Nov. 13, 1934. W. H. GREENFIELD 1,980,582

RESISTANCE ELEMENT FOR RAIL HEATERS

Original Filed Oct. 7, 1930

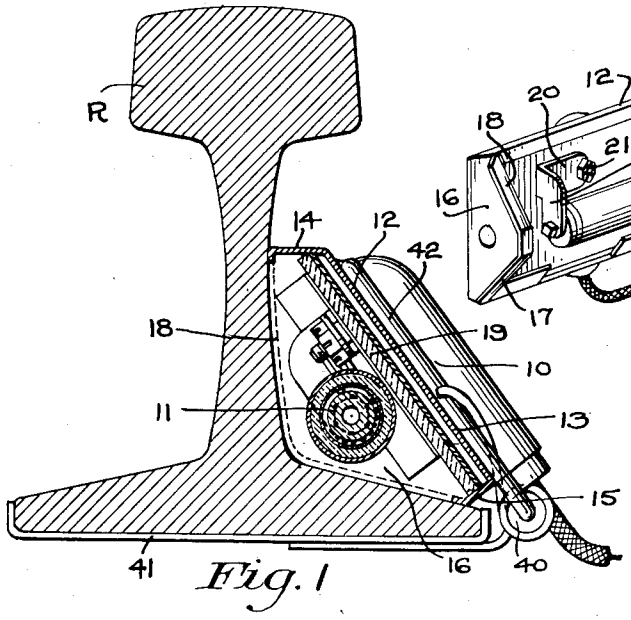


Fig. 1

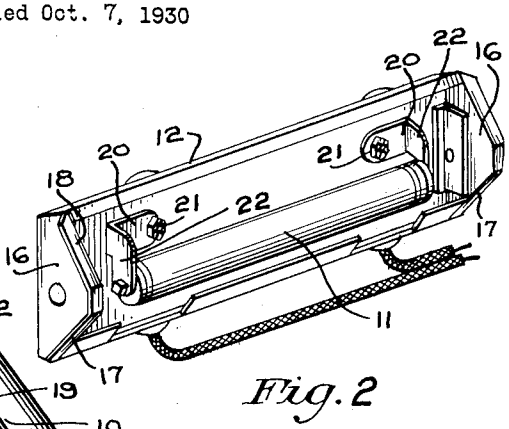


Fig. 2

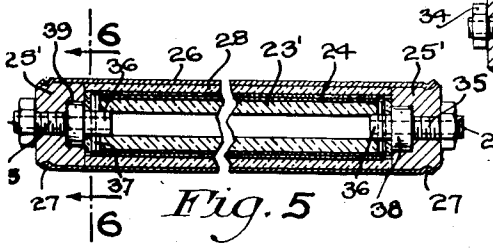


Fig. 5

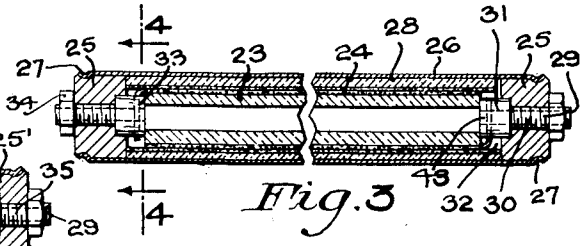


Fig. 3

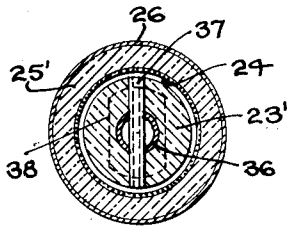


Fig. 6

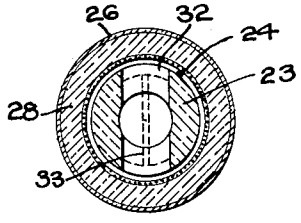


Fig. 4

Inventor:
WILLIAM H. GREENFIELD,
By Leon Edelson
Attorney.

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RESISTANCE ELEMENT FOR RAIL HEATERS

William H. Greenfield, Philadelphia, Pa.

Original application October 7, 1930, Serial No. 486,897. Divided and this application July 30, 1932, Serial No. 626,573

2 Claims. (Cl. 219—19)

This invention relates to rail heating devices and more particularly to electric heaters which are operative to prevent the formation or accumulation of sleet, snow and ice around rail switches and derail points and on conductor rails employed on electrified railroads to deliver power to cars or trains. Primarily the invention consists of heat radiating units positioned at said switch or derail points or at intervals spaced along said conductor rails for supplying heat to the track, these units being electrically operated from local or distant stations as may be desired.

This application is a division of my pending application, Serial No. 486,897, filed October 7, 1930, disclosing my invention having as one of its principal objects the provision of means for applying heat to predetermined zones of a railway track by direct radiation from a high resistance heating element, this element being in the form of an electric resistor which is adapted to raise the temperature of the rail in the zone in which the element is located to a degree sufficiently high to prevent the formation of sleet, snow or ice in said zone.

A further object of the invention is to provide a resistance element which is so designed as to effectively concentrate the heat in the desired zone whereby the loss in heat transmission from said element to the rail is reduced to a veritable minimum.

Still another object of the present invention is the provision of an electrical resistor unit which is capable of developing a high degree of heat over a long period of use and which is so designed and constructed as to withstand the vibrations and shocks to which it is subjected while in use.

A still further object is the design and provision of a resistance unit which is readily mounted within the rail heating unit and which may be readily removed therefrom at will for periodic inspection and repair.

Other objects of the invention, such as those relating generally to simplicity in design, economies of manufacture and efficiency and durability in use and specifically to details of construction will appear more fully hereinafter.

The invention consists substantially in the combination, construction, location and relative arrangement of parts, all as will be described more fully hereinafter, as shown in the accompanying drawing and as finally pointed out in the appended claims. In the accompanying drawing wherein have been illustrated preferred embodiments of the invention:—

Figure 1 is a vertical cross-sectional view of a rail equipped with a heating unit including a resistance element constructed in accordance with and embodying the principles of the present invention;

Figure 2 is a perspective view showing the interior of the unit;

Figure 3 is a longitudinal sectional view of one form of resistance element;

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 3;

Figure 5 is a longitudinal sectional view of a modified form of resistance element; and

Figure 6 is a cross-sectional view taken on line 6—6 of Figure 5.

Referring now to the drawing and more particularly to Figures 1 and 2 thereof, it will be observed that the rail heating unit, designated generally by the reference numeral 10, is adapted to be mounted in position within the angle formed between the base flange and web of a main rail R. It will be understood that this rail 11 may be a portion of an ordinary track switch or frog or a portion of a conductor rail for supplying electric power to electrically driven cars or trains. It will futher be understood that the rail heating units 10 are designed to be located at spaced intervals along the track, particularly at points where the formation or the accumulation of ice, sleet or snow would entail more or less serious consequences.

The heating unit 10 essentially comprises an electrical resistance element 11 which is supported upon the inner surface of a main casing or housing 12. As appears quite clearly in Figures 1 and 2 this housing 12, which is preferably in the form of a sheet metal stamping, is provided with an inclined wall or plate 13 the upper and lower longitudinally extending edges of which are flanged, as at 14 and 15. The sides edges of the housing plate 13 are respectively inturned to provide a pair of substantially parallel, triangularly shaped side walls 16. These triangular side walls 16 are so shaped that when the bottom edges 17 thereof rest upon the upper surface of the base flange of the rail the vertical edges 18 thereof will abut the web of the rail. The main back plate 13 of the sheet metal housing lies in a plane substantially subtending the free edges of the triangular side walls thereof, as most clearly appears in Figure 2. When the housing is applied to the rail an enclosed space or chamber is formed therebe-

tween, this space being bounded at its outer side by the inclined back plate 13, at its sides by the triangular side walls 16, at its bottom by the base flange of the rail and at its inner side by the web of the rail. The heating element 11 is supported upon the inclined back plate in the manner to be described more fully hereinafter and in spaced relation with respect to the enclosed portions of the rail.

In order to most effectively concentrate the heat and to direct it against the rail with a minimum loss in heat transmission the main back plate 13 of the housing or casing is provided with a lining 19 of suitable heat resisting material. Inasmuch as the heating unit 10 forms no part of this divisional application except as it is particularly related to the resistance element 11, no attempt will be made herein to describe in detail the heating unit, reference being made for this purpose to the above identified parent application Serial No. 486,897.

Angled bracket members 20 of the character shown most clearly in Figure 2 are secured to the threaded ends of the terminal members of the heating unit by means of nuts 21, these angle members being so respectively secured in position that the branches 22 thereof are arranged in substantial parallelism and between which is supported the resistance element 11.

As appears most clearly in Figures 3 and 4, this resistance element 11 essentially comprises a tubular member 23 of refractory material about the external surface of which the resistance wire 24 is spirally wound. Arranged at either end of the tubular member 23 is a spool 25 of non-conducting material and of a diameter greater than that of the tubular member 23. The latter member and the end spools 25 are maintained in assembled relation by means of a metal tube 26 the opposite ends of which are respectively secured, as at 27, to the spools 25. This securement is preferably accomplished by spinning or otherwise forcing the ends of the metal tube 26 into annular grooves respectively formed in the spools 25. The space formed between the inner refractory tube 23 and the outer metal tube 26 is preferably filled with insulating material 28.

In order to effect the necessary electrical connection between the ends of the resistance wire 24 and the angle brackets 20, which latter are in electrical engagement with the terminal elements of the heater unit, and at the same time afford a substantial mechanical joint between the insulating tube 23 and its supporting end spools 25, the arrangements shown more particularly in Figures 3 and 5 are employed. In the form shown in Figure 3, end studs 29 are employed, these studs being each characterized by the provision of a threaded shank 30 and an enlarged head 31 of substantially rectangular cross section, the spool 25 being provided in its inner surface with a rectangularly shaped socket for partially accommodating said rectangular head 31. The adjoining end of the tubular member 23 is diametrically slotted, as at 32, for non-rotatably receiving that portion of the stud head 31 which projects interiorly of the end spool. With the head 31 of the stud thus commonly accommodated within the socket portion of the end spool and the slotted portion of the tubular member 23, relative rotation between said spool and member is effectually precluded. The head 31 of the stud is suitably apertured, as at 33, to permit the projection therethrough of one end of the resistance wire 24, said wire being suitably brazed or otherwise permanently secured to said head to effect a positive electrical connection therebetween. The threaded shanks 30 of the studs extend through axial bores respectively provided in the end spools 25, the exteriorly projecting portions of these threaded shanks 30 being adapted for projection through suitable apertures formed in the lower ends of the branches 22 of the supporting brackets 20. Nuts 34, threadedly engageable with the shanks 30, serve to maintain the resistance unit in the position shown most clearly in Figure 3.

Figures 5 and 6 show an alternative arrangement for preventing relative rotation between the tubular member 23′ and the end spools 25′. In this modified construction studs 35 are employed which differ from the studs 29 of Figure 3 in that they are each provided with an axial extension 36 adapted for projection into the bore of the tubular member 23′. This axial extension 36 is anchored within the end of the tube 23′ by means of a tubular pin 37 which is projected diametrically through the tube and extension. The enlarged rectangularly shaped head 38 of the stud is non-rotatably positioned within the correspondingly shaped socket 39 formed in the end spool such that the inner surfaces of said head and spool are flush with one another. The ends of the resistance wire are respectively threaded through the tubular pins 37 and are secured thereto as by brazing, soldering or otherwise whereby a permanent electrical connection is effected between each end of the wire and one of the studs 35. In all other respects the resistance unit of the form shown in Figure 5 is similar to that shown in Figure 3, both forms being removably supported between the bracket members 20 in the manner appearing most clearly in Figure 2.

It will thus be seen that the opposite ends of the resistance wire are respectively connected to the terminal elements of the heating unit through the intervention of the end studs and the supporting brackets.

It will be understood, of course, that any suitable means may be provided to maintain the heater unit in the operative position shown in Figure 1. It has been found preferable, however, to employ a spring clamp 40 having a flat body or plate 41 which is adapted to underlie the base flange of the rail and a spring-pressed pivoted member 42 adapted to overlie the inclined back plate 13 of the heater. The use of a spring clamp of the character just described eliminates the necessity of employing screws or bolts for securing the heater to the rail at the same time that it greatly facilitates the ease with which the unit may be secured to and removed from the rail. Should it be desired to remove the unit from the rail for purposes of inspection, replacement or repair it is merely necessary to swing the bail member 42 outwardly about its pivoted axis whereupon the unit may be bodily removed from the rail, no tools of any sort being required in this operation.

Returning again to the resistance unit per se, it will be observed that the end studs thereof are longitudinally bored, as at 43, to provide a continuous passage extending longitudinally through the resistance unit. This passage permits of a circulation of heated air outwardly

from the center of said unit to supplement the heat radiated from the external surface thereof.

It will be understood of course that the invention is susceptible of various changes and modifications other than those hereinbefore pointed out, all without departing from the general principles or real spirit of the invention, and it is accordingly intended to claim the same broadly, as well as specifically, as indicated by the appended claims.

What is claimed as new and useful is:—

1. In an electric heater, a resistance unit therefor including a refractory tube upon the external surface of which a resistance wire is spirally wound, an end member of non-conducting material disposed adjacent one end of said tube, the inner surface of said member being provided with a recess of noncircular cross section, and a stud projecting axially through said member, said stud being provided with an enlarged intermediate portion of non-circular cross section adapted to be seated within said recess and with a tubular extension adapted to be projected within the bore of said refractory tube, and means extending diametrically through said tube and tubular extension whereby to prevent relative rotation between said tube and end member.

2. In an electric heater, a resistance unit therefor including a refractory tube upon the external surface of which a resistance wire is spirally wound, an end member of non-conducting material disposed adjacent one end of said tube, the inner surface of said member being provided with a recess of non-circular cross section, and a stud projecting axially through said member, said stud being provided with an enlarged intermediate portion of non-circular cross section adapted to be seated within said recess and with a tubular extension adapted to be projected within the bore of said refractory tube, and means extending diametrically through said tube and tubular extension whereby to prevent relative rotation between said tube and end member, said means being electrically connected to one end of the resistance wire.

WILLIAM H. GREENFIELD.