Oct. 27, 1931. W. SHURTLEFF 1,829,241

PROCESS OF ASSEMBLING RADIATORS

Original Filed Dec. 29, 1926

Fig. 1.

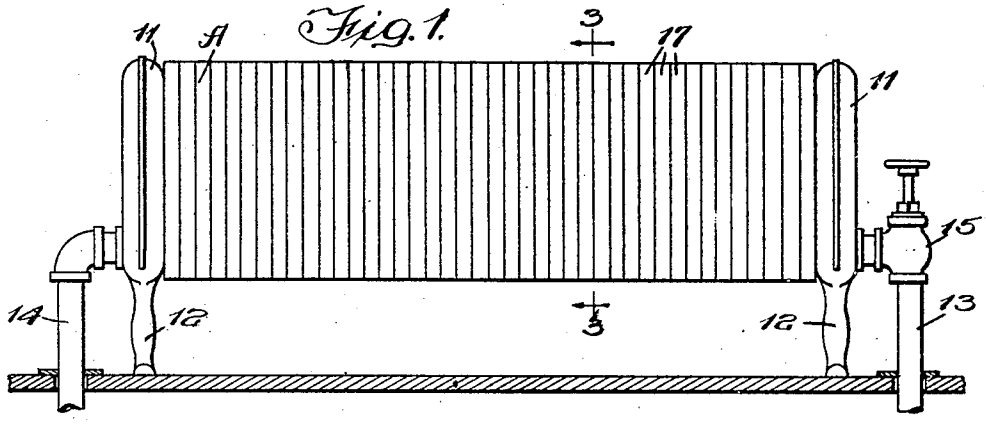


Fig. 2.

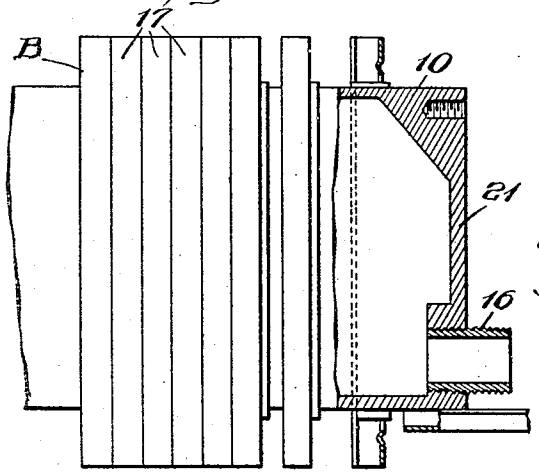


Fig. 3.

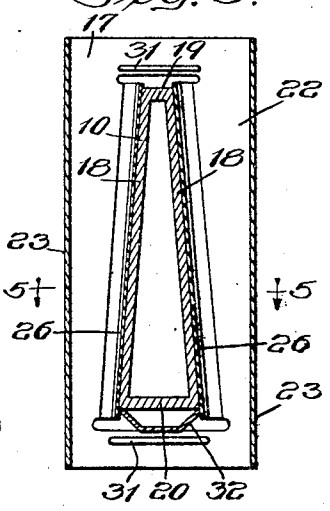


Fig. 4.

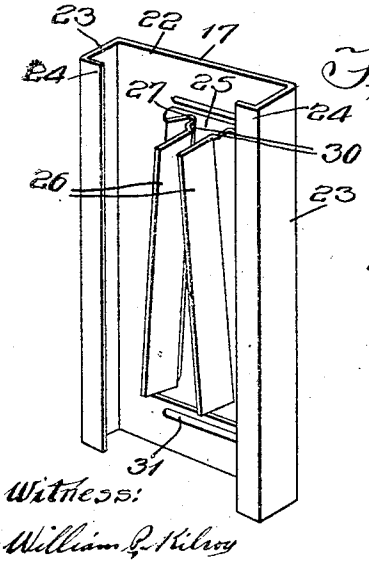
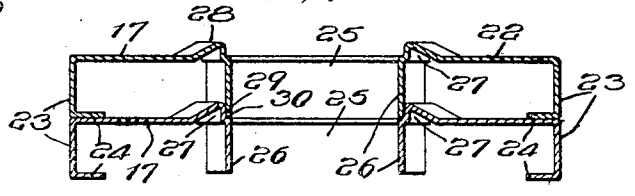


Fig. 5.



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Patented Oct. 27, 1931

1,829,241

UNITED STATES PATENT OFFICE

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PROCESS OF ASSEMBLING RADIATORS

Original application filed December 29, 1926, Serial No. 157,658, and in Great Britain March 1, 1927. Divided and this application filed February 1, 1930. Serial No. 425,099.

My invention relates to improvements in processes of assembling radiators for heating purposes. This application is a division of my co-pending application Serial Number 157,658, filed December 29, 1926, issued September 9, 1930, Patent No. 1,775,257.

The object of my invention is to provide a simple, efficient, and economical process of making and assembling radiators having a plurality of fins extending from a container or hollow core member, which process includes accurately forming a core member of predetermined exterior contour, forming a plurality of fin members to embrace the core with means for engaging the surface of the core, assembling the fins on the core in proper relative position, and applying such force to the fins in the proper direction to bring about an intimate heat conducting contact between the core and fins.

Other objects of my invention will appear hereinafter.

In the drawings forming a part of this specification:

Fig. 1 is a side elevational view of a radiator illustrating my improved process in connection with the forming and assembling of the parts thereof;

Fig. 2 is an enlarged detailed sectional view of one end of a radiator, partly in section, illustrating the manner in which the parts are assembled;

Fig. 3 is a transverse vertical sectional view on enlarged scale, corresponding substantially to the line 3—3 of Fig. 1;

Fig. 4 is a detailed perspective view of one of the fins or plates employed in connection with my improved radiator; and

Fig. 5 is a horizontal sectional view on an enlarged scale, corresponding substantially to the line 5—5 of Fig. 3, illustrating two adjacent fins or plates, the hollow container or core of the radiator being omitted for the sake of clearness.

My process may be carried into effect in connection with the making and assembling of radiator parts such as disclosed in the above mentioned patent, or it may be employed in making and assembling of the radiator parts which are shown in the accompanying drawings and which involve certain improvements over the process disclosed in said patent.

In the accompanying drawings, A designates a radiator made in accordance with my process, the radiator shown being of the type employed in the usual direct heating systems, that is, in systems where the radiator is placed directly in the room to be heated, and in Fig. 2 B designates a radiator of the type employed in connection with an indirect heating system, that is, where the radiator is disposed in a cabinet or housing into which air is drawn and then expelled from the housing into the room to be heated. In each of the two forms of radiator disclosed in Figs. 1 and 2, the radiator includes a central section or unit 10 in the form of a hollow container or core. In the structure shown in Fig. 1, the hollow vertical end sections 11—11 are fixed to the central core section which is substantially the same as the core section 10 shown in Fig. 2. The end sections 11 are each provided with integral feet or legs 12 for supporting the radiator on the floor. Communication between the interior of the hollow end sections 11 and the central core section 10 is established in any well known manner so that the heating medium may pass freely from one section to another. One of the sections 11 is provided with the usual inlet or supply pipe connection 13 and the other section 11 is provided with the return or outlet pipe 14, a control valve 15 being preferably located at any convenient place in the supply pipe and the return pipe 14 being preferably provided with the usual trap not shown. In case the radiator is not supported directly on the floor or is employed in connection with an indirect heating system hereinafter more fully referred to, the supply and return pipe connections may be made directly with the opposite ends of the core section 10 by means of nipples 16, as clearly illustrated in Fig. 2.

The hollow core section 10, shown in Fig. 2, and the corresponding central core section in Fig. 1, have a plurality of radiating elements or plate-like fins 17 mounted there-

on in a manner more fully hereinafter described.

The core section or container 10 which is preferably in the form of a casting, as most clearly shown in Figs. 2 and 3, has a pair of spaced side walls 18—18 which converge upwardly, a relatively short horizontally disposed connecting top wall 19, a relatively longer horizontally disposed connecting bottom wall 20 and a pair of vertical end walls 21. The hollow core 10 thus presents an outer contour of wedge shaped cross section. The hollow core section 10 serves as a container through which the heating fluid may circulate, the container being the primary heating or radiating unit of the radiator.

In order to produce radiators of relatively light weight per unit of heating capacity, the core is preferably made of light material and may be constructed in the form of a casting. It is found preferable to construct the core or hollow container of an aluminum silicon alloy. In forming the core, particular attention is given to obtaining as smooth an outer finish as is possible by the usual casting or machining operations.

The radiating members or fins 17 are preferably formed of relatively thin light sheet material and are made in plate-like sections. As most clearly shown in Figs. 3, 4, and 5, each fin 17 comprises a relatively large flat plate-like body portion 22 of substantially rectangular outline having vertical flanges 23—23 at the side edges thereof, the flanges 23 being disposed at right angles to the body portion 22 and having inturned outer edges 24—24 preferably parallel to the body portion 22. Each plate-like section is provided with a central opening 25 of substantially wedge shaped outline. The side edges of the opening 25 of each plate are defined by a pair of side flanges 26—26 formed integral with the body portion 22 of the fin. The flanges 26 are offset at their inner ends as indicated at 27 and the offset sections 27 are connected to the body portion 22 of the plate by outwardly offset sections 28. The offset sections 27 present inclined flat walls 29 which cooperate with the outer ends of the flanges 26 of the next adjacent fin in a manner hereinafter described. The offset sections 27 also provide shoulders 30 which act as abutment faces for the tips of the flanges of the adjacent section. The flanges 26 proper are of substantially the same length as the outer flanges 23 and the inner and outer flanges together function as means to accurately space the fins when assembled on the radiator core. Due to the offset provided at the inner end of each of the flanges 26, a certain amount of flexibility is imparted to the flange. The wedge shaped openings 25 of the fins 17 are slightly greater in height than the corresponding dimension of the core, as clearly shown in Fig. 3 for a purpose hereinafter set forth. The offset section 27 at the inner end of each flange 26 is so designed as to receive the tip of the flange 26 of the next adjacent fin between the wall 29 and the outer surface of the hollow core. Above and below the opening 25, the body portion of each fin may be provided with transverse ribs 31 stamped therein, as clearly shown in Fig. 3.

The fins 17 are preferably stamped from relatively thin sheet material of high conductivity, for example, the same are preferably made of aluminum in order to provide lightness, or the same may be made of pure copper when maximum heat conductivity is found desirable. As clearly shown in the drawings, the width of the fins is preferably several times that of the core or hollow container, thereby providing relatively large heat radiating surfaces, adding greatly to the economy of operation of the heating unit.

As clearly shown in Figs. 2 and 5, the plates or fins 17 are assembled onto the core by passing them, one after another, over the end of the core, with the flanges of all the plates extending in the same direction. When a number of fins have thus been loosely assembled on the core, sufficient pressure is applied to the group of fins at opposite ends thereof, to pack or assemble the fins together with their flanges in contact with each other. During this pressing operation, the tips of the flanges 26 will enter between the walls 29 of the offset sections 27 and the side walls 18 of the core. Due to the offset sections 27, the tips of the flanges 26 will be guided, during the grouping operation, into proper overlapping relation to the flanges of the adjacent fins, thus properly aligning the flanges of the fins preparatory to the operation of forcing the flanges into intimate contact with the core surfaces.

It is evident that the conductivity of heat from the central cast core is dependent upon the establishment of an intimate contact between the core and the fins, it being well known that metal offers very little resistance to the conduction of heat, and that it is the presence of air gaps which interrupt, and thereby materially reduce the conduction of heat from a primary heating element to a secondary element in contact therewith. With this explanation, the reason for the specific shape of core 10 and the openings 25 of the fins may now be pointed out. Assuming that the mere physical contact between the core and the flanges of the fins, when the fit must be loose enough to slide the fins over the core easily, would not produce that intimate contact necessary to obtain efficient heat conduction, it is conceived that by forming the core in wedge shape, thereby providing converging, inclined or beveled contact faces, the plates after being initially loosely applied to the core may be driven or forced downwardly in the direction of the planes of the fins, and

by reason of the wedging action that would result the contact surfaces of the core and flanges are brought into very close and intimate contact, the idea being, of course, to eliminate any air spaces or gaps, no matter how minute, between the surfaces. Any slight irregularity in the outer face contour of the core, due to unavoidable manufacturing conditions, will be taken care of by a slight yielding of the wedge faces 29 which are carried on the offset sections 28 which provide for slight flexing due to the curved portion of the offsets.

When the fins have been assembled together, the flanges 23 of each fin will bear on the next adjacent fin and the flanges 26 will have their outer extremities bearing on the shoulders 30 of said next adjacent fin, thereby accurately spacing the series of fins on the core.

It is evident that in order to facilitate the assembly or threading of the fins upon the core or hollow container, the same must fit the container rather loosely, so that they may be slid easily over the surfaces of the same. It is therefore necessary to provide the transverse wedging pressure in the direction of the planes of the fins, after the offset sections have telescopically received the tips of the adjacent flanges of the fins during this assembling or grouping of the fins on the core.

The transverse pressure in the planes of the fins necessary to force the flanges into intimate contact with the core surfaces may be obtained by forcing a wedge or key member 32 between the bottom wall of the openings 25 in the fins, and the bottom wall 20 of the core. Preferably, however, the transverse pressure is obtained by first driving on the upper edges of the fin members with a mallet or other suitable means until the intimate contact of said surfaces is accomplished, and then inserting the key or wedge to maintain this pressure in the completed structure, as described in the aforesaid patent.

The locking member 32 is preferably in the form of a sheet metal channel and when forced between the core and the lower walls of the openings 25 will act to pull the fins downwardly relatively to the core, thereby drawing the flanges 26 into wedging engagement with the side walls 18 of the core.

By providing the offset 27, the assembly of the fins with the core section is greatly facilitated inasmuch as the offset sections, by overlapping the flanges 26, operates to retain the end or tip of the cooperating flanges 26 and prevents the flanges from being kicked or sprung away from the core 10, when the transverse pressure is applied. In other words, the opposed converging walls 29 of each fin form means for telescopically receiving or overlapping the flanges 26 of the adjacent fin to press the flanges tightly against the walls of the core and cause the entire width of the flange to contact with the core surface.

While I have herein shown and described what I consider to be the preferred manner of carrying out my process of forming and assembling radiator parts, I contemplate all of the changes and modifications that come within the scope of the appended claims.

I claim:

1. The process of assembling radiator fins on radiator cores having wedging surfaces, which consists in forming said fins with openings and with flanges at the edge of said openings disposed at an angle to the plane of the fin, grouping said fins on the core with the core extending through the openings and with the flange of each fin in engagement with the flange of an adjacent fin, and applying pressure on the fins in the direction of the plane of fins to a degree sufficient to force the flanges into intimate contact with and in parallel relation to the wedging surfaces of the core.

2. The process of assembling radiator fins on radiator cores having wedging surfaces, which consists in forming said fins with openings and with flanges at the edges of said openings disposed at an angle to the plane of the fin, grouping said fins on the core with the core extending through the openings and with the flange of each fin overlapping a portion of the flange of an adjacent fin, and applying pressure on the fins in the direction of the plane of fins to a degree sufficient to force the flanges into intimate contact with and in parallel relation to the wedging surfaces of the core.

3. The process of assembling radiator fins on radiator cores having wedging surfaces, which consists in forming said fins with openings and with flanges at the edge of said openings disposed at an angle to the plane of the fin, grouping said fins on the core with the core extending through the openings and with the flange of each fin in engagement with the flange of an adjacent fin, applying pressure on the fins in the direction of the plane of fins to a degree sufficient to force the flanges into intimate contact with and in substantial parallel relation to the wedging surfaces of the core and maintaining said pressure by locking said fins against movement.

4. The herein described process which consists in forming a radiator core with converging surfaces, forming radiating fins with openings having converging edges and flanges on said edges at an angle to the plane of the fins, loosely assembling the fins on the core with their flanges arranged all in one direction and in contact with each other, and then forcing the flanges into intimate contact with said converging surfaces by applying pressure on the fins in the direction of the plane of the fins.

5. The herein described process which consists in forming a radiator core with surfaces longitudinally parallel and converging trans-

versely of the longitudinal axis of the core, forming radiating fins with openings having converging flanges adjacent the edges of the openings at an angle to the plane of the fins, assembling a plurality of fins on the core with the converging flanges parallel with the converging surfaces of the core, compressing the group of fins longitudinally of the core until the flanges of the fins are in contact with each other, and then relatively moving the fins and core toward each other in a direction transverse to the longitudinal axis of the core with sufficient pressure to force the converging surfaces and flanges into frictionally intimate contact.

6. The herein described process which consists in forming a radiator core with surfaces longitudinally parallel and converging transversely of the longitudinal axis of the core, forming radiating fins with openings having converging flanges adjacent the edges of the openings at an angle to the plane of the fins, assembling a plurality of fins on the core with the converging flanges parallel with the converging surfaces of the core, compressing the group of fins longitudinally of the core until the flanges of the fins are in contact with each other, then relatively moving the fins and core toward each other in a direction transverse to the longitudinal axis of the core with sufficient pressure to force the converging surfaces and flanges into frictionally intimate contact, and maintaining said intimate contact by locking the fins and core in against reverse relative movement.

7. In a process of assembling radiators consisting in providing a central core having wedging surfaces and a plurality of fins having wedging surfaces; threading the fins on the core; moving said fins in one direction to bring about wedging engagement of the wedge surfaces of said fins with each other; and moving said fins in a different direction relative to said core to effect wedging of said fins with respect to the wedging surfaces of said core.

In witness that I claim the foregoing, I have hereunto subscribed my name this 14th day of January, 1930.

WILFRED SHURTLEFF.