Oct. 18, 1966 J. H. KLANCKE ET AL 3,280,298

CORE PLUG HEATER

Filed April 24, 1964

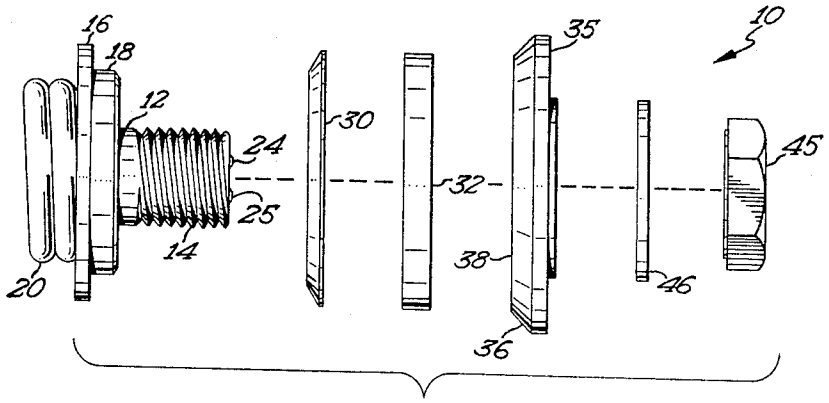

FIG 1

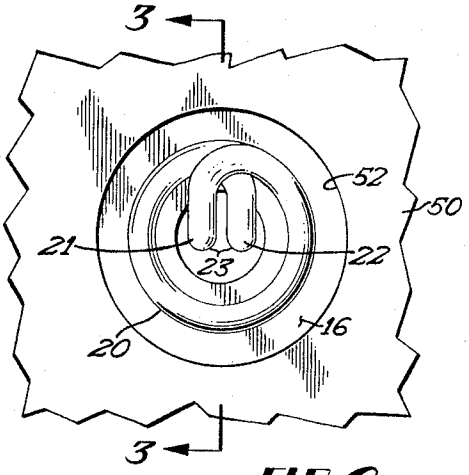

FIG 2

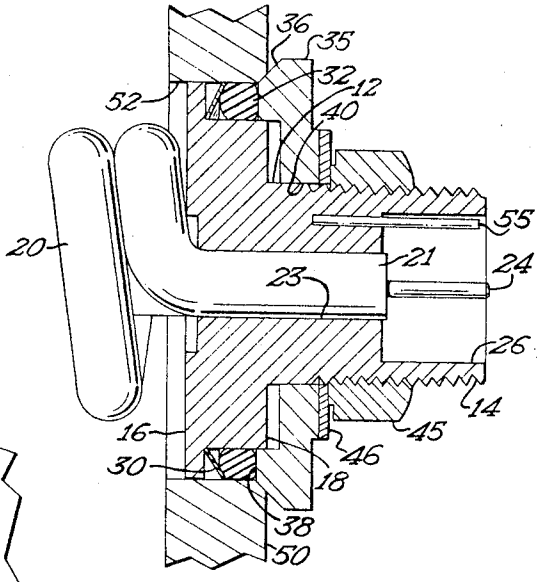

FIG 3

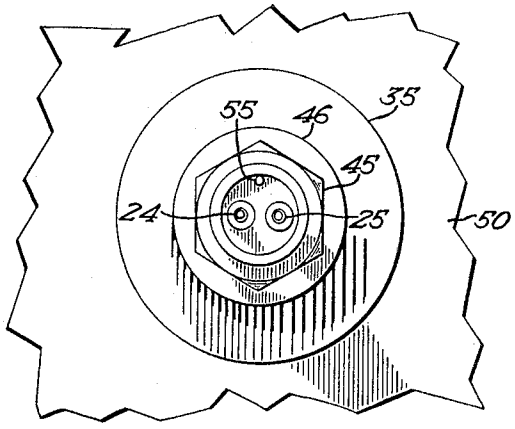

FIG 4

INVENTORS
JOHN H. KLANCKE
SETH B. LINDSEY

BY

Schroeder & Siegfried
ATTORNEYS

United States Patent Office

3,280,298

Patented Oct. 18, 1966

3,280,298

CORE PLUG HEATER

John H. Klancke and Seth B. Lindsey, both of Minneapolis, Minn., assignors to Phillips Manufacturing Company, Inc., Minneapolis, Minn., a corporation of Minnesota

Filed Apr. 24, 1964, Ser. No. 362,373
11 Claims. (Cl. 219—208)

This invention relates to core plug heaters and more particularly to an improved core plug heater adapted for use in automotive engines as a means for maintaining a cooling medium in the automotive engine at a standby or moderate temperature in cold weather to facilitate starting of automotive engines under such conditions.

Automotive engines or internal combustion engines are cast with holes in the casting process by means of which sand utilized at this time may be eliminated from the casting. Holes of this type are normally plugged with a core plug or freeze plug and generally the engine has such a hole bored to a predetermined size so that a heater may be inserted therein if it is desired to provide for heating of the cooling medium of the engine during cold weather conditions. For the purpose of this application, the hole in an internal combustion engine casting will be referred to as the core plug and the improved heater of the present invention is identified as a core plug heater to be used with internal combustion engines in this location.

The improved heater design or core plug heater has for its primary purpose a simplified economical design which may be readily constructed and easily and quickly applied to engines at the core or freeze plug opening therein. This improved core plug heater utilizes a simple mounting provision which accurately locates the heater within the engine and securely seals the same therein in a simplified installation. This improved core plug heater is an improvement over the structure of the co-pending application of Alfred A. Carl and John H. Klanke on a Freeze Plug Hole Heater, Serial No. 313,692, filed Oct. 3, 1963 in that it provides for a more simplified structure, an improved mounting provision for the heater in an automotive engine and a better seal to seal the core plug heater in the engine casting.

It is therefore a general object of this invention to provide an improved core plug heater which is simple in design, economical to manufacture and has great application and adaptability to various automotive engines.

Another object of this invention is to provide an improved core plug heater which is simple to instal.

A further object of this invention is to provide an improved core plug heater which may be utilized in freeze plug or core plug holes in an automotive engine having varying dimensions and which is readily adaptable for all core hole sizes.

A still further object of this invention is to provide an improved core plug heater which securely and positively locates the heater within an automotive engine block and insures against loss of the coolant in the engine block through a positive seal.

These and other objects of this invention will become apparent from a reading of the attached description together with the drawings wherein:

FIGURE 1 is an exploded view of the improved core plug heater;

FIGURE 2 is an end view of the improved core plug heater from the inner end normally inserted into an automotive engine;

FIGURE 3 is a sectional view of the improved core plug heater taken along the lines 3—3 in FIGURE 2 in showing the relationship of the heater and its mounting in the engine wall of an automotive engine; and

FIGURE 4 is an outer plan view of the improved core plug heater.

The improved core plug heater of our present invention is shown in exploded view in FIGURE 1 with the general designation **10**. It includes a metal tubular member or plug member **12** having an externally threaded end portion **14** and an annular flange portion **16** at the opposite extremity thereof. Intermediate the threaded portion **14** and the annular flanged or shoulder portion **16** is a raised center portion **18**, the purpose of which will be later noted. Mounted within the metal tubular member **12** is a copper electrical heating element **20** which is conventional in construction and is similar to the heating element shown in the U.S. Patent No. 2,783,352 issued to D. D. McKay, dated Feb. 26, 1957. While the heating element in the patent disclosuer referred to above is preferable, it will be understood that other suitable electrical heating elements may be utilized within the scope of this invention. The heating element **20** has its extremities **21**, **22** positioned in apertures or holes **23** extending through the plug member and which terminate in terminals conductors **24**, **25** respectively in a recess **26** in the threaded outer end portion **14** of the plug member. The extremities **21**, **22** are suitably sealed within the plug member **12** by a solder substance or epoxy resin to seal the ends of the heater element therein and thereby seal off the interior of the plug member **12** as it is assembled.

Further, as will be seen in FIGURE 1, the plug member **12** mounts at the central portion thereof a clamping washer **30** which has tapered surfaces giving it an annular dish shaped form and is made of a hardened steel material, such as stainless steel, with a predetermined spring rate. This type of washer is sometimes identified as a "Belleville" spring and when flattened by compression will depart from the tapered dish shaped form and expand radially to increase the diametrical or radial dimension of the same. The clamping washer **30** is positioned adjacent the annular flanged portion **16** of the plug member **12** to bear against the same. Adjacent the clamping washer **30** is an annular sealing ring **32** which is made of a flowable elastic material, such as rubber, and may include fabric material embedded therein. The rubber ring, as will be later noted, performs the sealing for the core plug heater and is adapted to expand radially when compressed in an axial direction for purposes to be later noted.

Also positioned on the plug member **12** is an expander member **35** which has an inner peripheral camming surface **36** on one side thereof terminating with an annular thrust portion **38**. The expander member **35** has an aperture **40** therein which loosely fits over the threaded end portion **14** of the plug member to be slidably mounted thereon and axially relative thereto. Positioned behind the expander member **35** is a nut **45** threaded on the threaded end portion **14** of the plug member with a spacing washer **46** positioned between the nut and the expander member **35** for thrust purposes. As will be best seen in the sectional view of FIGURE 3, these parts are positioned in assembled relationship in the wall of an engine which is indicated generally at **50** through a core plug hole **52** therein. The improved heater in assembled relationship normally has the nut **45** threaded on the threaded end portion of the plug member such that the expander **35** is positioned adjacent and bears on the seal member **32** and which in turn snugly bears against the clamping washer **30** urging the same against the flanged end portions **16** of the plug member **12**. In this assembled realtionship, the heater is adapted to be inserted into a core plug hole **52** in an engine. As will be seen in the inner or bottom plan view or inner end view **2**, the heater element **20** has a circumferential or diametrical

dimension slightly less than the dimension of the flange portion **16** so that the heater may be inserted into the core plug hole without engagement with the sides of the engine. This provides for a simplified installation of the core plug heater in an engine. The improved core plug heater design also includes a rib **55** at the threaded end portion **14** adjacent the plugs **24, 25** for accurately locating the male type electrical connector to connect the source of electrical power to the heater in the use of the same.

This improved heater design has great adaptability to openings of various sizes in engines due to the variation in manufacturing tolerances. A substitution of the clamping washer and sealing element **30, 32** with varying dimensions will accommodate varying sizes to positively mount and seal the heater in engine blocks with different size core plug holes. The improved heater plug may be securely mounted merely by advancing the nut **45** on the threaded portion of the plug member **12** causing the washer **46** to increase the thrust on the expander member **35** further expanding the sealing element **32** and the clamping washer **30** to positively secure the same in the engine wall **50**. This improved design provides for a more compact heater with the heating element **20** located adjacent the engine wall **50** such that the effect of the heating therefrom will not heat the center wall of the engine but rather the fluid only to provide for more efficient operation of the core plug heater.

When it is desired to utilize the improved core plug heater, the elements of the same are so assembled and mounted and the nut **45** advanced on the threaded portion such that the expander member **35** engages the seal element **32** to start collapse of the clamping ring **30**. In this form, the diametrical dimension of the core heater is such as to freely fit into the core plug hole and in this position the nut **45** may be tightened to expand the clamping member and seal member to form the securing and sealing function.

It will be seen that we have provided an extremely simple and inexpensive core plug heater which can be manufactured at a minimum of cost and be installed with a minimum of effort. The heater as applied effectively locks itself in position so as to preclude the loss of the heater element itself and the cooling medium within the engine block. By variation in size of the clamping washer **30** and sealing element **32**, the improved core plug heater is adaptable for substantially universal application in varying size core plug holes.

Therefore in considering this invention it should be remembered that the present disclosure is intended to be illustrative only and the variations in the particular shape and materials involved may be made within the scope of the claims.

We claim:

1. A core plug heater for automotive engines comprising,

(a) a rigid tubular member having an externally threaded end portion and a circumferentially flanged opposite end portion,

(b) an electrical heating element sealed within said tubular member to seal off the interior thereof and extending axially outward from said opposite end portion,

(c) electrical connectors mounted within said threaded end portion of said tubular member being electrically connected with said heating element and adapted to be connected to a source of electric power,

(d) a dish shaped annular resilient clamping washer having the characteristic of expanding radially when flattened by compression, said clamping washer being positioned on said tubular member adjacent the flanged end portion thereof,

(e) an annular sealing member surrounding said tubular member in close fitting relation therewith and positioned adjacent said clamping washer, said sealing member being formed of a flowable elastic material and being circumferentially expandible.

(f) an expander plate positioned on said threaded end portion of said tubular member in pierced relation therewith and being movable axially thereof,

(g) an annular camming surface carried by said expander plate at one side thereof and extending concentrically with and bearing against one end of said tubular sealing member, the annular camming surface of said expander plate having a larger diametrical dimension than the flanged end portion of the tubular member, and

(h) a nut threaded on the threaded end portion of said tubular member and when tightened forcing said expander plate toward said flanged end portion of said tubular member causing compression of said tubular sealing member and radial expansion of said clamping washer, the heater plug when positioned in a core plug hole in an engine having the flanged end portion fitting within said hole and the camming surface bearing against the outer edge of the same such that upon compression of said clamping washer the radial expansion thereof will bite into the surface of the core plug hole in the engine in which the plug is mounted and compression of the tubular sealing member to seal between the tubular member and the core plug hole.

2. The structure defined in claim **1** in which the connectors are disposed entirely within the threaded end portion of said tubular member.

3. The structure defined in claim **2** in which the clamping washer is made of a stainless steel material considerably harder than the material in the engine wall in which the freeze plug hole heater is mounted.

4. The structure defined in claim **2** in which the tubular member of the freeze plug hole heater when mounted in a core plug hole of an automotive engine is positioned within the core plug hole such that the heater element on the opposite end thereof is positioned adjacent the wall of the automotive engine of the internal surface thereof.

5. A core plug heater for automotive engines comprising,

(a) a plug member having an annular flange portion adjacent one end of the plug member, said plug member being adapted to be positioned in a core plug hole in an automotive engine with the flange portion having a dimension slightly less than the core plug hole and being normally positioned within said core plug hole,

(b) an electrical heating element mounted on said plug member and extending outwardly from the end thereof and adapted to be connected to an electrical power at the other end of the plug member, said heating element being adapted to be positioned within the automotive engine when said plug member is mounted in a core plug hole therein,

(c) an annular sealing element carried by the plug member and bearing against the plug member, said sealing element being circumferentially expandible,

(d) a continuous annular dish shaped washer made of a resilient material and having a characteristic of expanding radially when flattened by compression positioned on said plug member adjacent said annular sealing element,

(e) expander means carried by and axially movable on said plug member and having an inclined camming surface larger than the core plug hole in the engine in which said plug member is adapted to be mounted and with an annular thrust surface thereon having a radial dimension smaller than the core plug hole in the engine, said expander means when positioned on said plug member within the core plug hole in the engine being positioned mainly outside the surface of the core plug hole with a portion of the camming surface bearing against the peripheral

surface of the core plug hole and with the thrust surface of the expander means acting against said sealing element and said clamping washer to compress the washer such that it expands radially and bears against the interior surface in the core plug hole in the engine to secure the plug member therein and to compress the sealing element such that it engages the surface of the core plug hole and the surface of the plug member to seal the plug member in the core plug hole in the engine, and

(f) means carried by said plug member at the other end of the same for urging the expander means toward the flange portion of the plug member so as to clamp the sealing element and the clamping washer therebetween to compress said sealing element and said clamping washer.

6. The structure of claim **5** in which the clamping washer has an inclined circumferential surface and is made of a material harder than the material in the automotive engine in which it is mounted.

7. The structure of claim **6** in which the clamping washer upon radial expansion imbeds into the interior metal surface in the core plug hole in the automotive engine to secure the plug member therein and the camming surface of the expander member wedges against the peripheral surface of the core plug hole to hold the plug member in the core plug hole in the automotive engine.

8. The structure of claim **7** in which the clamping washer is of the Belleville spring type.

9. The structure of claim **8** in which the electrical heating element is sealed in the plug member and has connector means extending from the surface thereof normally positioned outside the automotive engine and adapted to be connected to a source of electric power.

10. The structure of claim **9** in which the urging means is a nut threaded on a threaded portion of the plug member which bears against a portion of the expander member slidably mounted on the plug member to urge the camming surface into engagement with the core plug hole in the automotive engine.

11. The structure of claim **10** in which the clamping washer is made of stainless steel and is positioned adjacent the annular flange portion of the plug member with the sealing element positioned adjacent the same and engagable by the thrust portion of the expander member.

References Cited by the Examiner

UNITED STATES PATENTS

2,783,352	2/1957	McKay	219—208 X
2,824,945	2/1958	Derumaux	219—208 X
3,211,888	10/1965	Windsor	219—208

FOREIGN PATENTS

654,393	12/1962	Canada.

ANTHONY BARTIS, *Primary Examiner.*