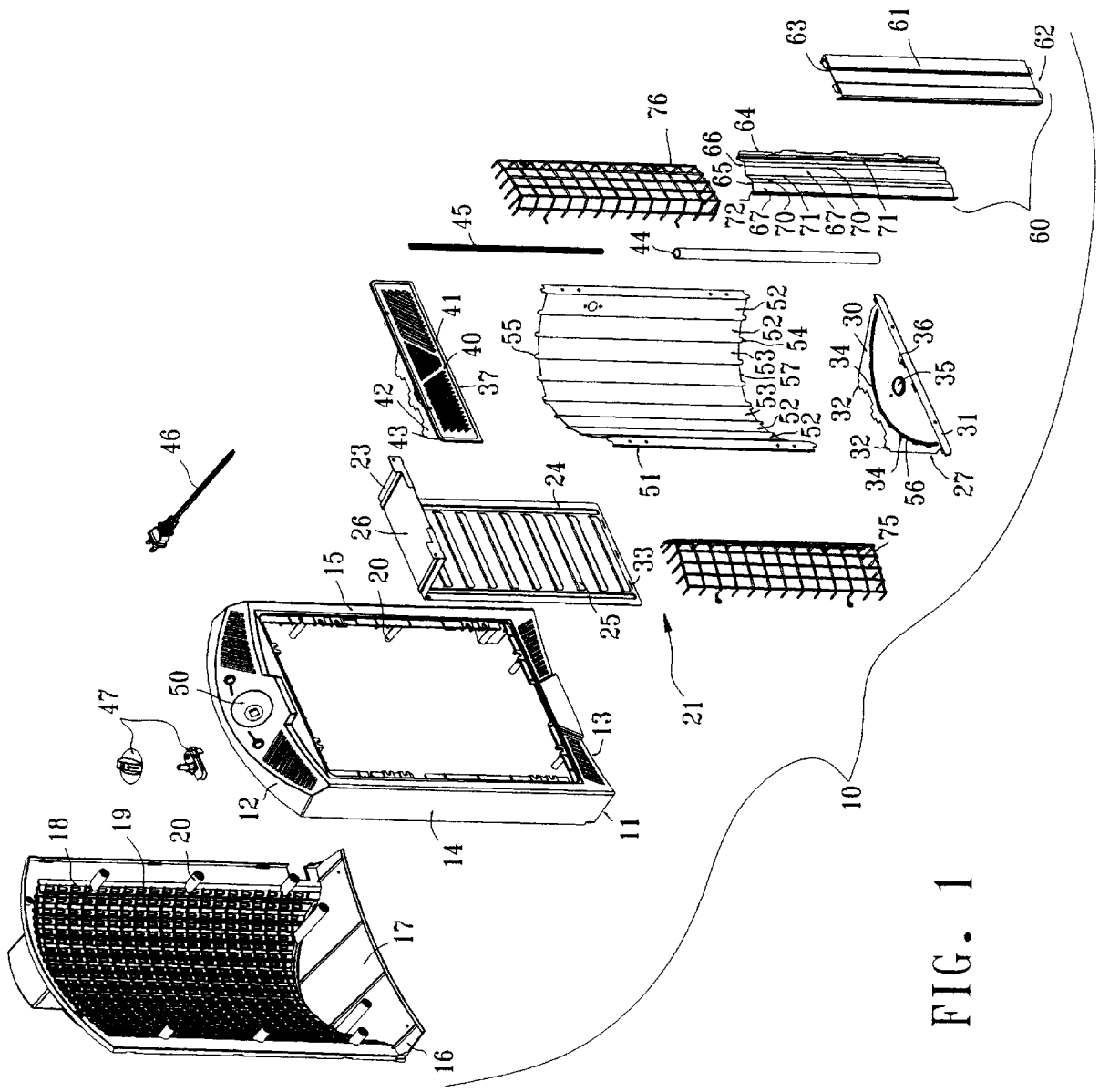

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FIG. 1

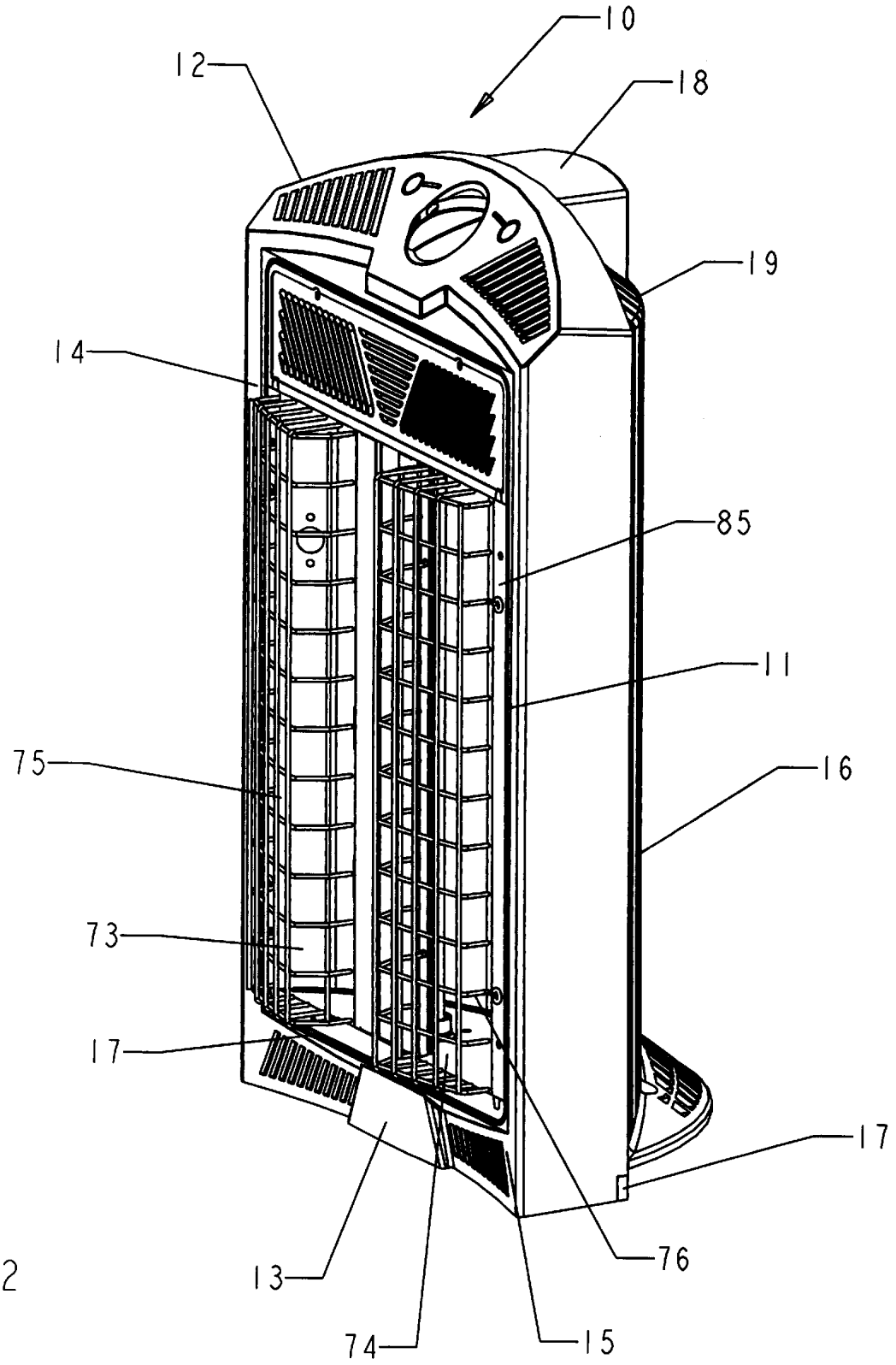

FIG. 2

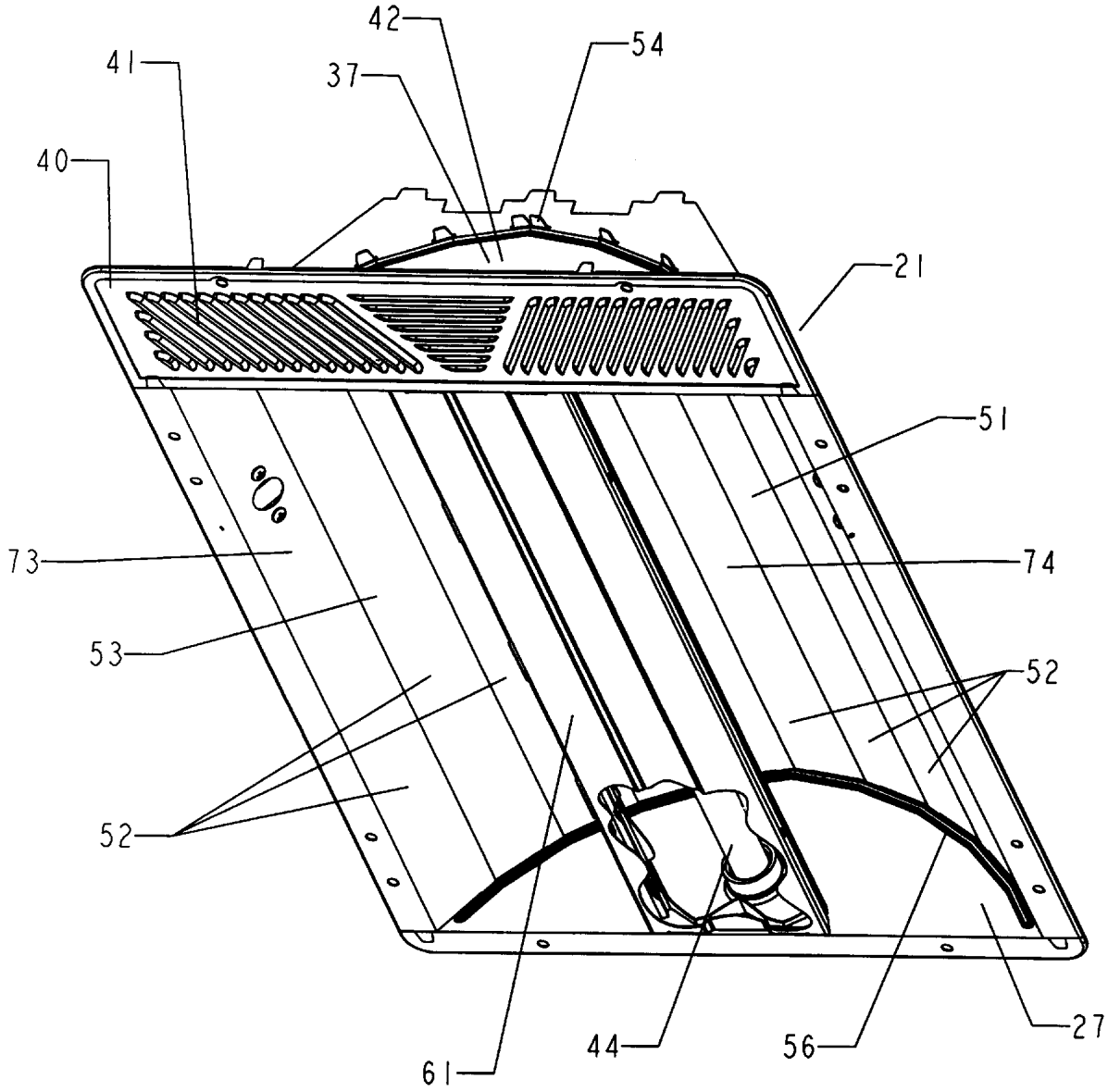

FIG. 3

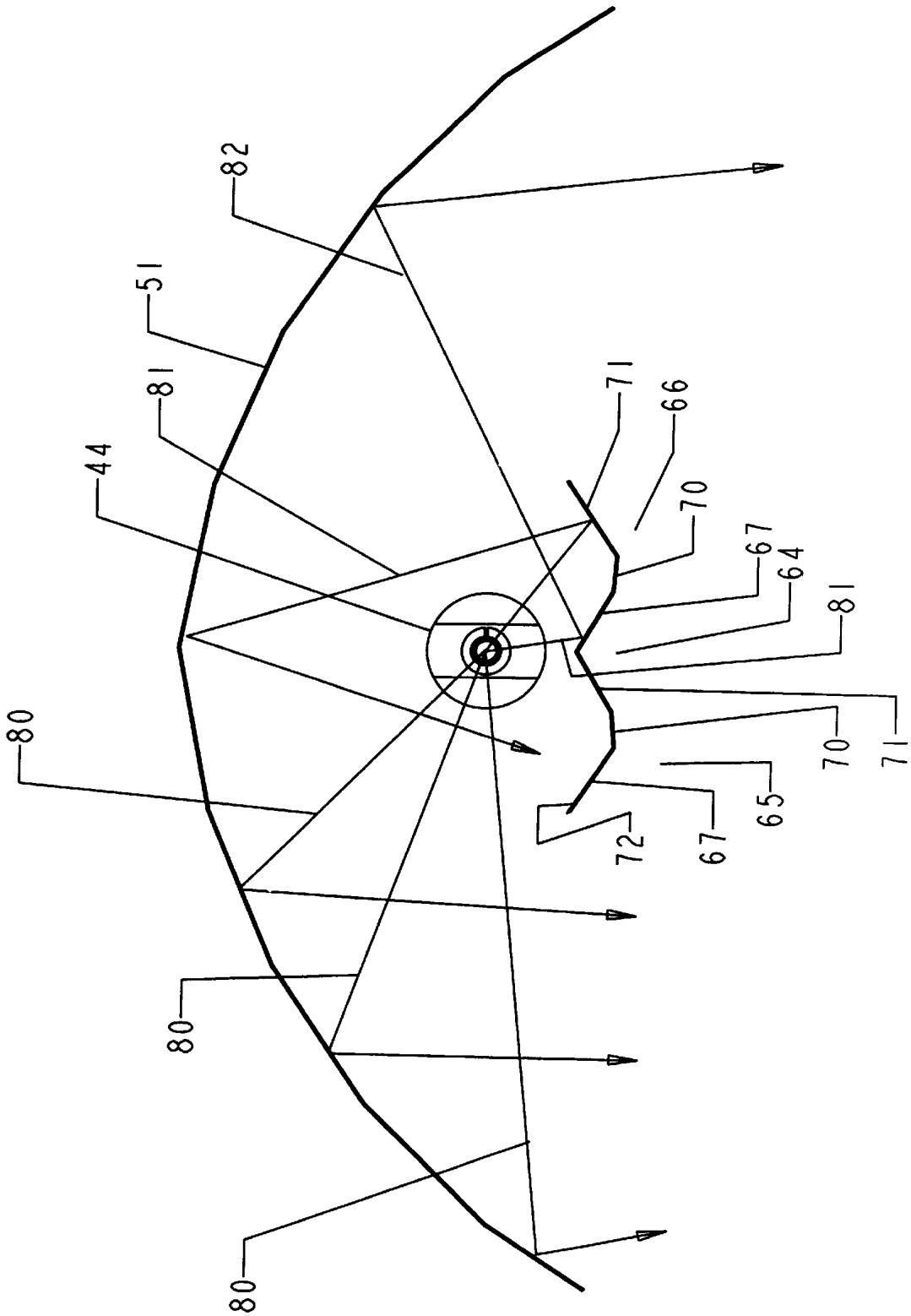

FIG. 4

PORTABLE RADIANT HEATER WITH TWO REFLECTORS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention generally relates to portable heating systems and more specifically to portable radiant heaters.

2. Description of Related Art

Portable heaters are used in a number of applications to provide localized heating. For example, U.S. Pat. No. 5,437,001 (1995) to Cheney et al. discloses an upright radiant electrical heater with a reflector assembly supporting a vertically extending heating element assembly. Energy radiates in all directions in a horizontal plane so the inherent radiation pattern is onmidirectional. The reflector assembly includes heat reflective panels that redirect energy directed to the rear through an open grill at the front of the heater. A fan forces room air into the heater from below the reflector assembly upwardly through an air passage behind the assembly into an open control chamber at the top of the heater and outwardly into the room through ducts along the top front edge of the assembly. The resulting air flow assures that accessible components remain cool to the touch.

U.S. Pat. No. 5,761,377 (1998) to Wolfe et al. depicts another portable radiant heater that includes a plurality of vertically oriented, horizontally spaced quartz heating tubes. A common reflector partially surrounds the heating tubes and is configured to open at an obtuse angle at each quartz tube. The reflector is perforated to allow air to pass out from the interior of the heater. A fan moves the air for cooling purposes.

As shown in both these patents and is generally found in commercially available portable radiant heaters, the heating elements themselves are directly visible from the front exterior of the heater. Consequently various standards require an increased spacing between such heating elements and any surface which an individual can contact. In the above identified Cheney et al. patent a cylindrical grill extends partially around the heating elements. In the Wolfe et al. patent the corresponding protection is provided by a flat grill piece. This requirement for extra spacing increases the bulkiness of such space heaters by increasing the front-to-back dimension, or depth, of the portable radiant heater. That is a disadvantage in many applications.

Typically in these heating systems an individual sees only one image of each heating element which is the view of the actual heating element itself. For many individuals the result is not pleasing aesthetically.

Further in these systems heating elements radiate heat omnidirectionally so forward directed radiant energy from the heating element disperses radially. The radial dispersal dissipates energy more rapidly than a directed beam as a function of distance from the source. Energy emanating from the rear of the heating elements is reflected by the rear reflector to direct that energy into a better defined beam. Nevertheless, the forward energy continues to disperse so portable radiant heaters tend to be inefficient.

SUMMARY

Therefore, it is an object of this invention to provide an improved portable radiant heater.

Another object of this invention is to provide an improved portable radiant heater that operates with maximum efficiency.

Still another object of this invention is to provide an improved portable radiant heater that has a minimum depth.

Yet another object of this invention is to provide an improved portable radiant heater that is aesthetically pleasing in appearance especially during operation.

In accordance with one aspect of this invention, a portable heater comprises a housing, a first reflector in the housing for directing energy in a first direction and a second reflector in the housing displaced from the first housing in the first direction for directing energy toward the first reflector. A radiant heater is located in the housing intermediate the first and second reflectors. The first reflector directs energy in the first direction that is received from the second reflector and the radiant heater.

In accordance with another object of this invention, a portable radiant heater comprises an upstanding housing comprising an open housing frame with front and rear frame surfaces and a curved back portion for spanning the rear frame surface. A first reflector has a concave, multifaceted reflective surface extending along a vertical axis through the upstanding housing and is positioned proximate the housing back portion. An elongated radiant heating element extends along an axis parallel to the vertical axis. A second reflector with at least one reflective surface faces the first reflector means and the radiant heater. A support carries the first and second reflectors and the radiant heating element on the housing frame with the first reflector being proximate the housing back portion.

In accordance with yet another aspect of this invention, a portable radiant heater comprises a frame for being supported in a vertical orientation including a back portion having a concave cylindrical surface formed about a vertical axis and an open frame for supporting the back portion. An electric radiant heater means includes a quartz radiant heating element that connects to a power source for energizing the heating element and a thermostat for controlling the energization of the heating element. A support carries the heating element and includes a bracket having a horizontal portion for connection to the housing means and a vertical portion and first and second vertically spaced end supports attached to the horizontal and vertical portions of the bracket respectively. The support means carries a first reflector including a plurality of planar members arranged along an arc with each planar member being tangent to the arc and having a reflective surface generally directed toward the radiant heater element. The support means also carries a second reflector on the opposite side of the heating element. The second reflector includes a reflector member having first and second parallel semi-hexagonal channels extending along channel axes parallel to the vertical axis and a support member for carrying the reflector member. Each of the channels has a reflective surface facing the heating element. First and second barriers adjacent opposite sides of the second reflector means that has a width that is less than the width of the first reflector.

BRIEF DESCRIPTION OF THE DRAWINGS

The appended claims particularly point out and distinctly claim the subject matter of this invention. The various objects, advantages and novel features of this invention will be more fully apparent from a reading of the following detailed description in conjunction with the accompanying drawings in which like reference numerals refer to like parts, and in which:

FIG. **1** is an exploded view of a portable radiant heater constructed in accordance with this invention;

FIG. **2** is a perspective view of a portable radiant heater constructed in accordance with this invention;

FIG. **3** is a perspective view of certain components disclosed in FIG. **1**; and

FIG. **4** is a diagram depicting certain reflections that occur in the portable radiant heater of FIG. **1**.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Now referring to FIGS. **1** and **2**, a portable radiant heater **10** constructed in accordance with this invention includes an open housing frame **11** designed to be in a vertical orientation having a top cross member **12**, a bottom cross member **13** and left and right side walls **14** and **15** respectively in the orientation of FIG. **1**. A rear housing **16** includes a base **17** and a vertical back wall **18** that curves about a vertical axis. The curved vertical back wall **18** may include an array **19** of air passages. Any number of specific arrays could be substituted for the specifically disclosed array provided that the sizes of individual air passages met various standards required for such devices. The housing frame **11** and rear housing portion **16** are formed into an integral structure through by plastic connectors **20** or other fasteners.

The housing frame **11** carries a subassembly **21** that includes a bracket **23** that has a back portion **24** with an optional array **25** of air passages and a top plate **26** at right angles to the back portion **24**. The back portion **24** carries a lower end support **27** that has a plate portion **30** and a depending lip portion **31** that attaches to the bottom cross member **13**. A plurality of tabs **32** in the plate portion **30** engage corresponding slots **33** at the bottom of the back portion **24**.

The plate portion **30** additionally includes a plurality of linear slots **34** arranged along a arcuate path preferably a path defined by a constant radius arc. These slots **34** carry a first reflector as described later. The plate portion **30** additionally includes a mounting **35** for a radiant heater and another mounting **36** for a second reflector.

An upper end support **37** includes a face plate **40** with an optional array **41** of air passages. The face plate **40** also carries a plate portion **42** that extends at right angles to the plane of the face plate **40**. Like the plate portion **30**, the portion plate **40** includes tabs **43** for engaging slots (not shown) corresponding to slots **33** in the back portion **24** of the isolation bracket **23** and a plurality of slots, a mounting hole and another sets of slots that mirror slots **34**, mount **35** and mount **36** of the plate portion **30**.

The mount **35** carries a radiant heating element that, for purposes of this invention, is depicted as comprising a ceramic tube **44** and an electrical heater element **45** disposed within the tube **44**. Various end terminations provide a mechanical connection to the plate portions **30** and **42** and electrical connections to a power cord **46** and thermostat **47**. The thermostat **47** can conveniently be located at a mounting area **50** that may also include a separate on/off switch and a power on pilot light or other indicator.

When the heating element **45** is energized, radiant heat energy radiates from the ceramic tube **44** radially in all directions. Heat energy that radiates toward the back housing portion **16** is intercepted by a first reflector **51** that comprises a plurality of vertically oriented, thin, slat-like members **52**, each with a planar reflective surface **53**. Each member **52** includes a bottom mounting tab **54** and a top mounting tab **55**. Each of the mounting tabs **54** engages one of the slots **34** in the plate portion **30**; each of the upper tabs **55** corresponding slots in the plate portion **42**.

In addition each planar member **52** is oriented in a plane that is tangent to the arc. In one embodiment individual planar members are angularly displaced by 75°from each other. Consequently, the assembly of members **52** defines a multi-faceted concave reflective cylinder along a vertical axis parallel to a corresponding axis through the ceramic tube **44**. Each of the end supports may contain a series of segmented linear slots or indentations such as indentations **56** shown on the bottom end support **30** for engaging the remaining edges **57** of each member **52**. This structure further stabilizes the subassembly **21**.

Still in accordance with this invention, the mount **36** in the end support **30** and corresponding mount in the top end support **42** carry a second reflector **60** that reflects toward radiating energy from the ceramic tube **44**. A front plate **61** constitutes a support with tabs **62** and **63** for engaging the mount **36** in the bottom end support **30** and corresponding mount in the top end support **42**. In addition the front plate **61** carries a reflector element **64** formed by stamping, folding or otherwise a metal sheet into two parallel channels **65** and **66**. These channels lie along axes that are parallel to the axis through the ceramic tube **44**. In this particular embodiment each channel has three planar sides **67**, **70** and **71** thereby to define, in cross-section, an irregular, semi-hexagonal reflective surface **72** that faces the ceramic tube **44**.

FIG. **4** depicts a top plan view of the reflectors **51** and **64** with the second reflector **64** being positioned closely adjacent the ceramic tube **44**. Consequently the reflective surfaces **72** in each of the channels **65** and **66** will intercept radiant energy dispersing forward and radially from the ceramic tube **44**, i.e, from a forward portion of the ceramic tube **44**. The surfaces **72** defined by the channels **65** and **66** reflect all this energy back toward the first reflector **51** that, in turn, redirects this reflected radiant energy forward in a more coherent manner. Commercially available reflective surfaces do not reflect the radiant energy with 100% efficiency. Nevertheless the redirection of essentially all the radially dispersing radiant energy from the ceramic tube **44** into a more collimated directed beam of radiant energy produced by the reflectors **51** and **64** provides more efficient radiant heating than otherwise possible without the two reflectors **51** and **64**.

FIG. **4** includes several ray traces to depict how the reflectors **51** and **64** achieve this result. Rays **80**, for example, travel from the back portion of ceramic tube **44** to reflect off various reflective surfaces to the front of the portable radiant heater. Ray **81** represents radiant energy that travels radially forward to reflect from planar side **71** of channel **66** to the reflector **51** to be reflected forward. Ray **82** is another example of doubling reflected radiant energy. As will be apparent from FIG. **4**, the dual reflectors **51** and **64** thereby redirect the radially dispersing radiant energy from the ceramic tube **44** into a quasi coherent, forward directed radiant energy beam with minimal dispersion.

Referring again to FIGS. **1** through **3**, in this particular embodiment the second reflector **60** is narrower than the first reflector **51**. Centering the second reflector **60** on the first reflector **51** produces side passages on each side of the second reflector **60**. Open grills **75** and **76** fill those passages **73** and **74** to prevent inadvertent contact with any heating elements while still allowing an individual to see into the portable radiant heater **10**, particularly the reflective surfaces **53**.

Referring again to FIGS. **1** and **2**, placing the second reflector **60** in close proximity to the ceramic core **44** precludes any direct view of the ceramic core **44** from the exterior of the portable radiant heater **10**. This positioning

greatly reduces the distance between the elements that constitute the front of portable radiant heater **10** and the heating elements. Consequently, the distance to the front **85**, shown in FIG. **2**, is reduced; this greatly reduces the bulkiness or depth of the portable radiant heater **10**.

As will also be apparent from FIG. **4**, the second reflector **60**, specifically the multiple reflective surfaces **72**, will reflect multiple visual images of the ceramic tube **44** to the first reflector **51**. The first reflector **51** will reflect those images and images produced by direct reflection of the ceramic tube **44** outward. Thus an individual looking at this device will see an array of heating elements from each facet. The net result is an aesthetically pleasing appearance.

Thus in accordance with this invention a portable radiant heater, such as the portable radiant heater **10** in FIGS. **1** and **2**, includes a radiant heating element with first and second reflectors. The second reflector is closely spaced and in front of the heating element to reflect radiant energy to the rear reflector. The rear reflector directs radiant energy received directly from the heating element and indirectly from the second or front reflector to provide a heater that meets the objects of this invention, namely providing a portable radiant heater that is more efficient than prior art devices, providing a portable radiant heater that has a pleasing appearance and that has minimum depth and size.

It will also apparent that this invention has been disclosed as a specific embodiment. Any number of variations can be made to individual components while obtaining some or all of the objectives of this invention. For example, the portable radiant heater **10** has a vertically oriented heating element. For other applications the housing could be simply modified so the heating element was oriented horizontally. The front reflector is shown with two parallel, semi-hexagonal channels. A reflector with a single curved channel or even a flat reflector could be substituted still increasing efficiency and improving aesthetics. Different arrangements of the first reflector **51** with its multiple facets and concave configuration could be substituted. As previously indicated, air passages may or may not be included in various portions of the housing and other components in order to further improve cooling of the heater components. Different grillwork could obviously be substituted. It will be apparent that these and many other modifications can be made to the disclosed apparatus without departing from the invention. Therefore, it is the intent of the appended claims to cover all such variations and modifications as come within the true spirit and scope of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A portable heater comprising:

A) a frame for being supported in a vertical orientation including a back portion having a concave surface formed about a vertical axis and an open frame for supporting said back portion,

B) an electrically operated, thermostatically controlled quartz radiant heating element,

C) a support for said heating element including:

i) a bracket having a horizontal portion for connection to said housing means and a vertical portion, and

ii) first and second vertically spaced end supports attached to said horizontal and vertical portions of said bracket respectively,

D) a first reflector carried by said end supports including a plurality of planar members arranged about a portion of the circumference of a circle with each planar member being tangent to the circle and having a reflective surface generally directed in the direction of said radiant heater element,

E) a second reflector carried by said end supports on the opposite side of said heating element comprising:

i) a reflector member having first and second parallel semi-hexagonal channels extending along channel axes parallel to the vertical axis, each of said channels having a reflective surface facing said heating element, and

ii) a support member for carrying said reflector member, and

F) first and second grills being disposed adjacent opposite sides of said second reflector means, the width of said first reflector being greater than the width of said second reflector and the width of said second reflector means and said first and second grills corresponding to the width of said first reflector means.

2. A portable heater comprising:

A) an upstanding housing comprising an open housing frame with front and rear frame surfaces and a curved back portion for spanning said rear frame surfaces,

B) first reflector means lying along an arc for defining a concave, multifaceted reflective surface extending along a vertical axis through said upstanding housing, said first reflector means being positioned proximate said housing back portion and comprising a plurality of adjacent planar members each having a reflective surface, each planar member being positioned parallel to the vertical axis and tangent to the arc,

C) an elongated radiant heating element extending along an axis parallel to the vertical axis,

D) a second reflector means for defining at least one reflective surface extending parallel to the vertical axis and facing said first reflector, said second reflector means including first and second parallel, semi-hexagonal channels having reflective surfaces facing said heating element and a parallel support and first and second end plates for attaching said parallel support to said housing frame means.

3. A portable heater comprising:

A) an upstanding housing comprising an open housing frame with front and rear frame surfaces and a curved back portion for spanning said rear frame surfaces,

B) first reflector means lying along an arc for defining a concave, multifaceted reflective surface extending along a vertical axis through said upstanding housing, said first reflector means being positioned proximate said housing back portion and comprising a plurality of adjacent planar members each having a reflective surface, each planar member being positioned parallel to the vertical axis and tangent to the arc,

C) an elongated radiant heating element extending along an axis parallel to the vertical axis,

D) a second reflector means for defining at least one reflective surface extending parallel to the vertical axis and facing said first reflector means, said first reflector means having a width transverse to the vertical axis that is greater than the corresponding width of said second reflector means,

E) support means for supporting said first and second reflector means and said radiant heating element on said housing frame, and

F) first and second grills disposed on opposite sides of said second reflector means.

4. A portable heater as recited in claim **3** wherein each of said grills includes an open grid structure and means for attaching said open grid structure to said housing frame means.

5. A portable heater comprising:

A) an upstanding housing comprising an open housing frame with front and rear frame surfaces and a curved back portion for spanning said rear frame surfaces,

B) first reflector means lying along an arc for defining a concave, multifaceted reflective surface extending along a vertical axis through said upstanding housing, said first reflector means being positioned proximate said housing back portion and comprising a plurality of adjacent planar members each having a reflective surface, each planar member being positioned parallel to the vertical axis and tangent to the arc,

C) an elongated radiant heating element extending along an axis parallel to the vertical axis,

D) a second reflector means for defining at least one reflective surface extending parallel to the vertical axis and facing said first reflector means and including end plates and a parallel support, said first and second end plates attaching to said parallel support, and

E) support means for supporting said first and second reflector means and said radiant heating element on said housing frame.

6. A portable heater as recited in claim 5 wherein said first reflector means has a width transverse to the vertical axis that is greater than the corresponding width of said second reflector means, said portable heater additionally comprising first and second grills disposed on opposite sides of said second reflector means.

7. A portable heater as recited in claim 6 wherein each of said grill includes an open grid structure and means for attaching said open grid structure to said housing frame means.

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