July 13, 1948. A. A. REISER 2,445,185

ELECTRIC CLAMP-ON HEATER

Filed Nov. 17, 1944 2 Sheets-Sheet 1

Fig. 1.

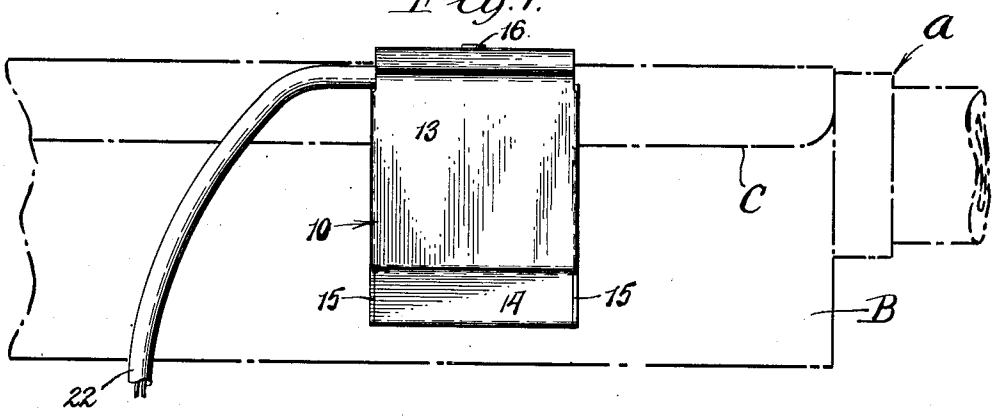

Fig. 2.

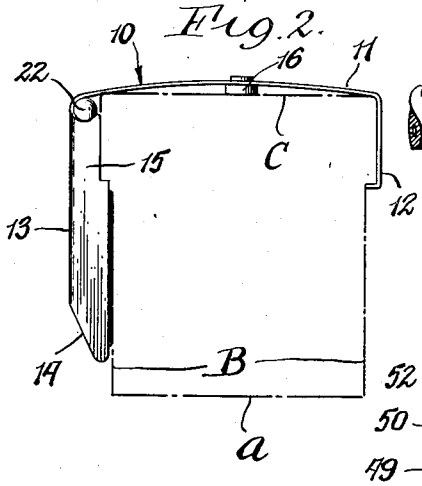

Fig. 3.

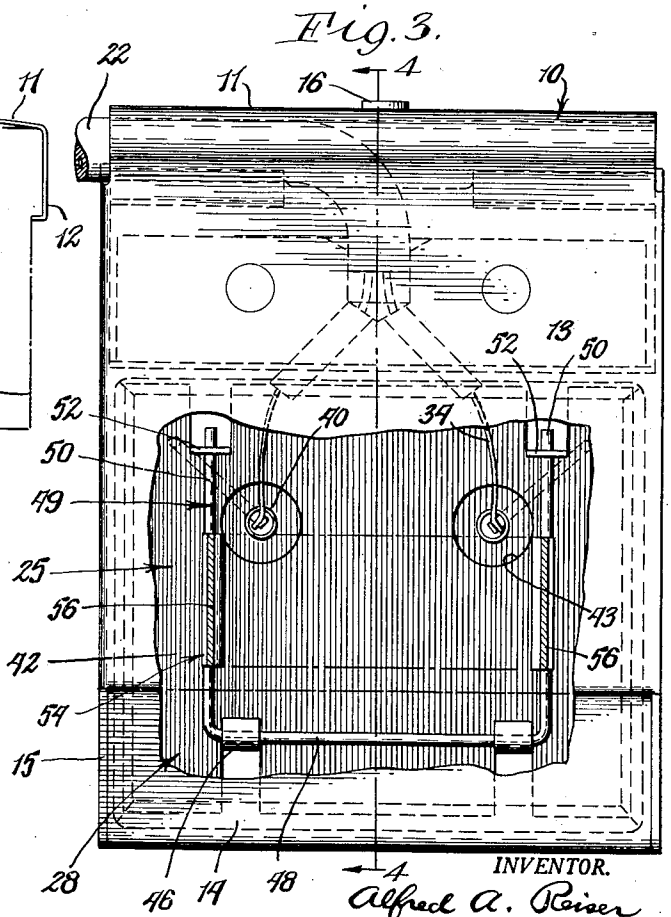

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Fig. 4.

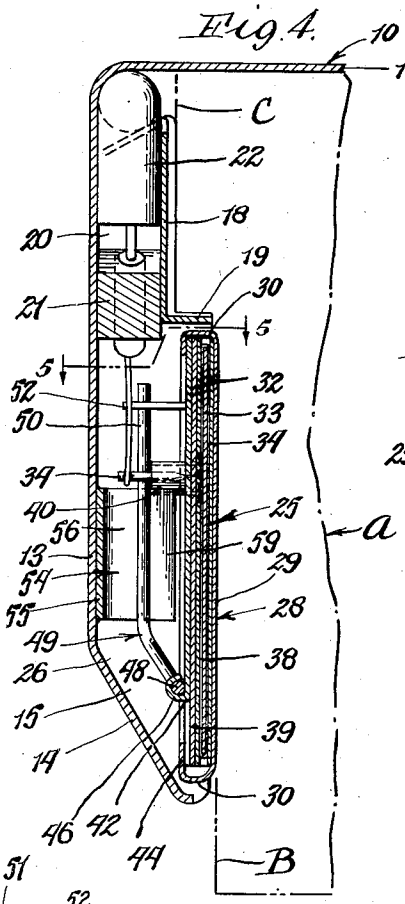


Fig. 5.

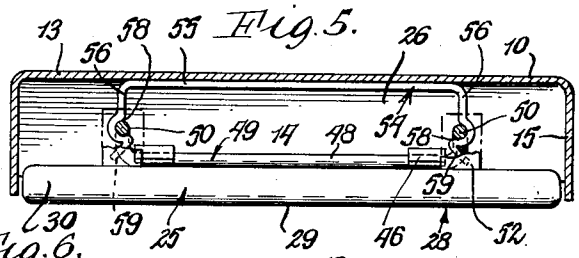


Fig. 6.

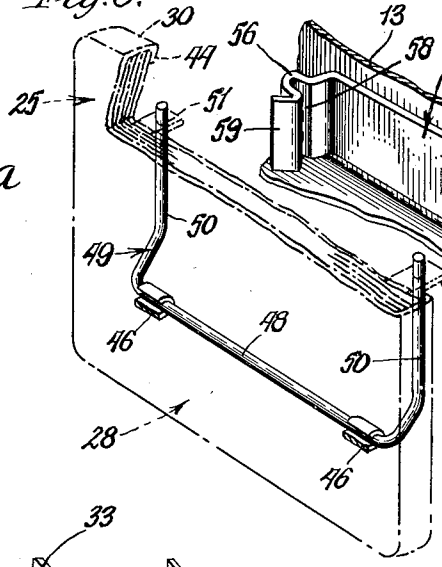
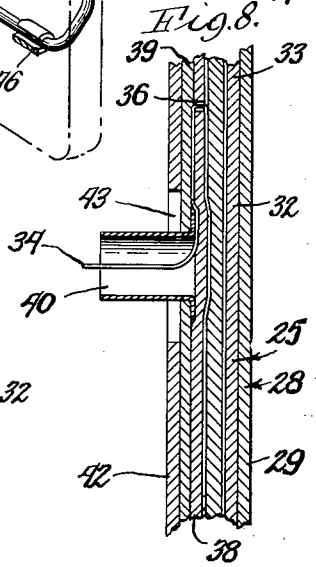


Fig. 7.

Fig. 8.



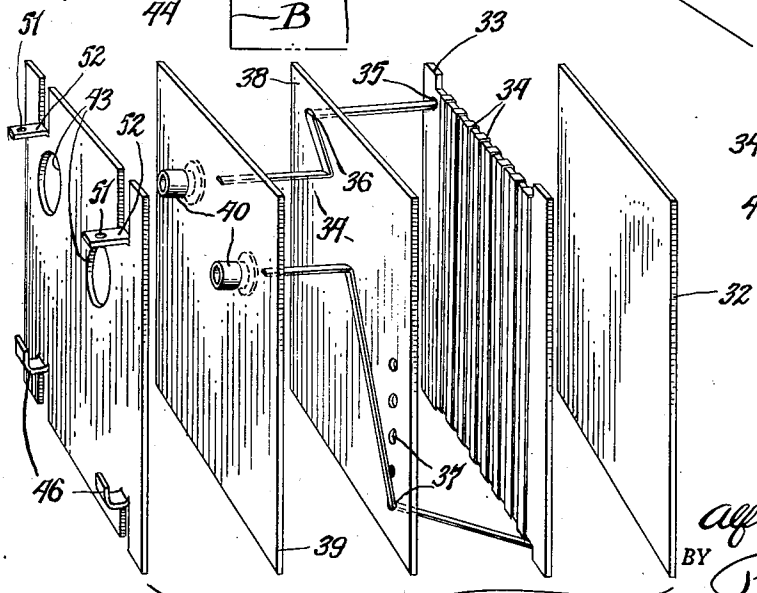


Fig. 9.

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2,445,185

ELECTRIC CLAMP-ON HEATER

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Application November 17, 1944, Serial No. 563,877

4 Claims. (Cl. 219—19)

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This invention relates to an electric heater and more particularly to an electric contact heater for maintaining a minimum temperature of a part to be heated, such as the mechanism of machine guns or cannon, particularly when used in aircraft to prevent the mechanism of the gun or cannon from jamming under the low temperatures encountered at high levels. The invention is not, however, limited to this particular use and can be embodied in any type of electrical contact heater where the features can be advantageously employed. This application is a modification of the electrical contact heater shown in my copending application Serial No. 459,793, filed September 26, 1942, issued October 30, 1946, as Patent No. 2,410,362, and is particularly distinguished from the said copending application in that in the present heater a higher temperature is developed over a smaller surface of the part to be heated.

In common with my said copending application, one of the principal objects of the present invention is to supply an electrical contact heater which will maintain the mechanism of a machine gun or cannon at a minimum temperature to prevent the parts from jamming and to insure the initial free operation of the gun.

Another object is to provide such an electrical contact heater which will operate within the maximum wattage available for this purpose, the electrical power plan of a combat plane having limitations in the amount of current which can be used for gun heating purposes.

It is another object of the present invention to provide such a contact heater which insures the maximum amount of heat being transferred to the part to be heated and which avoids the dissipation of heat to other parts of the mechanism to be heated or to the surrounding atmosphere.

Another object of the invention is to provide such an electrical contact heater, the efficiency of which will not be disturbed by the recoil of the gun or cannon on which it is mounted.

Another aim is to provide such an electrical contact heater which can be mounted so as not to interfere with the free operation of the mechanism to which it is applied.

Another object of the invention is to provide such an electrical contact heater which can be easily attached to the mechanism to be heated and readily removed therefrom.

Another object of the invention is to provide such a contact heater which is free from any danger of igniting any surrounding gasolene fumes and the like.

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Another object is to provide such an electrical heater which is simple, inexpensive and light in construction, is low in cost of production and which will stand up under conditions of severe and constant use without getting out of order or requiring repairs.

Other objects and advantages will appear from the following description and drawings in which:

Fig. 1 is a side elevation of an electrical heater embodying the present invention and showing the same mounted on a machine gun which is shown in broken lines.

Fig. 2 is an end elevation thereof.

Fig. 3 is an enlarged view similar to Fig. 1 and showing a part of the side wall of the holder for the heater broken away.

Fig. 4 is a fragmentary vertical transverse section, taken on line 4—4, Fig. 3.

Fig. 5 is a horizontal section, taken on line 5—5, Fig. 4.

Figs. 6 and 7 are perspective views of the attaching means for securing the heating pad to the holder.

Fig. 8 is an enlarged fragmentary vertical section, through the heating pad containing the resistance element.

Fig. 9 is an exploded view of the sheets of dielectric material and the backing plate of the heating pad.

The invention is shown as embodied in an electrical contact heater which is shown as mounted on a machine gun A having side walls B and a removable cover C which is provided with flanges which fit over the side walls B and enclose a chamber containing the operating mechanism to be heated. With a machine gun this mechanism is the firing mechanism which it is desirable to maintain at a minimum temperature of, say, 0° F. to prevent the oil of those parts from congealing and thereby render the gun inoperative.

The contact heater embodying the present invention is shown as including a holder 10 made of sheet metal to have the necessary strength and resilience and having a top 11 which fits over the cover C of the gun, a side flange 12 which hooks around one side flange of the cover C, and an opposite side wall 13 which extends downwardly along that side of the machine gun side wall B opposite from the flange 12. The lower end of the side wall 13 of the holder is shown as inclining downwardly and inwardly, as indicated at 14, so that its lower extremity is in close proximity to the machine gun. The opposite ends of the side wall 13 and its inclined bottom part 14 are also shown as enclosed by vertical flanges 15

which project inwardly from the side wall with their edges in closely spaced relation to the adjacent flange C of the cover and side wall B of the gun. These side flanges 15 are preferably offset to hook under the cover C so that the holder is attached to the cover and is removed from the machine gun with the cover. To insure this attachment of the holder to the cover a spacer 16 of any suitable form can be interposed between the top of the cover and the top 10 of the holder so as to bow this top upwardly, as illustrated in Fig. 2, and draw the side flange 12 and end walls 15 into firm engagement with the side flanges of the cover.

The holder is likewise shown as including an inner L-shaped plate or bar 18, the ends of which are secured to the end walls 15 of the holder at the upper part thereof, this L-shaped plate 18 having an inwardly extending horizontal flange 19 which fits under the edge of the corresponding side flange C of the cover. This plate 18 forms a chamber 20 in which an electrical connector 21 and the supply lines 22 can be mounted.

The heat is shown as supplied by a heating pad, indicated generally at 25, this heating pad being shown as being rectangular in shape and as being mounted in the chamber 26 formed by the side wall 13, 14; end walls 15; and horizontal flange 19 of the holder. This heating pad comprises a rectangular metal casing 28 having a face wall 29 which is adapted to contact the surface to be heated and having side walls 30 extending horizontally outward from the edges of the face wall 29. In the cup-shaped metal casing thus provided is fitted a rectangular sheet 32 of dielectric material, such as mica. Also fitted within the casing 28 and against the sheet 32 of mica is a sheet or form 33 of mica or other dielectric material having opposite indented marginal edges around which is helically wound a resistance wire 34, one end of which is brought out through a hole 35 in the upper left hand corner of the sheet 33, as viewed in Fig. 9. The opposite end of this helically wound resistance wire is shown as terminating adjacent the opposite corner of the mica sheet or form 33, that is, at the lower right hand corner of this sheet 33, as viewed in Fig. 9. The first end of the helically wound resistance wire 34, that is, the end passing through the hole 35, is passed directly through a registering hole 36 provided in a sheet 38 of mica, this sheet 38 being fitted in the metal casing 28 against the sheet 33 of mica upon which the resistance wire is wound. The hole 35 in the mica sheet 33 registers with the hole 36 in the mica sheet 38 so that the corresponding end of the resistance wire 34 is held against crossing in contact with the convolutions of this wire on the form 33. To similarly prevent the opposite end of the resistance wire 34 from coming in contact with any of the convolutions thereof on the sheet 33, the sheet 38 is provided in its lower right hand corner, as viewed in Fig. 9, with a vertical series of holes 37 through which the other end of the resistance wire is brought. The purpose of providing a series of such holes 37 is to permit of adjusting the length and hence the total resistance of the wire 34. Another rectangular sheet 39 of dielectric material is fitted in the casing over the sheet 38, this sheet 39 carrying a pair of eyelets 40, which can be arranged as desired, these eyelets being shown as arranged near the center of the sheet 39 and hence out of register with the holes 36, 37 of the sheet 38. Each end of the resistance wire passes along the face of the sheet 38 and then is

bent at right angles to pass through the corresponding eyelet 40.

The group of sheets 32, 33, 38 and 39 of dielectric material are held in the casing 28 by a backing plate 42 which is made of metal, this backing plate being provided with a pair of holes 43 through which the eyelets 40 carried by the sheet 39 extend. It is important that these holes 43 register with the eyelets 40 and that they be substantially greater in size than these eyelets 40 so that no part of these eyelets 40 come in contact with the metal backing plate 42. To securely hold the parts of the pad, as above described, together as a unitary structure the ends of the side walls 30 of the metal casing 28 are bent around the edges of the backing plate 42 so as to provide retaining flanges 45 which hold the various sheets of dielectric material, together with a backing plate 42, in the cup-shaped casing 28. The opposite sides of the supply line 22 can be connected to the projecting ends of the resistance wire 34 by solder, or in any other suitable manner, as illustrated in Fig. 4.

Means are provided to firmly hold the face wall 29 of the pad 25 firmly in contact with the wall B to be heated. For this purpose a pair of ears 46 are struck outwardly from one edge of the backing plate 42 and are formed to embrace the cross part 48 of a U-shaped piece 49 of spring wire. Each leg 50 of this U-shaped piece of wire is shown as extending upwardly, in spaced relation to the backing plate 42, and through a hole 51 provided in an ear 52, the pair of ears 52 being struck outwardly from the edge of the backing plate 42 opposite from the ears 46. The side legs 50 of the spring wire are caught by a C-shaped clip 54, this clip having a cross part 55 which is welded or otherwise secured to the inner face of the side wall 13 of the holder and from the opposite ends of which retaining fingers 56 project. These retaining fingers are shown as having opposed channels 58 which receive the side legs 50 of the U-shaped wire 49, the ears 56 holding these side legs 50 under inward pressure so as to secure the pad 25 reliably in place. In order to guide the two legs 50 of the wire 49 in to these channels 58 the exeremities of the fingers 56 are formed to provide inclined flanges 59. When the heating pad 25, together with its U-shaped wire 49, is pressed into position within the chamber 26 of the holder, the legs 50 of this wire engage the inclined flanges 59 of the clip 54 and are pressed toward each other until these legs 50 come into alinement with the channels 58 into which they snap outwardly.

It will be seen that the heater embodying the invention is very easily assembled. Thus, the resistance wire 34 is helically wound upon the sheet 33 of mica with one end inserted in the hole 35 therein. This end is brought out through the registering opening 36 in the sheet 38 of mica. The opposite end is brought out through one of the series of holes 37 in the mica sheet 38. Both ends of the resistance wire are then passed along the mica sheet 38 to positions registering with the eyelets 40 where they are bent at right angles. These bent ends of the resistance wire 34 are then threaded through the eyelets 40 of the sheet 39 of mica, these eyelets and the ends of the wire 34 crossing thereto being completely insulated from the coils of the resistance wire 34 by the interposed sheet 38 of mica. The inner sheet 32 of mica is then placed in the cup-shaped metal case 28 and the subassembly of the mica sheets 33, 38 and 39 placed in the case over the mica

sheet 32. The metal backing plate 42 is then placed over the sheet 39 of mica and this backing plate is automatically alined by the side walls 30 of the casing so that the eyelets 40 extend through the centers of the large holes 43 therein so that these eyelets cannot contact the backing plate. The side walls 30 of the casing are then flanged over, as indicated at 44, to hold the parts of the pad together as a unitary structure.

The ends of the legs 50 of the U-shaped spring wire 49 are then threaded through the holes 51 of the ears 52 of the backing plate 42. Following this the cross part 48 of the spring wire is placed in the ears 46 and these ears bent to embrace this cross part. The pad, with the spring wire 49 so attached, is then pressed into the chamber 26 so as to engage the inclined flanges 56 of the clip 54, these side legs 50 being bent together upon being pressed against the flanges 56 and thereafter snapping outwardly into the opposing channels 58 of the clip so as to be reliably held in position.

The mounting of the spring wire 49 on the backing plate 42 can, of course, precede the assembly of this backing plate, together with the mica sheets, in the metal case 28.

From the foregoing it will be seen that the present invention provides an electric heater which is extremely simple in construction and is capable of being fabricated at very low cost. At the same time it is rugged in construction, thoroughly insulated, both electrically and thermally and will stand up under severe operating conditions, particularly on machine guns which are subjected to recoil impacts.

I claim as my invention:

1. An electric contact heater, comprising a heating pad including a heating element housed within a metal casing having a face wall adapted to be held in contact with the surface of the part to be heated and having a back plate at its opposite side, and means for holding said face wall in contact with said surface, comprising a U-shaped length of spring wire extending along three sides of said back plate, means at spaced intervals along said wire and securing said length of spring wire to said casing to extend generally parallel with said black plate and with the legs of said U-shaped wire in spaced relation to said back plate, a holder in rear of said pad and held in fixed relation to the part to be heated, and means on said holder and engaging each of said legs intermediate the corresponding securing means to yieldingly urge said pad toward the part to be heated.

2. An electric contact heater comprising a rectangular heating pad including a heating element housed within a metal casing having a face wall adapted to be held in contact with the surface of the part to be heated and having a back plate at its opposite side, and means for holding said face wall in contact with said surface, comprising an ear struck rearwardly from each corner of said back plate, a U-shaped length of spring wire attached to said ears to extend along three sides of said pad, said ears holding the legs of said length of wire in generally parallel rearwardly spaced relation to said back plate, a holder in rear of said pad and held in fixed relation to the part to be heated, and means on said holder and engaging each of said legs to yieldingly urge said pad toward the part to be heated.

3. An electric contact heater, comprising a heating pad including a heating element housed within a metal casing having a face wall adapted to be held in contact with the surface of the part to be heated and having a back plate at its opposite side, and means for holding said face wall in contact with said surface, comprising a U-shaped length of spring wire extending along three sides of said back plate, means at spaced intervals along said wire and securing said length of spring wire to said casing to extend generally parallel with said back plate and with the legs of said U-shaped wire in spaced relation to said back plate, a holder in rear of said pad and held in fixed relation to the part to be heated, and means on said holder and engaging each of said legs intermediate the corresponding securing means to yieldingly urge said pad toward the part to be heated comprising a pair of clips on said holder and extending forwardly therefrom and corrugated to receive and hold opposite sides of said legs.

4. An electric contact heater comprising a rectangular heating pad including a heating element housed within a metal casing having a face wall adapted to be held in contact with the surface of the part to be heated and having a back plate at its opposite side, and means for holding said face wall in contact with said surface, comprising an ear struck rearwardly from each corner of said back plate, a U-shaped length of spring wire attached to said ears to extend along three sides of said pad, said ears holding the legs of said length of wire in generally parallel rearwardly spaced relation to said back plate, a holder in rear of said pad and held in fixed relation to the part to be heated, and means on said holder and engaging each of said legs to yieldingly urge said pad toward the part to be heated comprising a U-shaped clip secured to said holder and having forwardly projecting ears provided with opposing recesses adapted to receive the outer sides of said legs when said heating pad is forced rearwardly toward said holder.

ALFRED A. REISER.

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