May 31, 1927. 1,630,749

R. L. KJERNER

RADIATOR

Filed Dec. 31, 1926 2 Sheets-Sheet 1

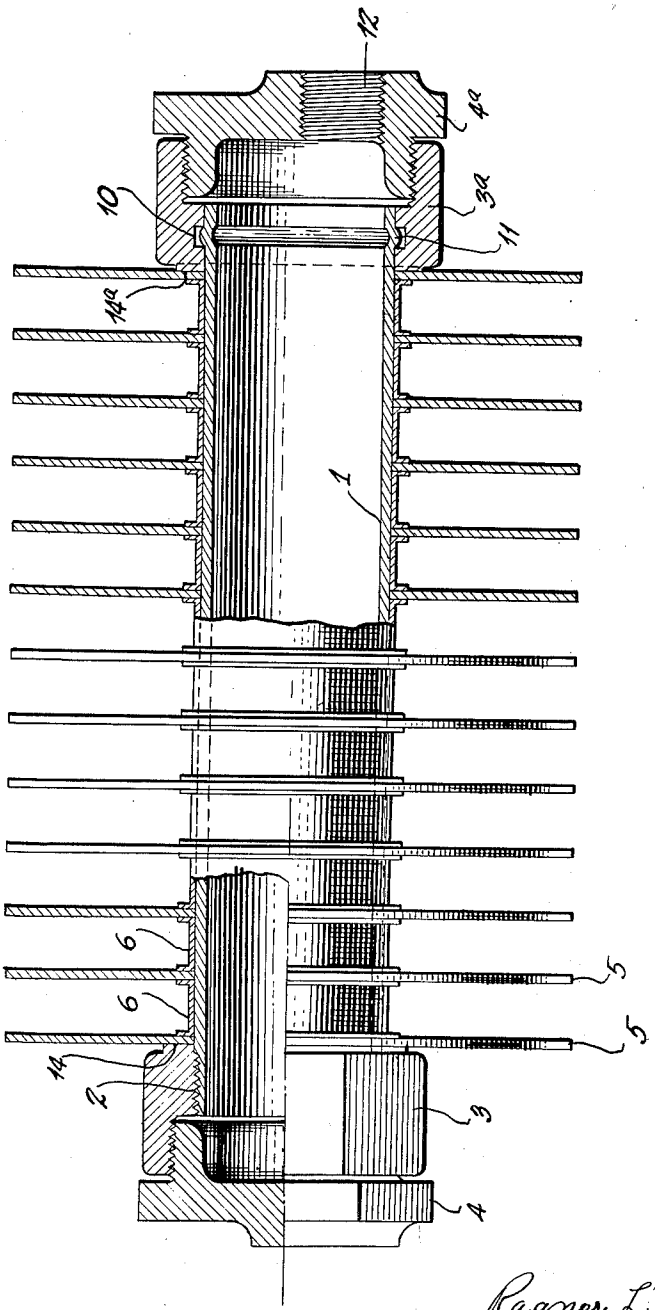


Fig. 1

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Fig. 3

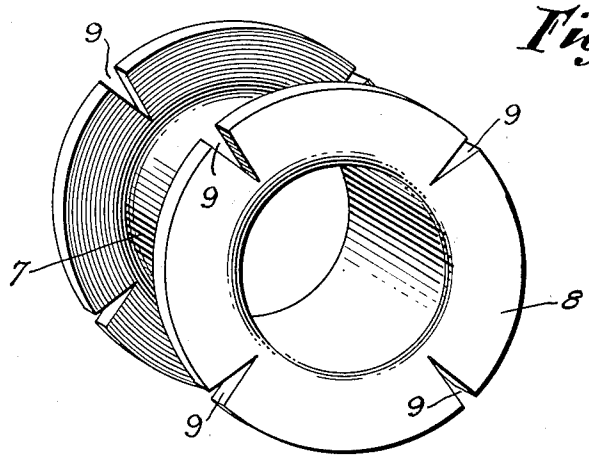
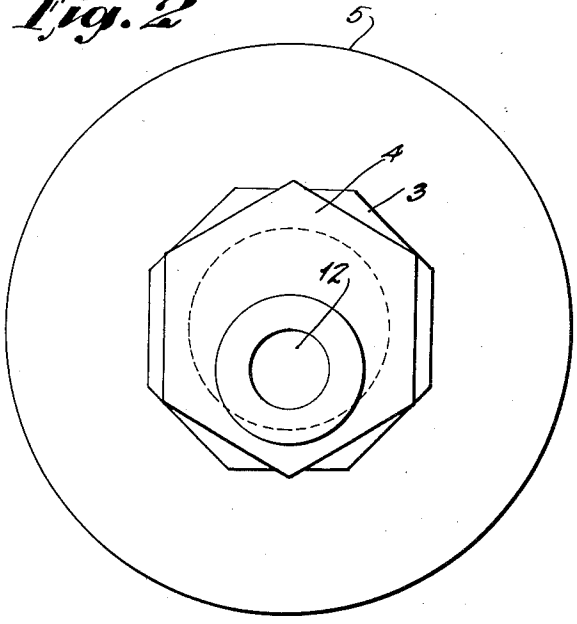


Fig. 2



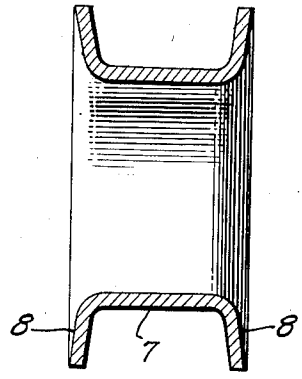


Fig. 4

Ragnar L. Kjerner. INVENTOR.
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Patented May 31, 1927. 1,630,749

UNITED STATES PATENT OFFICE.

RAGNAR L. KJERNER, OF CRESTWOOD, NEW YORK.

RADIATOR.

Application filed December 31, 1926. Serial No. 158,142.

This invention is a radiator adapted to be used either for heating or cooling.

The main object of the invention is to provide a simple, inexpensive and compact form of radiator embodying a relatively extended radiating surface and particularly one which is built up of a plurality of parts, so assembled that the parts will not become loose with respect to one another due to continued expansion and contraction incident to the continued functioning of the structure in a heating system.

The radiator of the present invention is of the general character embodying a straight through tube or pipe upon which spaced apart fins are mounted to form the major portion of the radiating surface. Structures of this general character have heretofore been suggested, but my extended experience in this field has convinced me that none of them will remain tight for any appreciable period. When such a radiator heats up, the parts appreciably expand and when the radiator subsequently cools, there is a corresponding amount of contraction in the respective parts. The result is that in every radiator of this character of which I am aware, the parts will become loosened in a relatively short time after installation. In other words, the majority of these radiators after being installed a couple of months, or for an even shorter period will be found to have loose disks and in some cases, this looseness is so pronounced, that the efficiency of the radiator as a heater or cooler is diminished. This will be apparent when it is understood that the efficiency of radiators of this character depends entirely upon metallic contact between the tube and the fins or disks.

The primary purpose of the present invention is to provide a radiator of the character specified which will remain in the form of a rigid assembly indefinitely. I accomplish this result by assembling the disks or fins upon the tube with intermediate spacers, which are preferably longitudinally resilient and during the process of manufacture, I assemble the parts to put all of these spacers under compression within their elastic limits, so that when the radiator is finished or complete, the parts thereof will be secured together under tension. The result is that as the parts expand or contract, the tension of the spacers will compensate for these physical changes and will maintain the parts, throughout the life of the radiator, in the form of a rigid assembly, well adapted for the performance of its intended functions.

As stated, in the preferred form of the invention, resilient spacers are employed. These spacers are tubular and are provided at their opposite ends with substantially radially extending flanges, which are radially slit to form the flanges into series of spring fingers, the resilient properties of which perform the functions to which I have referred. It is within the purview of this invention, however, to utilize non-resilient spacers for separating the disks.

Features of the invention, other than those specified, will be apparent from the hereinafter detailed description and claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 shows the heater of the present invention, partly in central section and partly in elevation.

Figure 2 is an end view of the construction shown in Figure 1.

Figure 3 is a perspective view of one of the spacers; and,

Figure 4 is a central section through one of the spacers, showing the same as it appears prior to assembly.

Referring to the drawing, 1 designates a tube, one end of which is threaded as shown at 2. On this threaded end is screwed a two piece union embodying sections 3 and 4 which also have threaded connection with one another. After the tube 1 is threaded into the union section 3, I assemble on the tube fins 5 with spacers 6 between successive fins. The spacers 6 are preferably shown in detail in Figures 3 and 4. They embody a substantially cylindrical part 7 of an inner diameter adapting them to fit over and closely conform to the tube 1 and at the opposite ends of the cylindrical portion 7 are outwardly extending substantially radial flanges 8.

It will be noted, however, from Figure 4 that these flanges diverge outwardly. That is to say, they are not parallel to one another or perpendicular to the axis of the cylindrical portion, but are at a fairly pronounced

angle to said axis. These flanges are, moreover, radially slit as shown at 9 to divide them into a plurality of spring fingers or tongues.

The radiator is built up in the manner described by positioning alternately, disks 5 and spacers 6, until the free end of the tube 1 is substantially reached, leaving sufficient space, however, for a union section 3^a to be slipped over the free end of the tube.

This union section may be threaded upon the tube, if desired, but I find it more convenient, in practice, to provide said section with an internal annular channel 10 into which the tube may be expanded when the parts are tight. In practice, the parts are assembled loosely and before the tube is expanded into the channel 10, the whole assembly is introduced into a press where pressure is applied in opposite directions to the union sections 3 and 3^a to force these sections toward one another under the desired pressure. During this operation, the inner faces 14 and 14^a of the sections 3 and 3^a serve as abutments, the former of which is stationary and the latter of which is movable to produce such compression of the parts as desired.

Sufficient pressure is applied in practice to place the flanges 8 of all of the spacers or separators under sufficient tension to hold the parts rigid even though they be considerably expanded under the action of steam or hot water in a radiator. The pressure required may be readily ascertained by those skilled in the art.

After the parts have been placed under this pressure, and while thus held under compression, an expanding tool is inserted into the end of the tube 1 and the tube is expanded into the channel 10, as shown at 11. This expanding operation tightly locks the parts in position with the spacers under tension and the whole construction rigid.

After the parts are assembled as described, the union section 4^a is associated with the union section 3^a and this section 4^a, as well as the section 4 has a tapped opening 12 adapted to receive the threaded end of a pipe to incorporate the radiator in a heating system.

My experience with the structure which I have described has shown that it can be manufactured with marked economy and that the disks or fins will be maintained in contant metallic contact with the tube through indeterminate periods. That this is true will be apparent from the fact that with all of the flanges 8 under tension, it necessarily follows that any expansion or contraction of the parts will be compensated for by the inherent resiliency of the spacers, so that the disks can never become loose. I am aware of the well known commercial structure, wherein disks or fins are mounted upon a tube by expanding the tube radially between successive fins, so that the expanded portions of the tube will space the fins apart and also hold them rigid.

In practice, however, radiators made in this manner will not maintain their tight assembly. No matter how tightly they may be assembled during the process of manufacture, it is found that expansion and contraction incident to the normal functioning of the heater, will in a relatively short time cause loosening of the plates. Obviously this cannot occur with the construction of this invention. Moreover, the expanding operation to which I have referred, as practiced in the prior art, necessitates the employment of numerous jigs, blocks or other adjuncts incident to the expanding operations, whereas in carrying out the present invention, the employment of these jigs is completely disposed of and the structure may be manufactured at an appreciable saving over prior practice.

In the foregoing detailed description of the invention, I have set forth its preferred practical embodiment as employing axially resilient spacers in order that the construction when assembled may be under axial compression. My experience has convinced me that this construction is of the highest efficiency as it readily compensates in an entirely automatic manner for any expansion and contraction which may be met with in practice. I am aware, however, that a very satisfactory form of radiator may be produced by assembling the disks upon a tube with independent spacers which are not axially resilient, and in practice, I may if desired even use castings in this connection. I further wish it to be clearly understood that while the resilient form of spacer is preferred that it is not exclusive and that the present invention contemplates broadly, the use of separate and independent spacers, resilient or not resilient, positioned between successive disks on the tube and tightly clamped in position between suitable abutments. It may be here noted that when non-resilient spacers are employed, I find it desirable in order to secure the best practical results in such a construction to dip the radiator after assembly in a suitable metallic compound in order to insure increased metallic contact between the spacers, tube and disks. I wish to lay particular stress upon the necessity for a constant metallic contact between the respective parts of the construction, since in the absence of such contact, the efficiency of the radiator either as a heater or cooler is negatived.

The foregoing detail description sets forth the invention in its preferred practical form, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. In a radiator, a tube provided at its opposite ends with fixed abutments, a plurality of disks or fins embracing the tube between the abutments and spacers interposed between consecutive disks to space them from one another, said spacers embodying cylindrical portions embracing the tube and substantially outwardly extending resilient radial flanges bearing against the contiguous disks with the flanges under compression, whereby said resilient flanges will grip and hold the disks firmly in position irrespective of expansion and contraction of the parts.

2. In a radiator, a tube provided at its opposite ends with unions adapted for the inclusion of a radiator in a heating system, alternate disks and spacers embracing the tube between the unions, said spacers being axially resilient and under compression, whereby they are adapted to axially expand and contract to maintain the disks firmly gripped in position irrespective of changes in temperature of the parts.

3. In a radiator, a tube provided at its opposite ends with clamping abutments, disks positioned between the abutments and embracing the tube, and spacers between successive disks to space said disks consecutively apart, each of said spacers embodying a cylindrical portion adapted to embrace the tube and provided at its opposite ends with outwardly expanding, radially slit, axially resilient flanges adapted to bear against the adjacent faces of contiguous disks under tension to maintain the parts of the structure in rigid assembled relation irrespective of changes of temperature of said parts.

4. In a radiator, a tube provided at its opposite ends with unions adapted to include the radiator in a heating system, disks embracing the tube between the unions, and spacers between each two adjacent disks, said spacers being axially resilient, and means for securing the unions to the opposite ends of the tube with all of the spacers under compression, whereby the disks will be tightly gripped irrespective of changes in temperature of the parts of the radiator.

5. In a radiator, a tube provided at its opposite ends with unions adapted for the inclusion of the radiator into a heating system, spacers and disks alternately positioned longitudinally of the tube between the unions with both the disks and spacers coaxial with and embracing the tube, said spacers having substantially radially extending resilient tongues bearing against adjacent disks under compression to maintain said disks tightly in position irrespective of changes of temperature of the parts of the radiator.

In testimony whereof I have signed the foregoing specification.

RAGNAR L. KJERNER.