

[54] **FORCED CIRCULATION ELECTRIC HEATER**  
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2,724,044 11/1955 Campbell..... 219/370 X  
 2,849,589 8/1958 Lancaster..... 219/364 X  
 3,147,368 9/1964 Walker..... 219/368 X  
 3,277,275 10/1966 Brusven..... 219/341 X

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 [51] Int. Cl.<sup>2</sup>. **H05B 1/00; F24H 3/04; H01H 37/76**  
 [58] Field of Search ..... **219/366-371, 219/374-376, 363, 364, 341, 365, 517; 165/122; 337/403-405, 414**

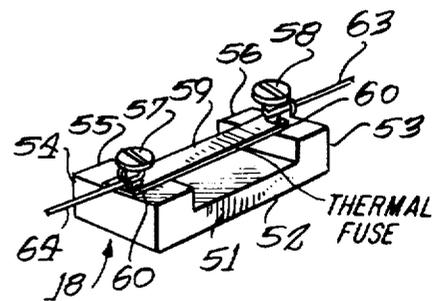
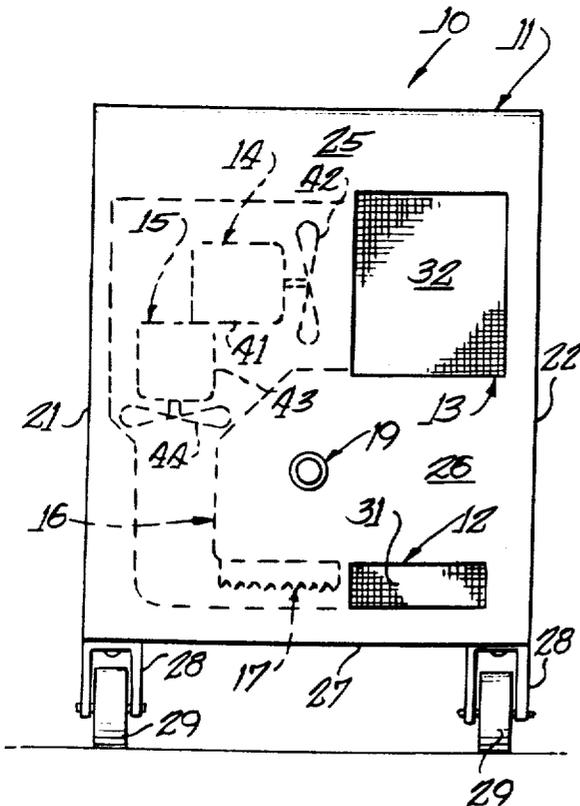
[57] **ABSTRACT**

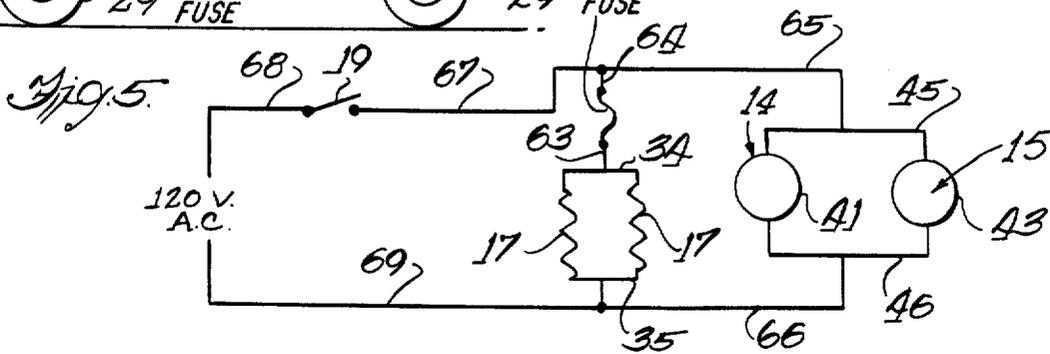
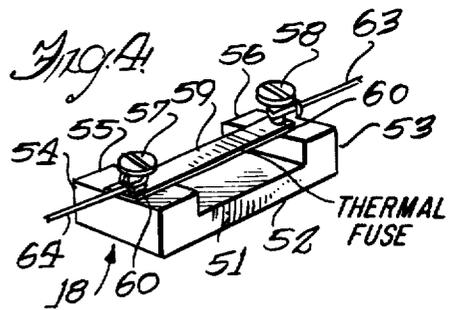
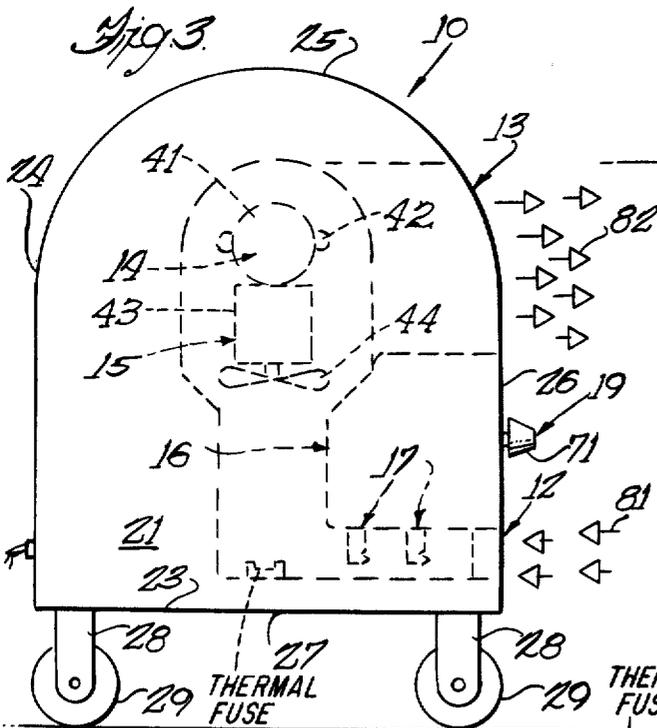
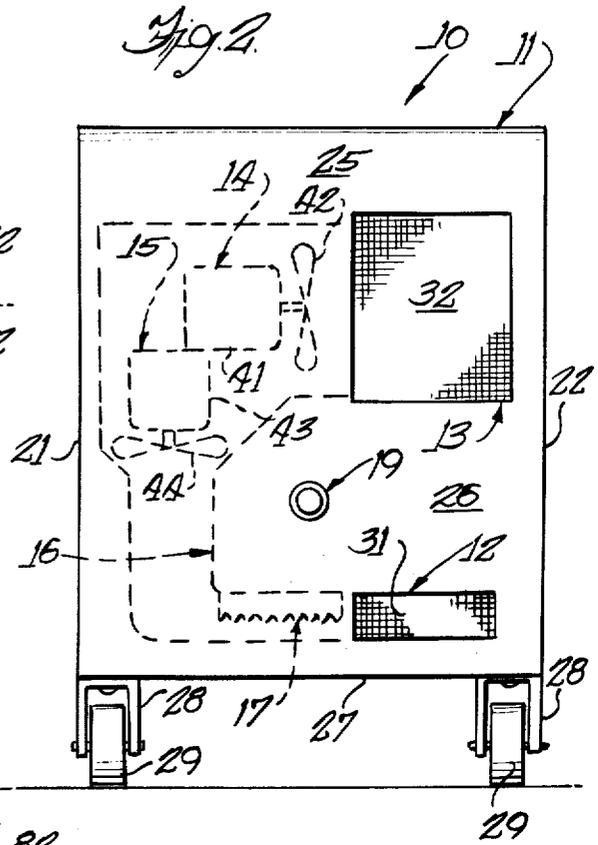
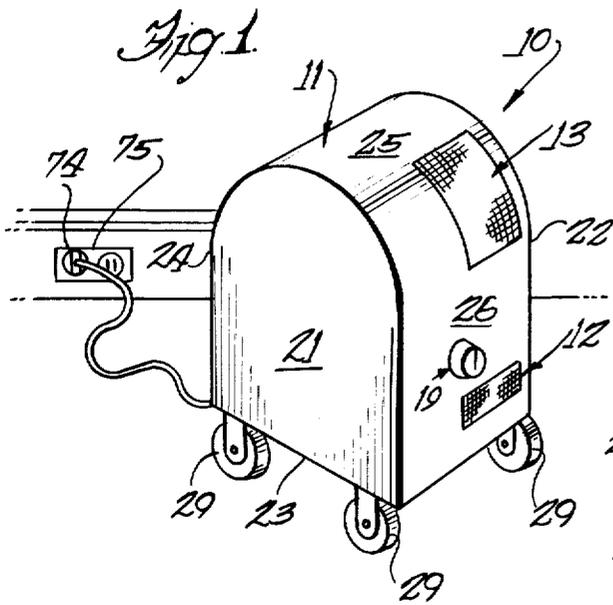
A forced circulation electric heater includes a wheeled housing having a front provided with an air inlet adjacent its bottom edge and an air outlet at its top portion. A pair of electric motor driven fans are provided in an airflow passage connecting the inlet and outlet. The fans are disposed in perpendicular relation to each other and are arranged to draw air in through the inlet and over a pair of heating element coils located in the passageway between the inlet and the fans and to force the heated air out the outlet into the space to be heated. A thermal fuse is supported on a U-shaped fuse block in the passageway at a location between the heating coils and the fans for de-energizing the coils should excessive heat build-up occur in the heater housing.

[56] **References Cited**  
**UNITED STATES PATENTS**

1,644,595	10/1927	Karg.....	219/368 UX
1,945,815	2/1934	Landerman.....	219/365
1,978,413	10/1934	Child.....	219/370 X
2,015,251	9/1935	Browning.....	219/363
2,277,094	3/1942	Fisher.....	219/368 X
2,429,733	10/1947	Trent.....	219/369
2,481,963	9/1949	Witte et al.....	219/368 X
2,562,436	7/1951	Pass.....	219/370 X

**1 Claim, 5 Drawing Figures**





**FORCED CIRCULATION ELECTRIC HEATER****BACKGROUND OF THE INVENTION****1. Field of the Invention**

This invention relates generally to heating devices and more particularly to a novel and improved forced circulation electric heater of a portable construction.

**2. Description of the Prior Art**

It has been known in the prior art to provide electric heaters of various sizes, shapes and configurations, including those of hand carried and portable units having fan forced heat units and heating elements.

However, such units suffer from one or more disadvantages and inefficiencies, such as inadequate displacement of heated air, difficulty in directing the air to the positions desired, difficulty in transporting and moving from location to location, lack of adequate safety protection against overheating and the like.

**SUMMARY OF THE INVENTION**

The present invention remedies and overcomes all of the foregoing deficiencies and disadvantages of presently available electric heaters by providing a novel forced circulation electric heater including a housing mounted on wheels for ease of movement between locations. The housing has an inlet port in its front surface adjacent a bottom edge thereof and an outlet port located in the same front surface adjacent the top portion thereof. An air flow passageway is defined interiorly of the housing and interconnects the inlet port and the outlet port. A first electric motor having a fan blade affixed thereto is mounted in the passageway nearest the inlet port and a second substantially identical electric motor is also mounted in the passageway and having a fan blade affixed thereto which is disposed nearest the outlet port. A pair of identical electrically energized heating coils which are connected in electrical parallel relationship are mounted in spaced physical tandem relationship in the passageway downstream of the inlet port and upstream of the second mentioned motor for use in heating the air flowing through the passageway from the inlet port to the outlet port. A fuse block is mounted in the passageway between the heating coils and the second mentioned motor with the fuse block having removably affixed thereto a heat sensitive thermal fuse link spanning a portion of the fuse block to be supported in a free manner thereon. The fuse link is electrically connected in series with the heating coils and is of a physical construction selected to melt at a predetermined temperature within the passageway to break the electrical circuit and thus de-energize the electrical heating coils to prevent the overheating of the coils. An electrical switch is provided for selectively connecting the heating coils and the first and second mentioned motors to a source of electrical power.

It is a feature of the present invention to provide a forced circulation electric heater.

A further feature of the present invention provides a forced circulation electric heater which is relatively simple in its construction and which therefore may be readily manufactured at a relatively low cost and by simple manufacturing methods such that it can be retailed at a sufficiently low price to encourage widespread use thereof among the general public.

Still a further feature of the present invention provides a forced circulation electric heater which is of a

rugged and durable construction and which therefore may be guaranteed by the manufacturer to withstand many years of intended usage.

Yet still a further feature of the present invention provides a forced circulation electric heater which is easy to use and reliable and efficient in operation.

Other features and advantages of this invention will be apparent during the course of the following description.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In the accompanying drawings forming a part of this specification, and in which like reference characters are employed to designate like parts throughout the same:

FIG. 1 is a perspective view of the heater of the present invention;

FIG. 2 is a front elevational view of the heater of the present invention;

FIG. 3 is a side elevational view of the heater of the present invention;

FIG. 4 is a perspective view of the fuse block and protective fuse strip; and

FIG. 5 is an electrical schematic wiring diagram of the heater of the present invention.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring now to the drawings in detail, there is illustrated a preferred form of a forced circulation electric heater constructed in accordance with the principles of the present invention and which is designated generally in its entirety by the reference numeral 10 and which is comprised of a housing 11, an inlet port 12, an outlet port 13, a pair of identical fan motors 14 and 15 disposed at right angles to each other within a passageway 16 within the housing 11 interconnecting the inlet and outlet ports, a pair of electric heating coils 17, a fuse block 18, and an on-off electrical switch 19.

The housing 11 consists of a pair of opposed identically shaped side panels 21 and 22 each having a semi-circular curved top portion and a bottom edge 23 with there being bent and curved between a continuous front, top and back panel designated generally by reference numerals 24, 25 and 26. A horizontal bottom panel 27 completes the housing. Affixed to the corners of bottom panel 27 are U-shaped brackets 28 having wheels 29 rotatively supported between the leg portions thereof for ease in rolling transportation of the device 10 between locations.

Inlet port 12 is covered by screening 31 with outlet port 13 being similarly covered by protective screening 32, the screening 31 and 32 being disposed in the front 26 and bottom end of the top 25 of housing 11.

Disposed immediately rearwardly of intake port 12 are the pair of electrical heating coils 17 which are connected in electrical parallel relationship by suitable insulated wires 34 and 35, the heating coils projecting into the passageway 16 interconnecting the inlet and outlet ports 12 and 13.

Disposed adjacentmost the outlet port 13 and spaced inwardly therefrom is the fan 14 which is in axial alignment with the outlet port and includes motor 41 having a shaft projecting forwardly therefrom and onto which is mounted a fan 42. Disposed at right angles to the motor 41 is a fan unit 15 which includes motor 43 having a shaft projecting vertically downwardly therefrom

and terminating where it is mounted to the axis of fan blade 44. The motors 41 and 43 are connected in electrical parallel relationship by suitable insulated electrical wires 45 and 46.

Mounted in passageway 16 intermediate fan 44 and heating coil 17 is the fuse block 18 which consists of a generally U-shaped base 51 having bight portion 52 and vertically upwardly depending leg portions 53 and 54 terminating in flat top surfaces 55 and 56. Each of the flat surfaces 55 and 56 is provided with a threaded aperture (not shown) extending vertically into and opening out of the top surface and adapted to threadedly receive therein the threaded shanks of terminal screws 57 and 58. A heat sensitive fuse link of an elongated flat rectangular configuration is designated generally by reference numeral 59 and has apertures 60 extending through its opposite end portions adapted to be received about the shanks of terminal screws 57 and 58 so as to rest on flat surfaces 55 and 56 and extend across the bight portion 52. The fuse strip connected at one end by a wire 63 to wire 64 with its opposite end being connected by a wire 64 to a wire 65 which, in turn, is connected to wire 45. Further, wire 35 is connected by means of wire 66 to wire 46.

It is thus seen that the electrical coils 17 are wired in electrical series relationship with fuse block 18, and this series combination is connected in parallel relationship to the parallel connected motors 41 and 43.

The on-off switch 19 includes a manual actuating knob 71 which projects outwardly of front surface 26, the switch being connected by wire 67 at one terminal to wire 65 with the opposite terminal being connected by wire 68 to one prong of a conventional plug 74. The opposite prong of plug 74 is connected by a wire 69 to wire 66.

In operation, an individual plugs the plug 74 into a conventional outlet type receptacle, such as designated by reference numeral 75, rolls the device 10 to the desired location, and then energizes the device by using the on-off switch 19. Turning the unit on energizes the fan units 14 and 15 and the electrical heating element 17 to draw air through inlet port 12 in the direction of arrows 81, the inlet air passing through the passageway 16 to be heated by the coil 17 from whence it is discharged by means of the fan units 14 and 15 through outlet port 13 in the direction indicated by arrows 82. Should the temperature of the heated air within passageway 16 be greater than that for which it was designed, then the fuse strip 59 is preset for such temperature to disintegrate and thus open the circuit to the heating coil 17 to prevent further heating of the air until after the cause of difficulty has been repaired and a new fuse link 59 installed in the fuse block 18.

It is apparent that the flow of air as indicated by arrows 82 may be readily directed for warming the interior of structures, for drying or thawing various materials, for use by members of the general household when working outside during cold months such as in a garage during fixing or tuning of a vehicle engine, for use by contractors to yield more comfortable surroundings while constructing out of doors and in unheated structures, and the like.

It is to be understood that the form of this invention herewith shown and described is to be taken as a preferred example of the same, and that this invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in

this specification as various changes in the details of construction as to shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention, the scope of the novel concepts thereof, or the scope of the sub-joined claims.

Having thus described the invention, what is claimed is:

1. A forced circulation electric heater comprising, in combination:
  - a housing having opposed side wall surfaces, opposed front and back wall surfaces, a top surface, and a horizontal flat bottom surface;
  - wheels mounted on said bottom surface for ease of transportation of said housing between locations of usage;
  - an inlet port disposed in said front surface closely adjacent the bottom edge thereof;
  - an outlet port disposed in said front surface at the top portion thereof;
  - an airflow passageway disposed interiorly of said housing and interconnecting said inlet port and said outlet port;
  - a first electric motor mounted in said passageway and having a motor shaft projecting horizontally outwardly therefrom in the direction of said outlet port and having a fan blade mounted on said shaft for rotation therewith in said passageway;
  - a second electric motor separate from said first motor and identical to said first motor and mounted in said passageway adjacent said first motor, the second motor having its motor shaft disposed along a vertical axis normal to said shaft of said first motor and projecting vertically downwardly therefrom and having a fan blade mounted thereon for rotation therewith in said passageway;
  - a pair of identical electrically energized heating coils electrically connected in parallel and mounted in spaced tandem relationship in said passageway downstream of said inlet port and upstream of said second motor and fan blade for heating the air flowing in said passageway from said inlet port to said outlet port;
  - a U-shaped fuse block disposed in said passageway intermediate said heating coils and said second motor, the fuse block having a bight portion and upright leg portions terminating in a flat top surface, each flat top surface having a threaded aperture extending vertically thereinto;
  - a terminal screw having a threaded shank adapted to be threadedly received in each associated aperture;
  - a heat sensitive fuse link of a flat elongated rectangular configuration having apertures in opposite ends thereof adapted to be received beneath said terminal screws, said fuse link spanning said bight portion between said leg portions of said fuse block and rest on said flat top surfaces of said leg portions; and said fuse link being electrically connected in series with said heating coils and being selected to melt at a predetermined temperature within said passageway to break the electrical circuit between said terminal screws and de-energize said electrical heating coils to which said fuse link is electrically series connected; and
  - means for selectively connecting the heating coils and first and second motors to a source of electric power.

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