

Exhibit D – Invalidity Chart for JPH06272069 (A) titled “Corrosion Prevention of Al Alloy Radiator Using Sacrificed Anode” to Hanazaki Masayuki and Kobayashi Tatsuyuki (“Masayuki JP’2069”)

JPH06272069 (A) to Hanazaki Masayuki and Kobayashi Tatsuyuki (“Masayuki JP’2069”) was filed on March 22, 1993 and published on September 27, 1994. Masayuki JP’2069 is prior art to U.S. Reissue Patent No. RE47,494 (“the ’494 Patent”) at least under pre-AIA 35 U.S.C. § 102(b) and/or at least under AIA 35 U.S.C. § 102(a)(1).

As described in the following claim chart, asserted claims 25-27, 29, 31-37, 42, 43, 45-47 (collectively “the Asserted Claims”) of the ’494 Patent are invalid as anticipated or obvious over Masayuki JP’2069. To the extent that Masayuki JP’2069 is found not to anticipate one or more of the Asserted Claims of the ’494 Patent, those claims are also invalid as obvious in view of Masayuki JP’2069 alone and/or with other prior-art references disclosed in Daimler Trucks North America LLC’s (“DTNA” or “Defendant”) invalidity contentions, including in this Exhibit as set forth below.

The representative citations and quotations provided below should not be construed as limiting. Defendant intends to rely on Masayuki JP’2069 and any prior art that may be combined with Masayuki JP’2069 in their entirety, rather than only the identified excerpts thereof. Defendant further relies on the knowledge and understanding of a person of ordinary skill in the art as applied to Masayuki JP’2069 and any other prior art discussed herein.

For at least some of the asserted claims, Defendant’s invalidity contentions may be based in part on Electrolysis Prevention Solutions LLC’s (“EPS” or “Plaintiff”) apparent interpretation and application of the claim in its infringement contentions (to the extent Defendant can understand them). However, any such contentions do not represent agreement with Plaintiff’s positions as to the interpretation and application of any claim. Defendant reserves the right to dispute Plaintiff’s interpretation and application of the claims, and to make any argument based on indefiniteness, lack of written description support, enablement, or other issues concerning the validity and enforceability of the claims.

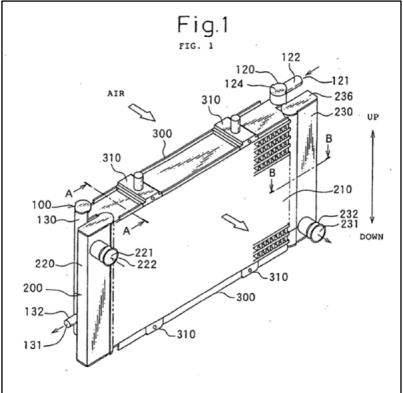
Defendant reserves the right to amend and/or supplement this claim chart as discovery proceeds, after claim construction, in response to any amendments Plaintiff is permitted to make to its infringement contentions, or on any other permissible ground. In addition, to the extent that Plaintiff contends that Masayuki JP’2069 does not disclose any claim limitations, Defendant reserves the right to contend that those limitations are disclosed by other prior art that may be combined with Masayuki JP’2069.

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25. A radiator for use in a motor vehicle, the radiator further comprising:	To the extent the preamble is limiting, Masayuki JP’2069 discloses or renders obvious a radiator for use in a motor vehicle, according at least to Plaintiff’s apparent reading for the claim terms, as set forth in detail below. <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed</i>

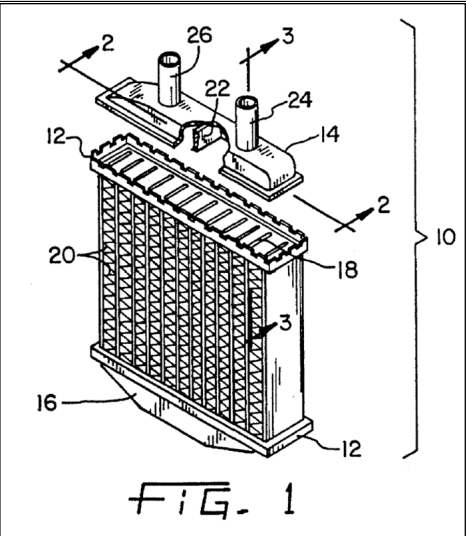
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	<i>anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>[Conventional Technology] Heat exchangers mounted on vehicles such as automobiles that require weight reduction are radiators made of Al or Al alloy instead of Cu or Cu alloy (hereinafter, these are collectively referred to as Al alloy radiators).</i> Masayuki JP'2069 at [0002] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20\text{ mV}$ between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3.</i>

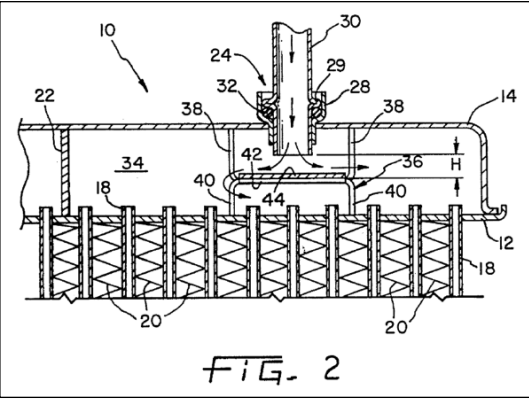
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	Masayuki JP'2069 at Claim 1 (machine translation).
a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine; and	Masayuki JP'2069 discloses or renders obvious a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine, according to at least to Plaintiff's apparent reading for the claim terms "hot liquid inlet" and "fluid communication." <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>[Conventional Technology] Heat exchangers mounted on vehicles such as automobiles that require weight reduction are radiators made of Al or Al alloy instead of Cu or Cu alloy (hereinafter, these are collectively referred to as Al alloy radiators).</i>

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	Masayuki JP'2069 at [0002] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20 \text{ mV}$ between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). To the extent that Masayuki JP'2069 does not expressly describe that the radiator includes “a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine” as claimed, a person of ordinary skill in the art would have understood the radiator of Masayuki JP'2069 to include such a hot liquid inlet. For example, the '494 Patent describes radiators “of any conventional type” that include such a hot liquid inlet such as a “‘crossflow’ type, meaning the tanks 33 are on the sides,” a “‘downflow’ type, meaning the tanks 33 are on top or bottom,” and a “‘double pass’ type, meaning that both connections (inlet and outlet) are on one side of the radiator.” See, e.g., the '494 Patent at 6:50-56. The '494 Patent further describes that “[a] typical radiator includes an aluminum core 31 and either plastic or all aluminum tanks 33” and that “[t]he specific inlet connection 16 varies by vehicle make, model and model year, but the inlet 17 is generally understood to refer to the vicinity of where hot water coming directly from the engine enters into the radiator 11.” See, e.g., the '494 Patent at 7:2-8. Thus, as described by the '494 Patent, conventional and typical radiators included such a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine. In addition, Osaki EP'311 and O'Connor '783 each expressly describes that a radiator includes “a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine,” as shown in the excerpts below. For example, Osaki EP'311 describes the radiator includes a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine: <i>[0027] In addition, a first radiator tank 220 for distributing coolant to the respective radiator tubes 211 is disposed at one of ends of the radiator core portion 210 where the side plates 300</i>

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	are not disposed, and a second radiator tank 230 for recovering the coolant from which heat has been removed after heat exchange. <i>[0028] An inlet 221 is provided at an upper end portion of the first radiator 220 for allowing coolant from the engine to flow therefrom into the first radiator 220, whereas an outlet 231 is provided at a lower end portion of the second radiator 230 for allowing coolant to flow out therefrom toward the engine.</i> Ozaki EP'311 at [0027]-[0028].  Ozaki EP'311 at Fig. , e.g., item 221. O'Connor '783 also describes the radiator includes a hot liquid inlet to the radiator from an engine of the motor vehicle, the hot liquid inlet providing fluid communication for fluid flow of hot liquid from the engine:

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	<i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i> O'Connor '783 at Abstract.

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	 FIG. 1 O'Connor '783 at Fig. 1, e.g., item 24.

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	 O'Connor '783 at Fig. 2, e.g., item 24.

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	FIG. 3 FIG. 4 O'Connor '783 at Figs. 3, 4. <i>Heat exchangers are increasingly being formed by a brazing operation in which the individual components of the heat exchanger are permanently joined together with a brazing alloy. Generally, brazed heat exchangers are lower in weight and are better able to radiate heat as compared to heat exchangers formed by known mechanical assembly techniques. An example of a brazed heat exchanger is the headered tube-and-center (HTC) type, which utilizes a number of parallel tubes which are brazed to and between a pair of headers, with finned centers being brazed between each adjacent pair of tubes. Conventionally, headered tube-and-center heat exchangers have been constructed by inserting the parallel tubes into apertures formed in each of an opposing pair of headers. A finned center is then positioned between each adjacent pair of parallel tubes. A tank is attached to each header so as to form reservoirs which are in fluidic communication with the tubes through the apertures. One or both tanks include one or more ports which serve as an inlet and outlet to the heat exchanger.</i>

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	O'Connor '783 at 1:31-49. <i>Erosion particularly occurs due to the coolant directly impinging the ends of the tubes of a headered tube-and-center heater core as it flows into the heater core through the inlet, causing significant erosion of the metal and premature deterioration of the heater core. Furthermore, the performance of the heater core is impaired because the flow distribution of the coolant among the tubes is not uniform, with the tubes closest the inlet handling the majority of coolant flow through the heater core.</i> O'Connor '783 at 1:66-2:7. <i>From the above, it is apparent that the prior art lacks a suitable solution to the problem of coolant tube erosion in an all-aluminum heat exchanger such as those used as an automotive heater core. Accordingly, it would be desirable to provide an all-aluminum monolithic heat exchanger which is characterized by significantly reduced internal erosion, particularly at the ends of the coolant tubes immediately downstream of the heat exchanger inlet, without reducing the flow capacity of the heat exchanger and without complicating the assembly and installation of the heat exchanger.</i> O'Connor '783 at 2:56-66. <i>According to the present invention, there is provided a method for reducing the internal erosion of a aluminum monolithic heat exchanger, such as a heater core used in automotive applications. Such heat exchangers are typically composed of a pair of tanks and headers that form a corresponding pair of chambers, a number of coolant tubes secured to each of the headers such that both ends of the tubes project into the chambers, and an inlet to one of the chambers. The inlet is disposed opposite to the tubes such that a coolant flowing into the heat exchanger through the inlet is directed toward the ends of the tubes. The method of this invention generally includes brazing a sacrificial erosion member to the tank equipped with the inlet, such that the erosion member is in the path of the coolant as it flows from the inlet into the chamber. As a result, the coolant impinges the erosion member as it enters the chamber, and is deflected from the ends of the tube so as to reduce erosion of the ends of the tubes.</i>

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	O'Connor '783 at 3:33-50. <i>As illustrated, an inlet/outlet tank 14 is assembled to one of the headers 12, while a return tank 16 is assembled to the other header 12. The inlet/outlet tank 14 is equipped with an inlet 24 and an outlet 26 through which a suitable coolant is delivered to and from the heater core 10. As is conventional, the tanks 14 and 16 define reservoirs, with the inlet/outlet tank 14 being divided with a pass partition 22 such that the coolant is forced to flow through one bank of tubes 18 to the return tank 16, after which the coolant flows through the remaining tubes 18, back to the inlet/outlet tank 14, and out through the outlet 26.</i> O'Connor '783 at 5:5-15. <i>Shown in greater detail in FIG. 2 is a partial cross-sectional view of the heater core 10 after brazing in accordance with a first embodiment of this invention. As illustrated, the heater core 10 includes a sacrificial erosion bridge 36 disposed within a reservoir 34 formed by the inlet/outlet tank 14 and its corresponding header 12. The erosion bridge 36 is positioned immediately downstream of the inlet 24 formed by an inlet cup 28 and inlet pipe 30. The inlet cup 28 and inlet pipe 30 can be formed and assembled in a generally conventional manner. FIG. 2 depicts the inlet cup 28 is being brazed to the tank 14, while the inlet pipe 30 is formed with a peripheral flange 29 that engages an O-ring 32 disposed in the inlet cup 28 in order to form a fluid-tight seal. As shown, the end of the inlet pipe 30 extends into the reservoir 34 and defines the inlet opening into the heater core 10. While the use of cups for both inlet and outlet pipes 24 and 26 is conventional and well known in the art, it is also conventional to braze the inlet and outlet pipes 24 and 26 directly to the tank 14 without the use of a cup 28. Therefore, this invention is not to be interpreted as being limited to heater cores which use the inlet cup 28 shown in FIG. 2.</i> O'Connor '783 at 5:55-6:8. <i>From the above, it can be seen that a particularly advantageous feature of this invention is that an all-aluminum monolithic heat exchanger can be readily assembled in accordance with this invention to include a sacrificial erosion member which is capable of substantially increasing the service life of the heat exchanger. In particular, erosion which would otherwise result from coolant impinging directly on the ends of the coolant tubes 18 is primarily sustained by an erosion bridge 36 brazed between the tank 14 and the header 12, or by a</i>

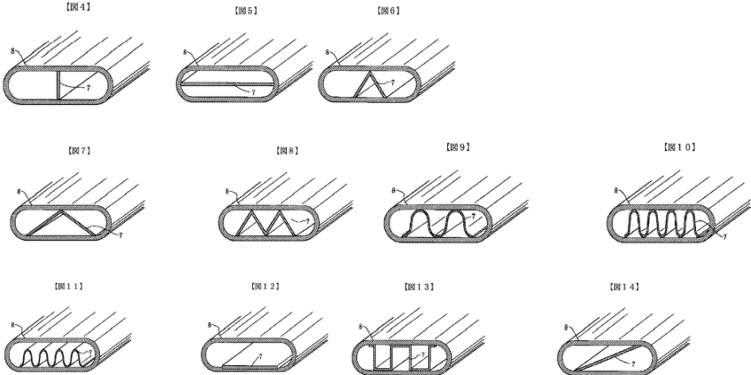
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	surface integrally formed with the inlet cup 54. Because erosion of the ends of the tubes 18 is significantly reduced, the tubes 18 can be formed from a tube stock material having a wall thickness of less than about 0.014 inch (about 0.35 millimeter), resulting in a significantly lower weight for the heat exchanger. Consequently, this invention is particularly suited for heater cores used in automotive applications which are particularly susceptible to erosion due to solid contaminants which are often suspended in the coolant. In addition, because a heater core formed in accordance with this invention can achieve the desired benefits with a standard-sized inlet pipe 30 that is aligned with and connected to the tank 14 in a conventional manner, the heater core is more readily able to be accommodated within the limited space typically available in an automobile. O'Connor '783 at 8:55-9:11. 1. A heat exchanger comprising: an aluminum alloy tank member having an inlet through which a coolant flows into the heat exchanger; a header attached to the tank member so as to form a chamber therewith, the header having a plurality of apertures formed therein; a plurality of tubes received in the apertures of the header such that an end of each of the tubes projects into the chamber formed by the tank member and the header; and an aluminum alloy sacrificial erosion member brazed to the tank member so as to be disposed within the chamber downstream of the inlet, such that the coolant entering the heat exchanger through the inlet impinges the sacrificial erosion member and is thereby deflected away from the ends of the tubes, so as to reduce erosion of the ends of the tubes, the sacrificial erosion member having a first support member and an oppositely disposed second support member, the first support member engaging the tank member and spacing the sacrificial erosion member from the tank member, the second support member spacing the sacrificial erosion member from the header, the first and second support members cooperating to immobilize the sacrificial erosion member within the chamber.

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	O'Connor '783 at Claim 1. <i>See also, e.g.,</i> O'Connor '783 at Fig. 5, Claim 9.
a sacrificial anode installed within 10 inches of the hot liquid inlet of the radiator.	Masayuki JP'2069 discloses or renders obvious a sacrificial anode installed within 10 inches of the hot liquid inlet of the radiator, according at least to Plaintiff's apparent reading for the claim terms "sacrificial anode" and "within 10 inches of the hot liquid inlet." <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 > = 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the</i>

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	<i>material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20$ mV is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube. Is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at [0006] (machine translation). <i>[Action] A metal material immersed in an aqueous solution exhibits a potential gradient peculiar to the metal, that is, a natural potential with respect to the reference electrode.</i> <i>The natural potential shows a value close to the pitting potential in an environment where pitting corrosion occurs. For example, when an Al alloy tube is immersed in an aqueous solution, it exhibits a cathode polarization curve and an anodic polarization curve showing a qualitative tendency in FIG. The cathode polarization curve sweeps the potential to the anode side starting from the natural potential, and reads the current value flowing at that time, and shifts to the base as the current density increases. The anodic polarization curve starts from the natural potential and sweeps the potential to the cathode side, and reads the current value flowing at that time, and shifts to you as the current density increases. The pitting potential E1 is where the anodic polarization curve rises sharply. When it becomes noble than the pitting potential E1, pitting corrosion occurs in the Al alloy tube.</i> Masayuki JP'2069 at [0007] (machine translation). <i>The sacrificial anode protects the inner surface of the Al alloy tube, which is the object to be protected, by corroding the surface. In the process of this cathodic protection, corrosion</i>

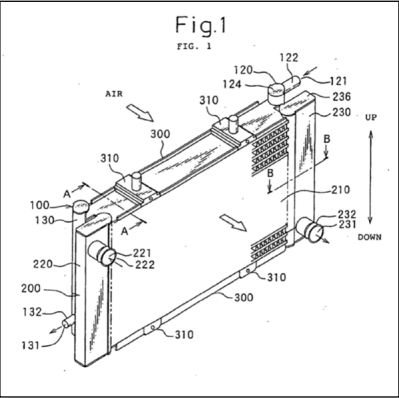
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	<i>products adhere to the surface of the sacrificial anode, shifting the natural potential of the sacrificial anode in your direction. As a result, the hybrid potential E2 may rise above the pitting potential E1.</i> Masayuki JP'2069 at [0009] (machine translation). <i>Further, it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction.</i> <i>Alternatively, a sacrificial anode divided into a plurality of parts in the longitudinal direction can be attached to the inner surface of the tube under the condition that the potential difference $\Delta E \geq 20$ mV is maintained between the farthest hybrid potential E2 and the pitting potential E1. .. When the sacrificial anode is attached to the inner surface of the tube over the entire length in the longitudinal direction, it becomes easy to maintain the area ratio $S2 / S1 = 0.1$ to 3 at any part of the pipeline. As the tube material, the present invention is not particularly bound, but 1000 series alloys, 2000 series alloys, 3000 series alloys, 6000 series alloys, 7000 series alloys and clads of these alloys are used as long as the brazing property is not impaired. Materials are used. It is also possible to use an alloy to which trace elements such as Si, Fe, Cu, Mn, Mg, Ti, and Zr are added.</i> Masayuki JP'2069 at [0014] (machine translation). <i>The material of the sacrificial anode does not constrain the present invention, and as long as the Al alloy tube is maintained at a noble potential with a potential difference ΔE of 20 mV or more within a range that does not impair the brazing property, Al, Zn, Mg or these Alloys can be used.</i> <i>However, since it is mounted in the narrow internal space of the tube, an Al alloy having good workability that can be mounted with a large bonding strength by brazing or the like is preferable. For example, when an Al alloy is used as a sacrificial anode, the anticorrosion effect improves as the Zn content increases. A given purpose is achieved if the sacrificial anode has a thickness that can withstand the pressure of the liquid flowing in the tube, specifically, a thickness of 20 μm or more. The sacrificial anode is attached to the inner surface of the tube in various ways. For example, the sacrificial anode may be attached by</i>

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	<i>mechanical fixing means such as caulking or screwing. However, brazing is preferable when workability is taken into consideration.</i> Masayuki JP'2069 at [0015] (machine translation). <i>Example 1: A clad material having a plate thickness of 250 μm in which an Al-1.2% Mn alloy was used as a core material and an Al-10% Si-based brazing material layer was laminated on both sides with a clad ratio of 10% was used for the radiator tube.</i> <i>As the sacrificial anode, an Al-1% Zn alloy plate having a plate thickness of 60 μm was used. As shown in FIGS. 4-12, the sacrificial anode 7 was brazed to the inner surface of the tube 8 in various forms. The brazed tube 8 was subjected to a corrosion resistance evaluation test. For the corrosion resistance evaluation test, a corrosive solution prepared by adjusting an aqueous solution containing 1000 ppm of Cl ions, 1000 ppm of SO₄ ions and 10 ppm of Cu ions to pH 3 with ferric chloride was used. After flowing the corrosive liquid maintained at 88 ° C. at a flow rate of 35 liters / minute for 8 hours, resting for 16 hours was set as one cycle, and circulation and suspension of the corrosive liquid were repeated for 180 cycles. After the test was completed, the depth of pitting corrosion generated on the inner surface of the tube was measured to determine the corrosion resistance. As is clear from Table 1 showing the survey results, pitting corrosion did not substantially occur in any of the cases.</i> Masayuki JP'2069 at [0017] (machine translation). <i>Example 2: A corrosion test was carried out under the same conditions as in Example 1 except that an Al-2% Zn alloy was used as the sacrificial anode.</i> Masayuki JP'2069 at [0019] (machine translation). <i>As described above, in the present invention, by attaching the sacrificial anode to the inner surface of the tube under the conditions of potential difference $\Delta E \geq 20$ mV and area ratio $S_2 / S_1 = 0.1$ to 3, the inner surface of the tube An Al alloy radiator that reliably suppresses pitting corrosion can be obtained.</i> Masayuki JP'2069 at [0025] (machine translation).

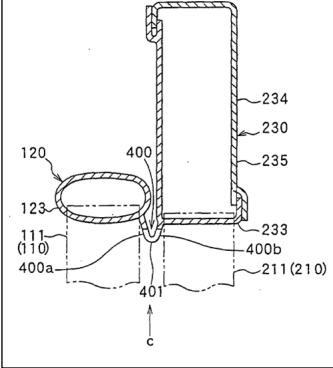
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	1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20$ mV between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3. Masayuki JP'2069 at Claim 1 (machine translation).  Masayuki JP'2069 at Figs. 4-14, e.g., items 7. To the extent that Masayuki JP'2069 does not expressly describe that the sacrificial anodes in the radiator tubes are "installed within 10 inches of the hot liquid inlet" as claimed, a person of ordinary skill in the art would have understood the tubes within the radiator of Masayuki JP'2069 would at least partially be within ten inches of the hot liquid inlet such that sacrificial anode(s) installed within each would be "installed within 10 inches of the hot liquid inlet."

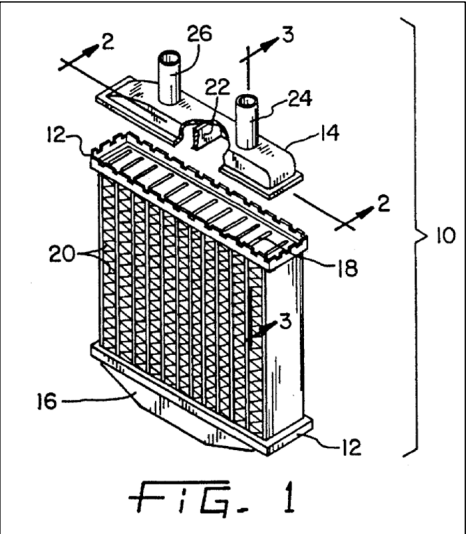
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	For example, Masayuki JP'2069 describes that “it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction” and that a sacrificial anode is “divided into a plurality of parts in the longitudinal direction.” <i>See, e.g.</i>, Masayuki JP'2069 at [0014] (machine translation). Further, as described above, the ‘494 Patent describes “conventional” type” radiators such as a “‘crossflow’ type” and a “‘downflow’ type.” <i>See, e.g.</i>, the ‘494 Patent at 6:50-56. The ‘494 Patent further states that “inlet 17 is generally understood to refer to the vicinity of where hot water coming directly from the engine enters into the radiator 11” and that “[b]oth downflow and crossflow radiators typically have a pedcock 25 for draining fluid from the radiator, an outlet 27, core fins and tubes 29, and may optionally have a transmission and engine oil cooler/heater connection 35 and temperature sensor 37.” <i>See, e.g.</i>, the ‘494 Patent at 7:4-16. Thus, as described by the ‘494 Patent, conventional and typical radiators included a hot liquid inlet as well as tubes, as described by Masayuki JP'2069. A POSITA would have understood that at least some of the sacrificial anodes of Masayuki JP'2069 located within the tubes at the ends nearest the inlet would have been “installed within 10 inches of the hot liquid inlet.” In addition, Osaki EP'311 and O'Connor '783 each expressly describes such a radiator where at least a portion of the tubes are “within 10 inches” of the hot liquid inlet, as shown in the excerpts below. To extent that Masayuki JP'2069 is found not to alone teach or suggest this claim element in view of the knowledge of a POSITA, combining the sacrificial anodes taught by Masayuki JP'2069 with the radiators taught by Osaki EP'311 or O'Connor '783 is merely the combination of familiar components according to known methods, and the resulting combination would yield predictable results. Each of these references provide interrelated teachings, for instance, regarding the use of sacrificial members to protect an aluminum or aluminum alloy heat exchanger from corrosion. As evidenced by the teachings of Masayuki JP'2069, Ozaki EP'311, and O'Connor '783, the use of sacrificial members to protect an aluminum heat exchanger was well-known in the art. A POSITA would recognize that, regardless of whether or not the sacrificial elements of Ozaki EP'311 or O'Connor '783 were also used, the combination of the sacrificial anodes of Masayuki JP'2069 into the tubes taught by Ozaki EP'311 or O'Connor '783 would provide corrosion protection within the tubes in addition to or in lieu of the sacrificial elements also taught by Ozaki EP'311 and O'Connor '783. The incorporation of the sacrificial anodes along the length of the tube as taught by Masayuki JP'2069 to the radiator and tubes taught by Ozaki EP'311 or O'Connor '783 would yield similar benefits as those described by each of the individual references. Such combinations are predictable variations of the techniques in the individual references. Thus, a POSITA would be able to make this modification to the Ozaki EP'311 or O'Connor '783 radiator without undue experimentation

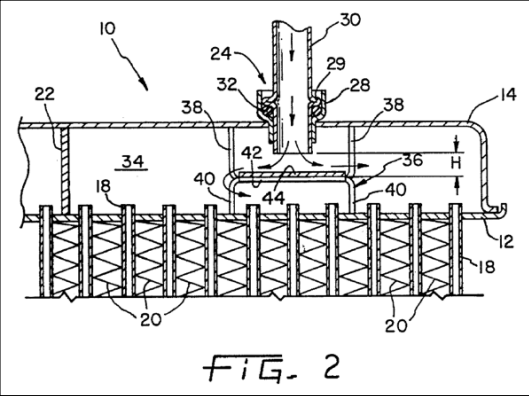
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	and with reasonable expectations of success. For example, Osaki EP'311 describes a radiator where at least a portion of the tubes are “within 10 inches” of the hot liquid inlet such that sacrificial anodes installed according to Masayuki JP'2069 would be installed within 10 inches of the hot liquid inlet: <i>Radiator caps (266) and radiator tubes (211) are heat brazed with an ingot Z of a sacrificial material being disposed in the interior of a radiator tank main body (234), whereby, as the ingot Z of the sacrificial material is heated while being surrounded by the radiator tank main body (234), the evaporated sacrificial material is allowed to adhere to internal surfaces of the radiator tank main body (234) relatively uniformly, the sacrificial material so adhering to the internal surfaces being then allowed to be radiated into aluminum constituting the radiator tank main body (234) to thereby form an alloy layer (a corrosion preventing layer) containing therein the sacrificial material heavily on the internal surface of the radiator tank main body (234).</i> Ozaki EP'311 at Abstract. <i>According to a further aspect of the invention, there are provided a plurality of tubes (211) through which fluid is allowed to flow and metallic header tanks (230) disposed at longitudinal ends of the plurality of tubes (211) for communication therewith. The header tank (230) comprises a tank main body (234) extending in a direction normal to the longitudinal direction of the tubes (211) and caps (236) for closing longitudinal ends of the tank main body (234), and the tank main body (234) and the caps (236) are joined to each other through heat brazing with a sacrificial material comprising a metal having a lower electric potential than that of the tank main body (234) being disposed in the interior of the tank main body (234).</i> Ozaki EP'311 at [0013]. <i>[0027] In addition, a first radiator tank 220 for distributing coolant to the respective radiator tubes 211 is disposed at one of ends of the radiator core portion 210 where the side plates 300 are not disposed, and a second radiator tank 230 for recovering the coolant from which heat has been removed after heat exchange.</i>

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	<i>[0028] An inlet 221 is provided at an upper end portion of the first radiator 220 for allowing coolant from the engine to flow therefrom into the first radiator 220, whereas an outlet 231 is provided at a lower end portion of the second radiator 230 for allowing coolant to flow out therefrom toward the engine.</i> Ozaki EP'311 at [0027]-[0028].  Ozaki EP'311 at Fig. 1, e.g., items 221, 220.

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	Ozaki EP'311 at Fig. 2, e.g., items 211. <i>Fig. 2 is a cross-sectional view taken along the line A-A of Fig. 1,</i> Ozaki EP'311 at [0019]. <i>[0041] Since the first radiator tank 220 and the second condenser tank 130 are similar in construction to the second radiator tank 230 and the first condenser tank 120, in the following description, unless otherwise stated, when used, the radiator tank 230 is meant to include both the radiators 220, 230, and similarly, when used, the condenser tank is meant to include both the condenser tanks 120, 130.</i> Ozaki EP'311 at [0041], describing that the description of the radiator tank 230 also applies to the first radiator tank 220 (at the inlet).

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	Fig. 3 FIG. 3  Ozaki EP'311 at Fig. 3, e.g., items 230, 211. <i>Fig. 3 is a cross-sectional view taken along the line B-B of Fig. 1,</i> Ozaki EP'311 at [0019]. O'Connor '783 also describes a radiator where at least a portion of the tubes are “within 10 inches” of the hot liquid inlet such that sacrificial anodes installed according to Masayuki JP'2069 would be installed within 10 inches of the hot liquid inlet: <i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the</i>

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	<i>tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i> O'Connor '783 at Abstract.  FIG. 1

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	O'Connor '783 at Fig. 1, e.g., items 18, 24.  FIG. 2 O'Connor '783 at Fig. 2, e.g., items 24, 18.

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	FIG. 3 FIG. 4 O'Connor '783 at Figs. 3, 4, e.g., items 18. <i>Heat exchangers are increasingly being formed by a brazing operation in which the individual components of the heat exchanger are permanently joined together with a brazing alloy. Generally, brazed heat exchangers are lower in weight and are better able to radiate heat as compared to heat exchangers formed by known mechanical assembly techniques. An example of a brazed heat exchanger is the headered tube-and-center (HTC) type, which utilizes a number of parallel tubes which are brazed to and between a pair of headers, with finned centers being brazed between each adjacent pair of tubes. Conventionally, headered tube-and-center heat exchangers have been constructed by inserting the parallel tubes into apertures formed in each of an opposing pair of headers. A finned center is then positioned between each adjacent pair of parallel tubes. A tank is attached to each header so as to form reservoirs which are in fluidic communication with the tubes through the apertures. One or both tanks include one or more ports which serve as an inlet and outlet to the heat exchanger.</i>

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	O'Connor '783 at 1:31-49. <i>Erosion particularly occurs due to the coolant directly impinging the ends of the tubes of a headered tube-and-center heater core as it flows into the heater core through the inlet, causing significant erosion of the metal and premature deterioration of the heater core. Furthermore, the performance of the heater core is impaired because the flow distribution of the coolant among the tubes is not uniform, with the tubes closest the inlet handling the majority of coolant flow through the heater core.</i> O'Connor '783 at 1:66-2:7. <i>From the above, it is apparent that the prior art lacks a suitable solution to the problem of coolant tube erosion in an all-aluminum heat exchanger such as those used as an automotive heater core. Accordingly, it would be desirable to provide an all-aluminum monolithic heat exchanger which is characterized by significantly reduced internal erosion, particularly at the ends of the coolant tubes immediately downstream of the heat exchanger inlet, without reducing the flow capacity of the heat exchanger and without complicating the assembly and installation of the heat exchanger.</i> O'Connor '783 at 2:56-66. <i>According to the present invention, there is provided a method for reducing the internal erosion of a aluminum monolithic heat exchanger, such as a heater core used in automotive applications. Such heat exchangers are typically composed of a pair of tanks and headers that form a corresponding pair of chambers, a number of coolant tubes secured to each of the headers such that both ends of the tubes project into the chambers, and an inlet to one of the chambers. The inlet is disposed opposite to the tubes such that a coolant flowing into the heat exchanger through the inlet is directed toward the ends of the tubes. The method of this invention generally includes brazing a sacrificial erosion member to the tank equipped with the inlet, such that the erosion member is in the path of the coolant as it flows from the inlet into the chamber. As a result, the coolant impinges the erosion member as it enters the chamber, and is deflected from the ends of the tube so as to reduce erosion of the ends of the tubes.</i>

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	O'Connor '783 at 3:33-50. <i>As illustrated, an inlet/outlet tank 14 is assembled to one of the headers 12, while a return tank 16 is assembled to the other header 12. The inlet/outlet tank 14 is equipped with an inlet 24 and an outlet 26 through which a suitable coolant is delivered to and from the heater core 10. As is conventional, the tanks 14 and 16 define reservoirs, with the inlet/outlet tank 14 being divided with a pass partition 22 such that the coolant is forced to flow through one bank of tubes 18 to the return tank 16, after which the coolant flows through the remaining tubes 18, back to the inlet/outlet tank 14, and out through the outlet 26.</i> O'Connor '783 at 5:5-15. <i>Shown in greater detail in FIG. 2 is a partial cross-sectional view of the heater core 10 after brazing in accordance with a first embodiment of this invention. As illustrated, the heater core 10 includes a sacrificial erosion bridge 36 disposed within a reservoir 34 formed by the inlet/outlet tank 14 and its corresponding header 12. The erosion bridge 36 is positioned immediately downstream of the inlet 24 formed by an inlet cup 28 and inlet pipe 30. The inlet cup 28 and inlet pipe 30 can be formed and assembled in a generally conventional manner. FIG. 2 depicts the inlet cup 28 is being brazed to the tank 14, while the inlet pipe 30 is formed with a peripheral flange 29 that engages an O-ring 32 disposed in the inlet cup 28 in order to form a fluid-tight seal. As shown, the end of the inlet pipe 30 extends into the reservoir 34 and defines the inlet opening into the heater core 10. While the use of cups for both inlet and outlet pipes 24 and 26 is conventional and well known in the art, it is also conventional to braze the inlet and outlet pipes 24 and 26 directly to the tank 14 without the use of a cup 28. Therefore, this invention is not to be interpreted as being limited to heater cores which use the inlet cup 28 shown in FIG. 2.</i> O'Connor '783 at 5:55-6:8. <i>From the above, it can be seen that a particularly advantageous feature of this invention is that an all-aluminum monolithic heat exchanger can be readily assembled in accordance with this invention to include a sacrificial erosion member which is capable of substantially increasing the service life of the heat exchanger. In particular, erosion which would otherwise result from coolant impinging directly on the ends of the coolant tubes 18 is primarily sustained by an erosion bridge 36 brazed between the tank 14 and the header 12, or by a</i>

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	surface integrally formed with the inlet cup 54. Because erosion of the ends of the tubes 18 is significantly reduced, the tubes 18 can be formed from a tube stock material having a wall thickness of less than about 0.014 inch (about 0.35 millimeter), resulting in a significantly lower weight for the heat exchanger. Consequently, this invention is particularly suited for heater cores used in automotive applications which are particularly susceptible to erosion due to solid contaminants which are often suspended in the coolant. In addition, because a heater core formed in accordance with this invention can achieve the desired benefits with a standard-sized inlet pipe 30 that is aligned with and connected to the tank 14 in a conventional manner, the heater core is more readily able to be accommodated within the limited space typically available in an automobile. O'Connor '783 at 8:55-9:11. 1. A heat exchanger comprising: an aluminum alloy tank member having an inlet through which a coolant flows into the heat exchanger; a header attached to the tank member so as to form a chamber therewith, the header having a plurality of apertures formed therein; a plurality of tubes received in the apertures of the header such that an end of each of the tubes projects into the chamber formed by the tank member and the header; and an aluminum alloy sacrificial erosion member brazed to the tank member so as to be disposed within the chamber downstream of the inlet, such that the coolant entering the heat exchanger through the inlet impinges the sacrificial erosion member and is thereby deflected away from the ends of the tubes, so as to reduce erosion of the ends of the tubes, the sacrificial erosion member having a first support member and an oppositely disposed second support member, the first support member engaging the tank member and spacing the sacrificial erosion member from the tank member, the second support member spacing the sacrificial erosion member from the header, the first and second support members cooperating to immobilize the sacrificial erosion member within the chamber.

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	O'Connor '783 at Claim 1.
26. The radiator of claim 25, wherein the sacrificial anode consists essentially of an active metal.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the sacrificial anode consists essentially of an active metal, according at least to Plaintiff's apparent reading for the claim term "active metal." <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20mV$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20 mV$ is maintained between the tube and the mixed potential</i>

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	<i>E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube. Is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at [0006] (machine translation). <i>Further, it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction.</i> <i>Alternatively, a sacrificial anode divided into a plurality of parts in the longitudinal direction can be attached to the inner surface of the tube under the condition that the potential difference $\Delta E \geq 20$ mV is maintained between the farthest hybrid potential E2 and the pitting potential E1. .. When the sacrificial anode is attached to the inner surface of the tube over the entire length in the longitudinal direction, it becomes easy to maintain the area ratio $S2 / S1 = 0.1$ to 3 at any part of the pipeline. As the tube material, the present invention is not particularly bound, but 1000 series alloys, 2000 series alloys, 3000 series alloys, 6000 series alloys, 7000 series alloys and clads of these alloys are used as long as the brazing property is not impaired. Materials are used. It is also possible to use an alloy to which trace elements such as Si, Fe, Cu, Mn, Mg, Ti, and Zr are added.</i> Masayuki JP'2069 at [0014] (machine translation). <i>The material of the sacrificial anode does not constrain the present invention, and as long as the Al alloy tube is maintained at a noble potential with a potential difference ΔE of 20 mV or more within a range that does not impair the brazing property, Al, Zn, Mg or these Alloys can be used.</i> <i>However, since it is mounted in the narrow internal space of the tube, an Al alloy having good workability that can be mounted with a large bonding strength by brazing or the like is preferable. For example, when an Al alloy is used as a sacrificial anode, the anticorrosion effect improves as the Zn content increases. A given purpose is achieved if the sacrificial anode has a thickness that can withstand the pressure of the liquid flowing in the tube, specifically, a thickness of 20 μm or more. The sacrificial anode is attached to the inner surface of the tube in various ways. For example, the sacrificial anode may be attached by mechanical fixing means such as caulking or screwing. However, brazing is preferable when</i>

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	workability is taken into consideration. Masayuki JP'2069 at [0015] (machine translation). <i>Example 1: A clad material having a plate thickness of 250 μm in which an Al-1.2% Mn alloy was used as a core material and an Al-10% Si-based brazing material layer was laminated on both sides with a clad ratio of 10% was used for the radiator tube.</i> <i>As the sacrificial anode, an Al-1% Zn alloy plate having a plate thickness of 60 μm was used. As shown in FIGS. 4-12, the sacrificial anode 7 was brazed to the inner surface of the tube 8 in various forms. The brazed tube 8 was subjected to a corrosion resistance evaluation test. For the corrosion resistance evaluation test, a corrosive solution prepared by adjusting an aqueous solution containing 1000 ppm of Cl ions, 1000 ppm of SO₄ ions and 10 ppm of Cu ions to pH 3 with ferric chloride was used. After flowing the corrosive liquid maintained at 88 ° C. at a flow rate of 35 liters / minute for 8 hours, resting for 16 hours was set as one cycle, and circulation and suspension of the corrosive liquid were repeated for 180 cycles. After the test was completed, the depth of pitting corrosion generated on the inner surface of the tube was measured to determine the corrosion resistance. As is clear from Table 1 showing the survey results, pitting corrosion did not substantially occur in any of the cases.</i> Masayuki JP'2069 at [0017] (machine translation). <i>Example 2: A corrosion test was carried out under the same conditions as in Example 1 except that an Al-2% Zn alloy was used as the sacrificial anode.</i> Masayuki JP'2069 at [0019] (machine translation). <i>3. The radiator made of an Al alloy according to claim 1, wherein the sacrificial anode is an Al alloy containing Si.</i> Masayuki JP'2069 at Claim 3 (machine translation).
27. The radiator of claim 26, wherein the active metal is at least one of aluminum,	Masayuki JP'2069 discloses or renders obvious the radiator of claim 26 wherein the active metal is at least one of aluminum, magnesium, and zinc, according to at least to Plaintiff's apparent reading for the claim

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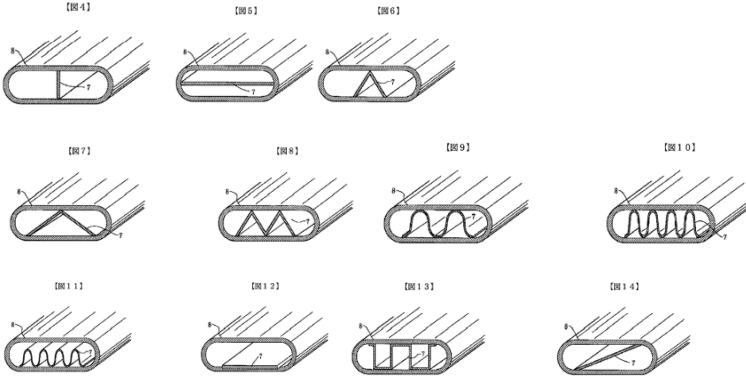
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29. The radiator of claim 25 wherein the sacrificial anode is installed onto a surface of the radiator.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the sacrificial anode is installed onto a surface of the radiator, according to at least to Plaintiff's apparent reading for the claim term "installed onto a surface." <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed</i>

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	<i>anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20\text{ mV}$ is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube. Is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at [0006] (machine translation). <i>For the Al alloy tube, a clad material in which an Al—Si brazing material is laminated on both sides can be used. The Al-Si brazing material on the inside of the tube facilitates brazing of the sacrificial anode, and the Al-Si brazing material on the outside of the tube facilitates brazing of the fin material. A Si-containing Al alloy may be used for the sacrificial anode in</i>

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	<i>consideration of brazing property. In this case, it is also possible to use a clad material having no brazing material on the surface on the wetted side of the tube. The sacrificial anode can be attached over the entire inner surface of the Al alloy tube by, for example, brazing.</i> Masayuki JP'2069 at [0006] (machine translation). <i>Further, it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction.</i> <i>Alternatively, a sacrificial anode divided into a plurality of parts in the longitudinal direction can be attached to the inner surface of the tube under the condition that the potential difference $\Delta E \geq 20$ mV is maintained between the farthest hybrid potential E2 and the pitting potential E1. .. When the sacrificial anode is attached to the inner surface of the tube over the entire length in the longitudinal direction, it becomes easy to maintain the area ratio $S2 / S1 = 0.1$ to 3 at any part of the pipeline. As the tube material, the present invention is not particularly bound, but 1000 series alloys, 2000 series alloys, 3000 series alloys, 6000 series alloys, 7000 series alloys and clads of these alloys are used as long as the brazing property is not impaired. Materials are used. It is also possible to use an alloy to which trace elements such as Si, Fe, Cu, Mn, Mg, Ti, and Zr are added.</i> Masayuki JP'2069 at [0014] (machine translation). <i>The material of the sacrificial anode does not constrain the present invention, and as long as the Al alloy tube is maintained at a noble potential with a potential difference ΔE of 20 mV or more within a range that does not impair the brazing property, Al, Zn, Mg or these Alloys can be used.</i> <i>However, since it is mounted in the narrow internal space of the tube, an Al alloy having good workability that can be mounted with a large bonding strength by brazing or the like is preferable. For example, when an Al alloy is used as a sacrificial anode, the anticorrosion effect improves as the Zn content increases. A given purpose is achieved if the sacrificial anode has a thickness that can withstand the pressure of the liquid flowing in the tube, specifically, a thickness of 20 μm or more. The sacrificial anode is attached to the inner surface of the tube in various ways. For example, the sacrificial anode may be attached by</i>

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	<i>mechanical fixing means such as caulking or screwing. However, brazing is preferable when workability is taken into consideration.</i> Masayuki JP'2069 at [0015] (machine translation). <i>Brazing of the sacrificial anode to the inner surface of the tube is easily performed by using the inner surface of the tube, that is, the wetted side, or at least the surface of the sacrificial anode attached to the tube containing Si.</i> <i>As such a material, for example, a clad material in which an Al—Si-based brazing material layer containing about 7 to 10% Si is bonded is used. When an Al—Si alloy layer is present at the bonding interface, the sacrificial anode is brazed to the tube by applying a non-corrosive flux, assembling the tube and the sacrificial anode into a predetermined shape, and heating the whole. Specifically, the Nocolock method is a suitable brazing method.</i> Masayuki JP'2069 at [0016] (machine translation). <i>Example 1: A clad material having a plate thickness of 250 μm in which an Al-1.2% Mn alloy was used as a core material and an Al-10% Si-based brazing material layer was laminated on both sides with a clad ratio of 10% was used for the radiator tube.</i> <i>As the sacrificial anode, an Al-1% Zn alloy plate having a plate thickness of 60 μm was used. As shown in FIGS. 4-12, the sacrificial anode 7 was brazed to the inner surface of the tube 8 in various forms. The brazed tube 8 was subjected to a corrosion resistance evaluation test. For the corrosion resistance evaluation test, a corrosive solution prepared by adjusting an aqueous solution containing 1000 ppm of Cl ions, 1000 ppm of SO₄ ions and 10 ppm of Cu ions to pH 3 with ferric chloride was used. After flowing the corrosive liquid maintained at 88 ° C. at a flow rate of 35 liters / minute for 8 hours, resting for 16 hours was set as one cycle, and circulation and suspension of the corrosive liquid were repeated for 180 cycles. After the test was completed, the depth of pitting corrosion generated on the inner surface of the tube was measured to determine the corrosion resistance. As is clear from Table 1 showing the survey results, pitting corrosion did not substantially occur in any of the cases.</i> Masayuki JP'2069 at [0017] (machine translation).

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	<i>As described above, in the present invention, by attaching the sacrificial anode to the inner surface of the tube under the conditions of potential difference $\Delta E \geq 20$ mV and area ratio $S2 / S1 = 0.1$ to 3, the inner surface of the tube An Al alloy radiator that reliably suppresses pitting corrosion can be obtained.</i> Masayuki JP'2069 at [0025] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1 - E2 \geq 20$ mV between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). <i>4. The Al alloy radiator according to claim 1, wherein the sacrificial anode is brazed to the inner surface of the Al alloy radiator.</i> Masayuki JP'2069 at Claim 4 (machine translation). <i>5. The Al alloy radiator according to claim 1, wherein one or more sacrificial anodes are attached over the entire inner surface of the Al alloy tube.</i> Masayuki JP'2069 at Claim 5 (machine translation). <i>8. The anticorrosion method according to claim 6, wherein a single or a plurality of sacrificial anodes are attached over the entire inner surface of the Al alloy tube.</i> Masayuki JP'2069 at Claim 8 (machine translation).

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	 Masayuki JP'2069 at Figs. 4-14.
31. The radiator of claim 25 wherein the radiator comprises aluminum.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the radiator comprises aluminum, according at least to Plaintiff's apparent reading for the claim terms. <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be</i>

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	<i>fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>[Conventional Technology] Heat exchangers mounted on vehicles such as automobiles that require weight reduction are radiators made of Al or Al alloy instead of Cu or Cu alloy (hereinafter, these are collectively referred to as Al alloy radiators).</i> Masayuki JP'2069 at [0002] (machine translation). <i>Aluminum materials have pitting corrosion in fresh water containing a large amount of anions such as Cl⁻ and SO₄²⁻. Therefore, in order to use an aluminum material as a structural material for a radiator, it is necessary to take measures to suppress pitting corrosion. As a means for improving corrosion resistance, it is the mainstream to use a clad material utilizing the sacrificial anode effect of Zn. For example, in order to impart corrosion resistance to the wetted portion inside the radiator, the wetted side has a layer structure of Al-Zn-based skin material / Al-Mn-based core material / Al-Si-based brazing material, which is an Al-Zn-based alloy. The radiator tube is made of clad material.</i> Masayuki JP'2069 at [0002] (machine translation). <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the</i>

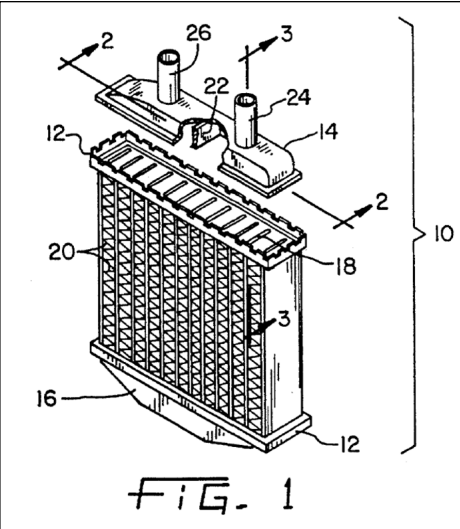
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	<i>purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20 \text{ mV}$ is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface of the tube. Is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at [0006] (machine translation). <i>For the Al alloy tube, a clad material in which an Al—Si brazing material is laminated on both sides can be used. The Al-Si brazing material on the inside of the tube facilitates brazing of the sacrificial anode, and the Al-Si brazing material on the outside of the tube facilitates brazing of the fin material. A Si-containing Al alloy may be used for the sacrificial anode in consideration of brazing property. In this case, it is also possible to use a clad material having no brazing material on the surface on the wetted side of the tube. The sacrificial anode can be attached over the entire inner surface of the Al alloy tube by, for example, brazing.</i> Masayuki JP'2069 at [0006] (machine translation). <i>As described above, in the present invention, by attaching the sacrificial anode to the inner surface of the tube under the conditions of potential difference $\Delta E \geq 20 \text{ mV}$ and area ratio $S2 / S1 = 0.1$ to 3, the inner surface of the tube An Al alloy radiator that reliably suppresses pitting corrosion can be obtained.</i> Masayuki JP'2069 at [0025] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20 \text{ mV}$ between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that</i>

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	<i>the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). 2. The Al alloy radiator according to claim 1, wherein the Al alloy tube is a one-layer or multi-layer clad material in which an Al—Si brazing material is laminated on both sides of an Al alloy core material. Masayuki JP'2069 at Claim 2 (machine translation).
32. The radiator of claim 25 wherein the radiator enables air-cooling of the hot liquid.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the radiator enables air-cooling of the hot liquid, according at least to Plaintiff's apparent reading for the claim terms. <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i>

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	Masayuki JP'2069 at [0001] (machine translation). <i>[Conventional Technology] Heat exchangers mounted on vehicles such as automobiles that require weight reduction are radiators made of Al or Al alloy instead of Cu or Cu alloy (hereinafter, these are collectively referred to as Al alloy radiators).</i> Masayuki JP'2069 at [0002] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20$ mV between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). To the extent that Masayuki JP'2069 does not expressly describe that the radiator enables “air-cooling of the hot liquid” as claimed, a person of ordinary skill in the art would have understood the radiator of Masayuki JP'2069 to enable air-cooling of the hot liquid. For example, the Oxford English Dictionary defines a “radiator” as “[i]n an internal combustion engine: a bank of thin tubes in which fluid (usually water) that has been circulated through the cylinder to cool it is itself cooled by the surrounding air.”¹ Further, the '494 Patent admits in the Background that “[a] typical radiator is made up of a storage tank” which “has . . . a core of cooling tubes, which is where the coolant liquid flows, and fins, connected to these cooling tubes, which transfers heat to the air that is pulled or pushed through the fins and round the tubes for heat transfer from the coolant to the air passing through.” See, e.g., the '494 Patent at 1:47-55. In addition, O'Connor '783, Hopkins AU'202, and Ozaki EP'311 each expressly describes that a radiator enables “air-cooling of the hot liquid,” as shown in the excerpts below. For example, O'Connor '783 describes the radiator enables air-cooling of the hot liquid:

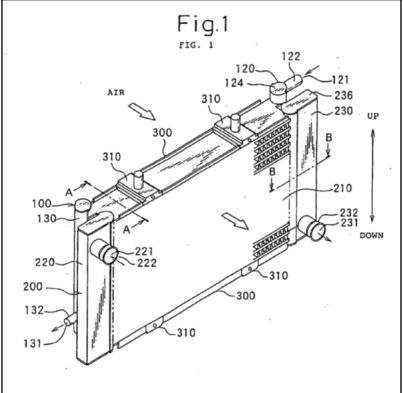
¹ See, e.g., Oxford English Dictionary definition #4 for “radiator” accessed at <https://www.oed.com/view/Entry/157248>.

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	<i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i> O'Connor '783 at Abstract.

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	 FIG. 1 O'Connor '783 at Fig. 1. <i>The present invention relates to heat exchangers, and particularly those of the type used as heater cores in automobile heating systems. More particularly, this invention relates to an improved monolithic aluminum heat exchanger whose service life is extended by the inclusion of a sacrificial member that significantly reduces the tendency for erosion within the heat exchanger, and more particularly reduces the amount of erosion which occurs at the ends of the heat exchanger's coolant tubes.</i> O'Connor '783 at 1:4-12.

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	<i>Heat exchangers are employed within the automotive industry as radiators which cool the engine coolant, condensers and evaporators for use in air conditioning systems, and heater cores. In order to efficiently maximize the amount of surface area available for transferring heat between the environment and a fluid flowing through the heat exchanger, the design of the heat exchanger is typically of a tube-and-fin type in which numerous tubes thermally communicate with high surface area fins. The fins enhance the ability of the heat exchanger to transfer heat from the fluid to the environment, or vice versa. For example, heat exchangers used in the automotive industry as heater cores serve to transfer heat from the engine coolant to the air entering the passenger compartment.</i> O'Connor '783 at 1:16-30. <i>Heat exchangers are increasingly being formed by a brazing operation in which the individual components of the heat exchanger are permanently joined together with a brazing alloy. Generally, brazed heat exchangers are lower in weight and are better able to radiate heat as compared to heat exchangers formed by known mechanical assembly techniques. An example of a brazed heat exchanger is the headered tube-and-center (HTC) type, which utilizes a number of parallel tubes which are brazed to and between a pair of headers, with finned centers being brazed between each adjacent pair of tubes. Conventionally, headered tube-and-center heat exchangers have been constructed by inserting the parallel tubes into apertures formed in each of an opposing pair of headers. A finned center is then positioned between each adjacent pair of parallel tubes. A tank is attached to each header so as to form reservoirs which are in fluidic communication with the tubes through the apertures. One or both tanks include one or more ports which serve as an inlet and outlet to the heat exchanger.</i> O'Connor '783 at 1:31-49. <i>Shown in FIG. 1 is a headered tube-and-center type heater core 10 which can be formed in accordance with this invention. The tube-and-center design is preferred for heat exchangers used in automotive applications, such as the heater core 10 shown, because the design maximizes the amount of surface area that is in contact with incoming air. The air is forced around the high surface area provided by finned centers 20 located between adjacent pairs of pipes or tubes 18, providing for a high heat exchange rate between the air and a suitable fluid which flows through the tubes 18. The tubes 18 are oriented to be geometrically in parallel with each other, as well as hydraulically in parallel, between a pair of headers 12.</i>

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	<i>The end of each tube 18 is received within a corresponding aperture formed in each of the headers 12.</i> O'Connor '783 at 4:57-5:4. <i>See also, e.g., O'Connor '783 at Figs. 2, 3, 4, 5.</i> In addition, Hopkins AU'202 describes the radiator enables air-cooling of the hot liquid: <i>Typical engine cooling systems include the following components:</i> <i>A radiator tank for cooling incoming heated water from the engine by way of heat conduction to the outside of the radiator tubes from where it is transferred to passing air;</i> <i>An electric cooling fan for providing the concentrated stream of air between the radiator tubes;</i> Hopkins AU'202 at pg. 2, ll. 11-16. Ozaki EP'311 also describes the radiator enables air-cooling of the hot liquid: <i>[0023] On the other hand, the radiator core 210 has a similar construction to that of the condenser core portion 110 and comprises radiator tubes 211 disposed in parallel with the condenser tubes 111 and fins 212.</i> <i>[0024] Both the core portions 110, 210 are arranged in series in a direction in which air flows with a gap being provided between the core portions for cutting off heat conduction there between.</i> Ozaki EP'311 at [0023]-[0024].

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	 Ozaki EP'311 at Fig. 1, e.g., arrows representing "AIR."
33. The radiator of claim 25, further comprising a second sacrificial anode.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 further comprising a second sacrificial anode, according at least to Plaintiff's apparent reading for the claim term "second sacrificial anode." <i>Further, it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction.</i> <i>Alternatively, a sacrificial anode divided into a plurality of parts in the longitudinal direction can be attached to the inner surface of the tube under the condition that the potential difference $\Delta E \geq 20$ mV is maintained between the farthest hybrid potential E2 and the pitting potential E1. .. When the sacrificial anode is attached to the inner surface of the tube over the entire length in the longitudinal direction, it becomes easy to maintain the area ratio $S2 / S1 = 0.1$ to 3 at any part of the pipeline. As the tube material, the present invention</i>

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	<i>is not particularly bound, but 1000 series alloys, 2000 series alloys, 3000 series alloys, 6000 series alloys, 7000 series alloys and clads of these alloys are used as long as the brazing property is not impaired. Materials are used. It is also possible to use an alloy to which trace elements such as Si, Fe, Cu, Mn, Mg, Ti, and Zr are added.</i> Masayuki JP'2069 at [0014] (machine translation). 5. The Al alloy radiator according to claim 1, wherein <i>one or more sacrificial anodes are attached over the entire inner surface of the Al alloy tube.</i> Masayuki JP'2069 at Claim 5 (machine translation). 8. The anticorrosion method according to claim 6, wherein a single or a plurality of sacrificial anodes are attached over the entire inner surface of the Al alloy tube. Masayuki JP'2069 at Claim 8 (machine translation).
34. The radiator of claim 25, wherein the hot liquid is coolant.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the hot liquid is coolant, according at least to Plaintiff's apparent reading for the claim term "coolant." <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation). To the extent that Masayuki JP'2069 does not expressly describe that the hot liquid is "coolant" as claimed, a person of ordinary skill in the art would have understood coolant to be the simple substitution of one known element (coolant) for another (the antifreeze of Masayuki JP'2069) to obtain a predictable

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	result. To the extent that coolant is determined to be distinct over antifreeze, coolant was a known choice of liquid in radiator systems as of the claimed priority date of the '494 Patent. For example, the '494 Patent admits in the Background that “[a]utomobile cooling systems circulate water and coolant liquids through an engine's water jacket, head, and water pump to facilitate heat transfer” and that “[a]fter absorbing the heat, the hot liquid is piped back to the radiator/storage tank which is a liquid to air heat exchanger.” <i>See, e.g.</i>, the '494 Patent at 1:43-47. In addition, Ozaki EP'311, O'Connor '783, and Hopkins AU'202 each expressly describes that the hot liquid is “coolant,” as shown in the excerpts below. For example, Ozaki EP'311 describes the hot liquid is coolant: <i>[0004] Cooling water or coolant is filled in the radiator tank, and therefore a corrosion preventing layer needs to be formed on internal surfaces of the radiator tank. To this end, in general, an aluminum sheet material having a corrosion preventing layer of zinc formed on the surface thereof is pressed into shapes and the members so pressed into shapes are then joined together through brazing, whereby a header tank is provided which has the corrosion preventing layer formed on the internal surfaces thereof.</i> Ozaki EP'311 at [0004]. In addition, O'Connor '783 describes the hot liquid is coolant: <i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i> O'Connor '783 at Abstract. <i>The present invention relates to heat exchangers, and particularly those of the type used as</i>

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	<i>heater cores in automobile heating systems. More particularly, this invention relates to an improved monolithic aluminum heat exchanger whose service life is extended by the inclusion of a sacrificial member that significantly reduces the tendency for erosion within the heat exchanger, and more particularly reduces the amount of erosion which occurs at the ends of the heat exchanger's coolant tubes.</i> O'Connor '783 at 1:4-12. <i>Heat exchangers are employed within the automotive industry as radiators which cool the engine coolant, condensers and evaporators for use in air conditioning systems, and heater cores. In order to efficiently maximize the amount of surface area available for transferring heat between the environment and a fluid flowing through the heat exchanger, the design of the heat exchanger is typically of a tube-and-fin type in which numerous tubes thermally communicate with high surface area fins. The fins enhance the ability of the heat exchanger to transfer heat from the fluid to the environment, or vice versa. For example, heat exchangers used in the automotive industry as heater cores serve to transfer heat from the engine coolant to the air entering the passenger compartment.</i> O'Connor '783 at 1:16-30. <i>According to the present invention, there is provided a method for reducing the internal erosion of a aluminum monolithic heat exchanger, such as a heater core used in automotive applications. Such heat exchangers are typically composed of a pair of tanks and headers that form a corresponding pair of chambers, a number of coolant tubes secured to each of the headers such that both ends of the tubes project into the chambers, and an inlet to one of the chambers. The inlet is disposed opposite to the tubes such that a coolant flowing into the heat exchanger through the inlet is directed toward the ends of the tubes. The method of this invention generally includes brazing a sacrificial erosion member to the tank equipped with the inlet, such that the erosion member is in the path of the coolant as it flows from the inlet into the chamber. As a result, the coolant impinges the erosion member as it enters the chamber, and is deflected from the ends of the tube so as to reduce erosion of the ends of the tubes.</i> O'Connor '783 at 3:33-50.

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	As illustrated, an inlet/outlet tank 14 is assembled to one of the headers 12, while a return tank 16 is assembled to the other header 12. The inlet/outlet tank 14 is equipped with an inlet 24 and an outlet 26 through which a suitable coolant is delivered to and from the heater core 10. As is conventional, the tanks 14 and 16 define reservoirs, with the inlet/outlet tank 14 being divided with a pass partition 22 such that the coolant is forced to flow through one bank of tubes 18 to the return tank 16, after which the coolant flows through the remaining tubes 18, back to the inlet/outlet tank 14, and out through the outlet 26. O'Connor '783 at 5:5-15. 1. A heat exchanger comprising: <i>an aluminum alloy tank member having an inlet through which a coolant flows into the heat exchanger;</i> <i>a header attached to the tank member so as to form a chamber therewith, the header having a plurality of apertures formed therein;</i> <i>a plurality of tubes received in the apertures of the header such that an end of each of the tubes projects into the chamber formed by the tank member and the header; and</i> <i>an aluminum alloy sacrificial erosion member brazed to the tank member so as to be disposed within the chamber downstream of the inlet, such that the coolant entering the heat exchanger through the inlet impinges the sacrificial erosion member and is thereby deflected away from the ends of the tubes, so as to reduce erosion of the ends of the tubes, the sacrificial erosion member having a first support member and an oppositely disposed second support member, the first support member engaging the tank member and spacing the sacrificial erosion member from the tank member, the second support member spacing the sacrificial erosion member from the header, the first and second support members cooperating to immobilize the sacrificial erosion member within the chamber.</i> O'Connor '783 at Claim 1. Hopkins AU'202 also describes the hot liquid is coolant:

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	Turning first to Figure 3, there is shown the typical components of an engine 28 including the engine block 22, cylinders 30, intake and exhaust valves 32, crankshaft 34 and sump 36. The cooling system components are also shown and include the thermostat 24, thermostat housing 20, radiator 26, upper radiator hose 38, lower radiator hose 40, water pump 42, cooling fan 44 and water jackets 46. In operation, coolant liquid is circulated by the water pump 40 through the water jackets 44 around the cylinders 30, through the upper radiator hose 38 into the radiator tank 26 where the heated liquid is then cooled through the radiator tubes by the cooling fan 42, and then back into the engine through the lower radiator hose 38. The sacrificial anode is located at the connection between the thermostat housing 20 and the engine block 22. Hopkins AU'202 at pg. 6, ll. 16-26.
35. The radiator of claim 25, wherein the hot liquid is water.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the hot liquid is water, according at least to Plaintiff's apparent reading for the claim term "water." Aluminum materials have pitting corrosion in fresh water containing a large amount of anions such as Cl⁻ and SO₄²⁻. Therefore, in order to use an aluminum material as a structural material for a radiator, it is necessary to take measures to suppress pitting corrosion. As a means for improving corrosion resistance, it is the mainstream to use a clad material utilizing the sacrificial anode effect of Zn. For example, in order to impart corrosion resistance to the wetted portion inside the radiator, the wetted side has a layer structure of Al-Zn-based skin material / Al-Mn-based core material / Al-Si-based brazing material, which is an Al-Zn-based alloy. The radiator tube is made of clad material. Masayuki JP'2069 at [0002] (machine translation). For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment

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	<i>fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation).
36. The radiator of claim 25, wherein the hot liquid is antifreeze.	Masayuki JP'2069 discloses or renders obvious the radiator of claim 25 wherein the hot liquid is antifreeze, according at least to Plaintiff's apparent reading for the claim term "antifreeze." <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation).
37. An electrolysis prevention device for preventing corrosion, the electrolysis prevention device comprising:	To the extent the preamble is limiting, Masayuki JP'2069 discloses or renders obvious an electrolysis prevention device for preventing corrosion, according at least to Plaintiff's apparent reading for the claim terms, as set forth in detail below. PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube. Masayuki JP'2069 at Purpose (machine translation). CONSTITUTION: <i>In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be</i>

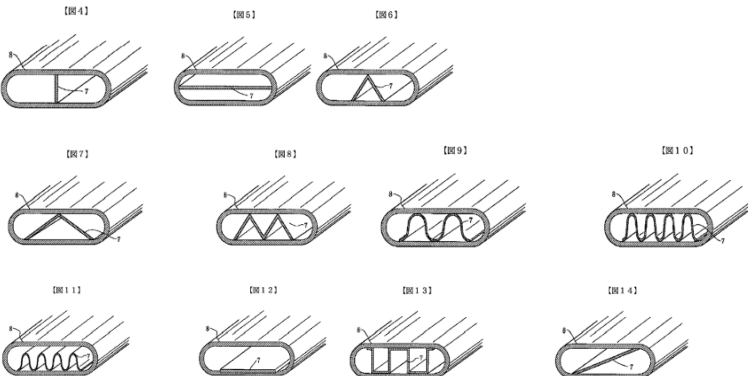
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	<i>fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). INDUSTRIAL APPLICABILITY <i>The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>[Action] A metal material immersed in an aqueous solution exhibits a potential gradient peculiar to the metal, that is, a natural potential with respect to the reference electrode.</i> <i>The natural potential shows a value close to the pitting potential in an environment where pitting corrosion occurs. For example, when an Al alloy tube is immersed in an aqueous solution, it exhibits a cathode polarization curve and an anodic polarization curve showing a qualitative tendency in FIG. The cathode polarization curve sweeps the potential to the anode side starting from the natural potential, and reads the current value flowing at that time, and shifts to the base as the current density increases. The anodic polarization curve starts from the natural potential and sweeps the potential to the cathode side, and reads the current value flowing at that time, and shifts to you as the current density increases. The pitting potential E1 is where the anodic polarization curve rises sharply. When it becomes noble than the pitting potential E1, pitting corrosion occurs in the Al alloy tube.</i> Masayuki JP'2069 at [0007] (machine translation). The sacrificial anode protects the inner surface of the Al alloy tube, which is the object to be protected, by corroding the surface. In the process of this cathodic protection, corrosion products adhere to the surface of the sacrificial anode, shifting the natural potential of the sacrificial anode in your direction. As a result, the hybrid potential E2 may rise above the pitting potential E1. Masayuki JP'2069 at [0009] (machine translation).

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	<i>Further, it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction.</i> Masayuki JP'2069 at [0014] (machine translation).
a sacrificial anode made of an active metal; and	Masayuki JP'2069 discloses or renders obvious a sacrificial anode made of an active metal, according at least to Plaintiff's apparent reading for the claim terms "sacrificial anode" and "active metal." <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy</i>

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	<i>fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20 \text{ mV}$ is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface of the tube. Is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at [0006] (machine translation). <i>[Action] A metal material immersed in an aqueous solution exhibits a potential gradient peculiar to the metal, that is, a natural potential with respect to the reference electrode.</i> <i>The natural potential shows a value close to the pitting potential in an environment where pitting corrosion occurs. For example, when an Al alloy tube is immersed in an aqueous solution, it exhibits a cathode polarization curve and an anodic polarization curve showing a qualitative tendency in FIG. The cathode polarization curve sweeps the potential to the anode side starting from the natural potential, and reads the current value flowing at that time, and shifts to the base as the current density increases. The anodic polarization curve starts from the natural potential and sweeps the potential to the cathode side, and reads the current value flowing at that time, and shifts to you as the current density increases. The pitting potential E1 is where the anodic polarization curve rises sharply. When it becomes noble than the pitting potential E1, pitting corrosion occurs in the Al alloy tube.</i> Masayuki JP'2069 at [0007] (machine translation). <i>The sacrificial anode protects the inner surface of the Al alloy tube, which is the object to be</i>

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	<i>protected</i>, by corroding the surface. In the process of this cathodic protection, corrosion products adhere to the surface of the sacrificial anode, shifting the natural potential of the sacrificial anode in your direction. As a result, the hybrid potential E2 may rise above the pitting potential E1. Masayuki JP'2069 at [0009] (machine translation). <i>Further, it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction.</i> <i>Alternatively, a sacrificial anode divided into a plurality of parts in the longitudinal direction can be attached to the inner surface of the tube under the condition that the potential difference $\Delta E \geq 20$ mV is maintained between the farthest hybrid potential E2 and the pitting potential E1. .. When the sacrificial anode is attached to the inner surface of the tube over the entire length in the longitudinal direction, it becomes easy to maintain the area ratio $S2 / S1 = 0.1$ to 3 at any part of the pipeline. As the tube material, the present invention is not particularly bound, but 1000 series alloys, 2000 series alloys, 3000 series alloys, 6000 series alloys, 7000 series alloys and clads of these alloys are used as long as the brazing property is not impaired. Materials are used. It is also possible to use an alloy to which trace elements such as Si, Fe, Cu, Mn, Mg, Ti, and Zr are added.</i> Masayuki JP'2069 at [0014] (machine translation). <i>The material of the sacrificial anode does not constrain the present invention, and as long as the Al alloy tube is maintained at a noble potential with a potential difference ΔE of 20 mV or more within a range that does not impair the brazing property, Al, Zn, Mg or these Alloys can be used.</i> <i>However, since it is mounted in the narrow internal space of the tube, an Al alloy having good workability that can be mounted with a large bonding strength by brazing or the like is preferable. For example, when an Al alloy is used as a sacrificial anode, the anticorrosion effect improves as the Zn content increases. A given purpose is achieved if the sacrificial anode has a thickness that can withstand the pressure of the liquid flowing in the tube, specifically, a thickness of 20 μm or more. The sacrificial anode is attached to the inner</i>

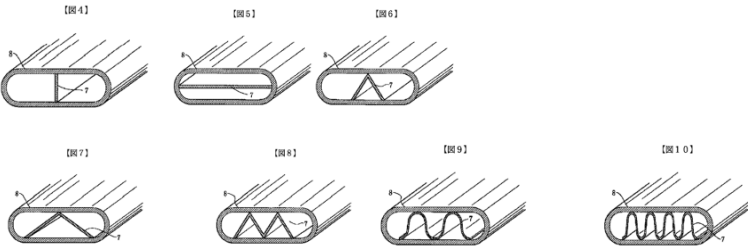
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	<i>surface of the tube in various ways. For example, the sacrificial anode may be attached by mechanical fixing means such as caulking or screwing. However, brazing is preferable when workability is taken into consideration.</i> Masayuki JP'2069 at [0015] (machine translation). <i>Example 1: A clad material having a plate thickness of 250 μm in which an Al-1.2% Mn alloy was used as a core material and an Al-10% Si-based brazing material layer was laminated on both sides with a clad ratio of 10% was used for the radiator tube.</i> <i>As the sacrificial anode, an Al-1% Zn alloy plate having a plate thickness of 60 μm was used. As shown in FIGS. 4-12, the sacrificial anode 7 was brazed to the inner surface of the tube 8 in various forms. The brazed tube 8 was subjected to a corrosion resistance evaluation test. For the corrosion resistance evaluation test, a corrosive solution prepared by adjusting an aqueous solution containing 1000 ppm of Cl ions, 1000 ppm of SO₄ ions and 10 ppm of Cu ions to pH 3 with ferric chloride was used. After flowing the corrosive liquid maintained at 88 ° C. at a flow rate of 35 liters / minute for 8 hours, resting for 16 hours was set as one cycle, and circulation and suspension of the corrosive liquid were repeated for 180 cycles. After the test was completed, the depth of pitting corrosion generated on the inner surface of the tube was measured to determine the corrosion resistance. As is clear from Table 1 showing the survey results, pitting corrosion did not substantially occur in any of the cases.</i> Masayuki JP'2069 at [0017] (machine translation). <i>Example 2: A corrosion test was carried out under the same conditions as in Example 1 except that an Al-2% Zn alloy was used as the sacrificial anode.</i> Masayuki JP'2069 at [0019] (machine translation). <i>As described above, in the present invention, by attaching the sacrificial anode to the inner surface of the tube under the conditions of potential difference $\Delta E \geq 20$ mV and area ratio S₂ / S₁ = 0.1 to 3, the inner surface of the tube An Al alloy radiator that reliably suppresses pitting corrosion can be obtained.</i>

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	Masayuki JP'2069 at [0025] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20 \text{ mV}$ between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). <i>3. The radiator made of an Al alloy according to claim 1, wherein the sacrificial anode is an Al alloy containing Si.</i> Masayuki JP'2069 at Claim 3 (machine translation). 

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	Masayuki JP'2069 at Figs. 4-14, e.g., items 7.
an anode holder supporting the sacrificial anode, the anode holder adapted for installation in an engine radiator within 10 inches of a hot liquid inlet to the engine radiator	Masayuki JP'2069 discloses or renders obvious an anode holder supporting the sacrificial anode, the anode holder adapted for installation in an engine radiator within 10 inches of a hot liquid inlet to the engine radiator, according at least to Plaintiff's apparent reading for the claim terms "anode holder," "within 10 inches" and "hot liquid inlet." <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20\text{ mV}$ is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface</i>

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	surface of the tube. Is selected in the range of 1: 0.1 to 3. Masayuki JP'2069 at [0006] (machine translation). <i>For the Al alloy tube, a clad material in which an Al—Si brazing material is laminated on both sides can be used. The Al-Si brazing material on the inside of the tube facilitates brazing of the sacrificial anode, and the Al-Si brazing material on the outside of the tube facilitates brazing of the fin material. A Si-containing Al alloy may be used for the sacrificial anode in consideration of brazing property. In this case, it is also possible to use a clad material having no brazing material on the surface on the wetted side of the tube. The sacrificial anode can be attached over the entire inner surface of the Al alloy tube by, for example, brazing.</i> Masayuki JP'2069 at [0006] (machine translation). <i>The material of the sacrificial anode does not constrain the present invention, and as long as the Al alloy tube is maintained at a noble potential with a potential difference ΔE of 20 mV or more within a range that does not impair the brazing property, Al, Zn, Mg or these Alloys can be used.</i> <i>However, since it is mounted in the narrow internal space of the tube, an Al alloy having good workability that can be mounted with a large bonding strength by brazing or the like is preferable. For example, when an Al alloy is used as a sacrificial anode, the anticorrosion effect improves as the Zn content increases. A given purpose is achieved if the sacrificial anode has a thickness that can withstand the pressure of the liquid flowing in the tube, specifically, a thickness of 20 μm or more. The sacrificial anode is attached to the inner surface of the tube in various ways. For example, the sacrificial anode may be attached by mechanical fixing means such as caulking or screwing. However, brazing is preferable when workability is taken into consideration.</i> Masayuki JP'2069 at [0015] (machine translation). <i>Brazing of the sacrificial anode to the inner surface of the tube is easily performed by using the inner surface of the tube, that is, the wetted side, or at least the surface of the sacrificial anode attached to the tube containing Si.</i>

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	<i>As such a material, for example, a clad material in which an Al—Si-based brazing material layer containing about 7 to 10% Si is bonded is used. When an Al—Si alloy layer is present at the bonding interface, the sacrificial anode is brazed to the tube by applying a non-corrosive flux, assembling the tube and the sacrificial anode into a predetermined shape, and heating the whole. Specifically, the Nocolock method is a suitable brazing method.</i> Masayuki JP'2069 at [0016] (machine translation). <i>Example 1: A clad material having a plate thickness of 250 μm in which an Al-1.2% Mn alloy was used as a core material and an Al-10% Si-based brazing material layer was laminated on both sides with a clad ratio of 10% was used for the radiator tube.</i> <i>As the sacrificial anode, an Al-1% Zn alloy plate having a plate thickness of 60 μm was used. As shown in FIGS. 4-12, the sacrificial anode 7 was brazed to the inner surface of the tube 8 in various forms. The brazed tube 8 was subjected to a corrosion resistance evaluation test. For the corrosion resistance evaluation test, a corrosive solution prepared by adjusting an aqueous solution containing 1000 ppm of Cl ions, 1000 ppm of SO₄ ions and 10 ppm of Cu ions to pH 3 with ferric chloride was used. After flowing the corrosive liquid maintained at 88 ° C. at a flow rate of 35 liters / minute for 8 hours, resting for 16 hours was set as one cycle, and circulation and suspension of the corrosive liquid were repeated for 180 cycles. After the test was completed, the depth of pitting corrosion generated on the inner surface of the tube was measured to determine the corrosion resistance. As is clear from Table 1 showing the survey results, pitting corrosion did not substantially occur in any of the cases.</i> Masayuki JP'2069 at [0017] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20 \text{ mV}$ between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation).

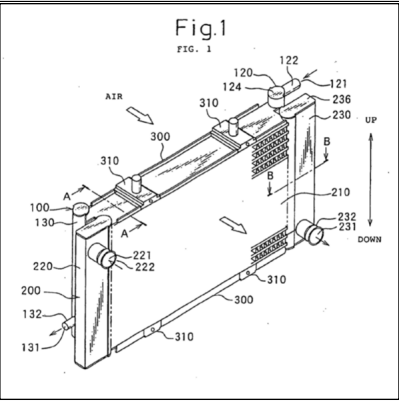
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	2. The Al alloy radiator according to claim 1, wherein the Al alloy tube is a one-layer or multi-layer clad material in which an Al—Si brazing material is laminated on both sides of an Al alloy core material. Masayuki JP'2069 at Claim 2 (machine translation). 4. The Al alloy radiator according to claim 1, wherein the sacrificial anode is brazed to the inner surface of the Al alloy radiator. Masayuki JP'2069 at Claim 4 (machine translation). 5. The Al alloy radiator according to claim 1, wherein one or more sacrificial anodes are attached over the entire inner surface of the Al alloy tube. Masayuki JP'2069 at Claim 5 (machine translation). 8. The anticorrosion method according to claim 6, wherein a single or a plurality of sacrificial anodes are attached over the entire inner surface of the Al alloy tube. Masayuki JP'2069 at Claim 8 (machine translation). 

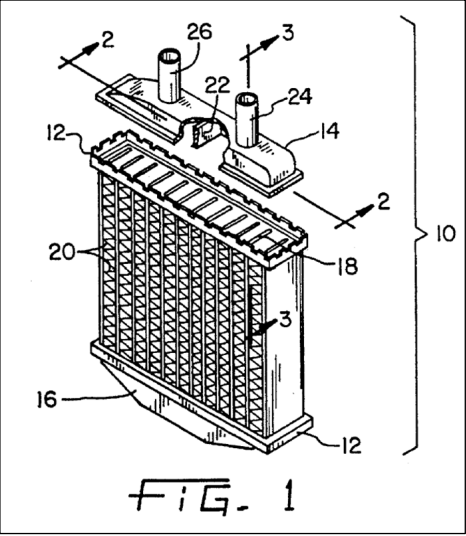
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	Masayuki JP'2069 at Figs. 4-14, e.g., items 8. To the extent it is determined that the “anode holder” supporting the sacrificial anode may include the radiator itself or portions or components thereof, Masayuki JP'2069 teaches this. In addition, Masayuki JP'2069 acknowledges that “the sacrificial anode may be attached by mechanical fixing means such as caulking or screwing,” which would include an “anode holder” as taught, for example, by MacKenna '149. MacKenna '149 describes an anode holder supporting a sacrificial anode: <i>Metal corrosion which occurs under conditions of use is mitigated and controlled by a sacrificial anode device which can be easily attached to, and detached from the corrosion-prone object. In ambient applications, the anode and cathode components of the device may be distinct metallic elements which may be alloys, or layers of alloys, and which are configured so as to optimize the interface surface area between the anode and cathode, while being sufficiently compact to be placed essentially in any corrosion-prone location. In extremely wet applications, such as underwater, or in water circulating or storage systems, the anode may be an effectively configured block of metal, and the cathode will be the water constituent of the environment in question. The optimized anode/cathode interface area provides increased operating life for the device, reduces material waste, and strengthens the structure of the device.</i> MacKenna '149 at Abstract.

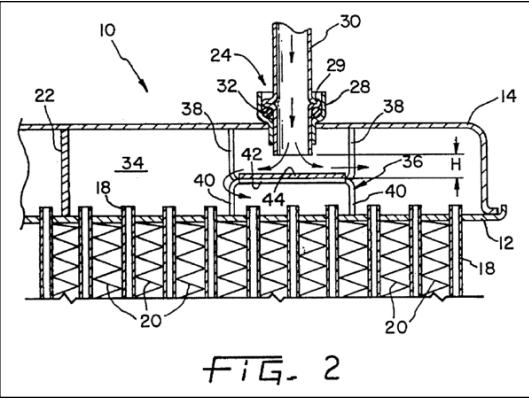
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	MacKenna '149 at Figs, 7, 8, e.g., items 64, 52. <i>FIG. 7 shows an embodiment of a sacrificial anode which is designed for use in a watery environment, and which is denoted generally by the numeral 46. The device 46 consists of a block of anodic metal 48 which has a first surface 50 that is adapted to be secured to the structure being protected. Bolts 52 may be provided to facilitate securement of the block 48 to the structure being protected. The block 48 has an opposite undulating surface 54 provided with alternating ridges 56 and valleys 58 that serve to optimize the area of the surface 54. Phantom lines 60 illustrate successive sacrificial corrosion generations which will occur on the surface 54 of the block 48. It will be noted that as the block 48 corrodes, the area of the corroding surface 54 will continue to be optimized relative to the size of the block 48.</i> MacKenna '149 at 5:27-40. <i>FIG. 8 illustrates a second embodiment of a sacrificial anode which is also designed for use in</i>

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	a watery environment, and which is denoted generally by the numeral 62. The anode 62 takes the general shape of a cylinder and has one end thereof which is provided with a threaded boss 64 that facilitates securement of the anode 62 to the structure being protected. The anode 62 has a plurality of transaxial through passages 66 formed therein which passages 66 serve to optimize the surface area of the anode 62 that will be subjected to sacrificial corrosion. It will be noted that the diameter of the passages 66 increases as the distance from the passages 66 to the threaded end of the anode 62 increases. Thus the diameter of the passages 66 most distal of the threads 64 will be larger than the diameter of the passages 66 most proximal to the threads 64. In this way, the degree of sacrificial corrosion of the anode 62 will increase distally of the threaded end of the anode. The anode 62 will thus gradually shrink back toward the threads 64 as it corrodes. Phantom lines 68 illustrate successive generations of sacrificial corrosion of the anode 62 around the passages 66 and along the sides of the anode. Both of the anodes 48 and 62 are formed from electron donor metals such as zinc, aluminum, magnesium or the like. MacKenna '149 at 5:41-63. <i>The ability to easily attach and detach the sacrificial device to and from the structure being protected makes the device simple to use and readily replaceable when necessary. The portion of the device which actually contacts the structure being protected is distal of the corroding surfaces on the device, so that the device will not corrosively adhere to the structure being protected.</i> MacKenna '149 at 6:4-10. To the extent that Masayuki JP'2069 does not expressly describe that the radiator includes "a hot liquid inlet to the engine radiator," as claimed, a person of ordinary skill in the art would have understood the radiator of Masayuki JP'2069 to include such a hot liquid inlet. For example, the '494 Patent describes radiators "of any conventional type" that include such a hot liquid inlet such as a "'crossflow' type, meaning the tanks 33 are on the sides," a "'downflow' type, meaning the tanks 33 are on top or bottom," and a "'double pass' type, meaning that both connections (inlet and outlet) are on one side of the radiator." See, e.g., the '494 Patent at 6:50-56. The '494 Patent further describes that "[a] typical radiator includes an aluminum core 31 and either plastic or all aluminum tanks 33" and that "[t]he specific inlet connection 16 varies by vehicle make, model and model year, but the inlet 17 is generally understood to refer to the vicinity of where hot water coming directly from the engine enters into the radiator 11."

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	See, e.g., the '494 Patent at 7:2-8. Thus, as described by the '494 Patent, conventional and typical radiators included such a hot liquid inlet to the radiator. In addition, Osaki EP'311 and O'Connor '783 each expressly describes that a radiator includes "a hot liquid inlet to the radiator," as shown in the excerpts below. For example, Osaki EP'311 describes the radiator includes a hot liquid inlet to the radiator: <i>[0027] In addition, a first radiator tank 220 for distributing coolant to the respective radiator tubes 211 is disposed at one of ends of the radiator core portion 210 where the side plates 300 are not disposed, and a second radiator tank 230 for recovering the coolant from which heat has been removed after heat exchange.</i> <i>[0028] An inlet 221 is provided at an upper end portion of the first radiator 220 for allowing coolant from the engine to flow therefrom into the first radiator 220, whereas an outlet 231 is provided at a lower end portion of the second radiator 230 for allowing coolant to flow out therefrom toward the engine.</i> Ozaki EP'311 at [0027]-[0028].

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	Fig.1 FIG. 1  Ozaki EP'311 at Fig. , e.g., item 221. O'Connor '783 also describes the radiator includes a hot liquid inlet to the radiator: <i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i>

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	O'Connor '783 at Abstract.  FIG. 1 O'Connor '783 at Fig. 1, e.g., item 24.

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	 O'Connor '783 at Fig. 2, e.g., item 24.

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	FIG. 3 FIG. 4 O'Connor '783 at Figs. 3, 4. <i>Heat exchangers are increasingly being formed by a brazing operation in which the individual components of the heat exchanger are permanently joined together with a brazing alloy. Generally, brazed heat exchangers are lower in weight and are better able to radiate heat as compared to heat exchangers formed by known mechanical assembly techniques. An example of a brazed heat exchanger is the headered tube-and-center (HTC) type, which utilizes a number of parallel tubes which are brazed to and between a pair of headers, with finned centers being brazed between each adjacent pair of tubes. Conventionally, headered tube-and-center heat exchangers have been constructed by inserting the parallel tubes into apertures formed in each of an opposing pair of headers. A finned center is then positioned between each adjacent pair of parallel tubes. A tank is attached to each header so as to form reservoirs which are in fluidic communication with the tubes through the apertures. One or both tanks include one or more ports which serve as an inlet and outlet to the heat exchanger.</i>

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	O'Connor '783 at 1:31-49. <i>Erosion particularly occurs due to the coolant directly impinging the ends of the tubes of a headered tube-and-center heater core as it flows into the heater core through the inlet, causing significant erosion of the metal and premature deterioration of the heater core. Furthermore, the performance of the heater core is impaired because the flow distribution of the coolant among the tubes is not uniform, with the tubes closest the inlet handling the majority of coolant flow through the heater core.</i> O'Connor '783 at 1:66-2:7. <i>From the above, it is apparent that the prior art lacks a suitable solution to the problem of coolant tube erosion in an all-aluminum heat exchanger such as those used as an automotive heater core. Accordingly, it would be desirable to provide an all-aluminum monolithic heat exchanger which is characterized by significantly reduced internal erosion, particularly at the ends of the coolant tubes immediately downstream of the heat exchanger inlet, without reducing the flow capacity of the heat exchanger and without complicating the assembly and installation of the heat exchanger.</i> O'Connor '783 at 2:56-66. <i>According to the present invention, there is provided a method for reducing the internal erosion of a aluminum monolithic heat exchanger, such as a heater core used in automotive applications. Such heat exchangers are typically composed of a pair of tanks and headers that form a corresponding pair of chambers, a number of coolant tubes secured to each of the headers such that both ends of the tubes project into the chambers, and an inlet to one of the chambers. The inlet is disposed opposite to the tubes such that a coolant flowing into the heat exchanger through the inlet is directed toward the ends of the tubes. The method of this invention generally includes brazing a sacrificial erosion member to the tank equipped with the inlet, such that the erosion member is in the path of the coolant as it flows from the inlet into the chamber. As a result, the coolant impinges the erosion member as it enters the chamber, and is deflected from the ends of the tube so as to reduce erosion of the ends of the tubes.</i>

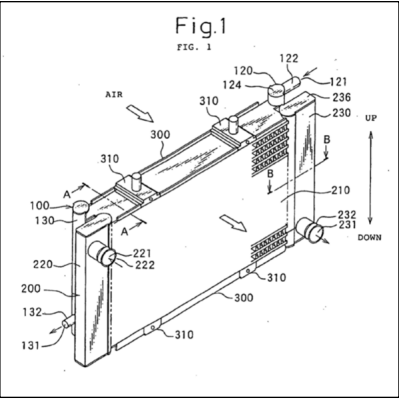
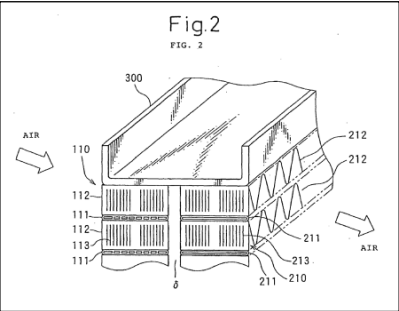
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	O'Connor '783 at 3:33-50. <i>As illustrated, an inlet/outlet tank 14 is assembled to one of the headers 12, while a return tank 16 is assembled to the other header 12. The inlet/outlet tank 14 is equipped with an inlet 24 and an outlet 26 through which a suitable coolant is delivered to and from the heater core 10. As is conventional, the tanks 14 and 16 define reservoirs, with the inlet/outlet tank 14 being divided with a pass partition 22 such that the coolant is forced to flow through one bank of tubes 18 to the return tank 16, after which the coolant flows through the remaining tubes 18, back to the inlet/outlet tank 14, and out through the outlet 26.</i> O'Connor '783 at 5:5-15. <i>Shown in greater detail in FIG. 2 is a partial cross-sectional view of the heater core 10 after brazing in accordance with a first embodiment of this invention. As illustrated, the heater core 10 includes a sacrificial erosion bridge 36 disposed within a reservoir 34 formed by the inlet/outlet tank 14 and its corresponding header 12. The erosion bridge 36 is positioned immediately downstream of the inlet 24 formed by an inlet cup 28 and inlet pipe 30. The inlet cup 28 and inlet pipe 30 can be formed and assembled in a generally conventional manner. FIG. 2 depicts the inlet cup 28 is being brazed to the tank 14, while the inlet pipe 30 is formed with a peripheral flange 29 that engages an O-ring 32 disposed in the inlet cup 28 in order to form a fluid-tight seal. As shown, the end of the inlet pipe 30 extends into the reservoir 34 and defines the inlet opening into the heater core 10. While the use of cups for both inlet and outlet pipes 24 and 26 is conventional and well known in the art, it is also conventional to braze the inlet and outlet pipes 24 and 26 directly to the tank 14 without the use of a cup 28. Therefore, this invention is not to be interpreted as being limited to heater cores which use the inlet cup 28 shown in FIG. 2.</i> O'Connor '783 at 5:55-6:8. <i>From the above, it can be seen that a particularly advantageous feature of this invention is that an all-aluminum monolithic heat exchanger can be readily assembled in accordance with this invention to include a sacrificial erosion member which is capable of substantially increasing the service life of the heat exchanger. In particular, erosion which would otherwise result from coolant impinging directly on the ends of the coolant tubes 18 is primarily sustained by an erosion bridge 36 brazed between the tank 14 and the header 12, or by a</i>

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	surface integrally formed with the inlet cup 54. Because erosion of the ends of the tubes 18 is significantly reduced, the tubes 18 can be formed from a tube stock material having a wall thickness of less than about 0.014 inch (about 0.35 millimeter), resulting in a significantly lower weight for the heat exchanger. Consequently, this invention is particularly suited for heater cores used in automotive applications which are particularly susceptible to erosion due to solid contaminants which are often suspended in the coolant. In addition, because a heater core formed in accordance with this invention can achieve the desired benefits with a standard-sized inlet pipe 30 that is aligned with and connected to the tank 14 in a conventional manner, the heater core is more readily able to be accommodated within the limited space typically available in an automobile. O'Connor '783 at 8:55-9:11. 1. A heat exchanger comprising: an aluminum alloy tank member having an inlet through which a coolant flows into the heat exchanger; a header attached to the tank member so as to form a chamber therewith, the header having a plurality of apertures formed therein; a plurality of tubes received in the apertures of the header such that an end of each of the tubes projects into the chamber formed by the tank member and the header; and an aluminum alloy sacrificial erosion member brazed to the tank member so as to be disposed within the chamber downstream of the inlet, such that the coolant entering the heat exchanger through the inlet impinges the sacrificial erosion member and is thereby deflected away from the ends of the tubes, so as to reduce erosion of the ends of the tubes, the sacrificial erosion member having a first support member and an oppositely disposed second support member, the first support member engaging the tank member and spacing the sacrificial erosion member from the tank member, the second support member spacing the sacrificial erosion member from the header, the first and second support members cooperating to immobilize the sacrificial erosion member within the chamber.

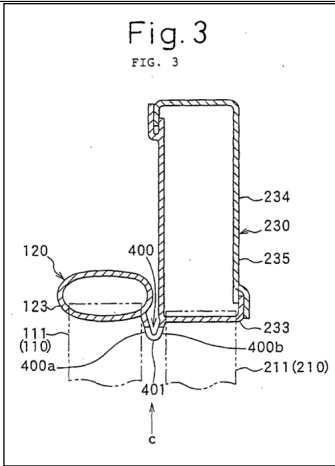
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	O'Connor '783 at Claim 1. <i>See also, e.g.,</i> O'Connor '783 at Fig. 5, Claim 9. To the extent that Masayuki JP'2069 does not expressly describe that the anode holder is “adapted for installation in an engine radiator within 10 inches of a hot liquid inlet to the engine radiator” as claimed, a person of ordinary skill in the art would have understood the tubes (or alternatively the mechanical fixtures) of Masayuki JP'2069 would be adapted for installation in an engine radiator within ten inches of the hot liquid inlet to the engine radiator such that sacrificial anode(s) installed within would be within 10 inches of a hot liquid inlet. For example, Masayuki JP'2069 describes that “it is preferable to provide the sacrificial anode over the entire length of the radiator tube so that the radiator tube is uniformly subjected to the anticorrosion action in the longitudinal direction” and that a sacrificial anode is “divided into a plurality of parts in the longitudinal direction.” <i>See, e.g.,</i> Masayuki JP'2069 at [0014] (machine translation). Further, as described above, the '494 Patent describes “conventional” type” radiators such as a “‘crossflow’ type” and a “‘downflow’ type.” <i>See, e.g.,</i> the '494 Patent at 6:50-56. The '494 Patent further states that “inlet 17 is generally understood to refer to the vicinity of where hot water coming directly from the engine enters into the radiator 11” and that “[b]oth downflow and crossflow radiators typically have a pedcock 25 for draining fluid from the radiator, an outlet 27, core fins and tubes 29, and may optionally have a transmission and engine oil cooler/heater connection 35 and temperature sensor 37.” <i>See, e.g.,</i> the '494 Patent at 7:4-16. Thus, as described by the '494 Patent, conventional and typical radiators included a hot liquid inlet as well as tubes, as described by Masayuki JP'2069. A POSITA would have understood that the tubes (or alternatively the mechanical fixtures) of Masayuki JP'2069 at the ends nearest the inlet would be “adapted for installation in an engine radiator within 10 inches of a hot liquid inlet to the engine radiator.” In addition, Osaki EP'311 and O'Connor '783 each expressly describes such a radiator where at least a portion of the tubes are “within 10 inches” of the hot liquid inlet, as shown in the excerpts below. To extent that Masayuki JP'2069 is found not to alone teach or suggest this claim element in view of the knowledge of a POSITA, combining the sacrificial anodes held by the tubes (or alternatively the mechanical fixtures within the tubes) taught by Masayuki JP'2069 with the radiators taught by Osaki EP'311 or O'Connor '783 is merely the combination of familiar components according to known methods, and the resulting combination would yield predictable results. Each of these references provide interrelated

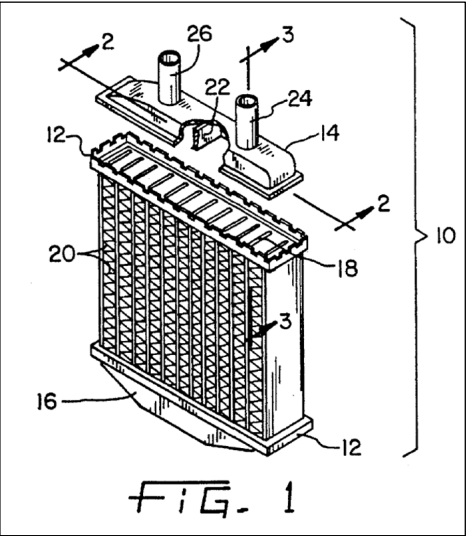
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	teachings, for instance, regarding the use of sacrificial members to protect an aluminum or aluminum alloy heat exchanger from corrosion. As evidenced by the teachings of Masayuki JP'2069, Ozaki EP'311, and O'Connor '783, the use of sacrificial members to protect an aluminum heat exchanger was well-known in the art. A POSITA would recognize that, regardless of whether or not the sacrificial elements of Ozaki EP'311 or O'Connor '783 were also used, the combination of the sacrificial anodes of Masayuki JP'2069 into the tubes taught by Ozaki EP'311 or O'Connor '783 would provide corrosion protection within the tubes in addition to or in lieu of the sacrificial elements also taught by Ozaki EP'311 and O'Connor '783. The incorporation of the sacrificial anodes along the length of the tube (in some embodiments held by mechanical fixtures) as taught by Masayuki JP'2069 to the radiator and tubes taught by Ozaki EP'311 or O'Connor '783 would yield similar benefits as those described by each of the individual references. Such combinations are predictable variations of the techniques in the individual references. Thus, a POSITA would be able to make this modification to the Ozaki EP'311 or O'Connor '783 radiator without undue experimentation and with reasonable expectations of success. For example, Ozaki EP'311 describes a radiator where at least a portion of the tubes are "within 10 inches" of the hot liquid inlet such that the tubes (or alternatively mechanical fixtures) holding the sacrificial anode(s) according to Masayuki JP'2069 would be adapted for installation in an engine radiator within 10 inches of a hot liquid inlet to the engine radiator: <i>Radiator caps (266) and radiator tubes (211) are heat brazed with an ingot Z of a sacrificial material being disposed in the interior of a radiator tank main body (234), whereby, as the ingot Z of the sacrificial material is heated while being surrounded by the radiator tank main body (234), the evaporated sacrificial material is allowed to adhere to internal surfaces of the radiator tank main body (234) relatively uniformly, the sacrificial material so adhering to the internal surfaces being then allowed to be radiated into aluminum constituting the radiator tank main body (234) to thereby form an alloy layer (a corrosion preventing layer) containing therein the sacrificial material heavily on the internal surface of the radiator tank main body (234).</i> Ozaki EP'311 at Abstract. <i>According to a further aspect of the invention, there are provided a plurality of tubes (211) through which fluid is allowed to flow and metallic header tanks (230) disposed at longitudinal ends of the plurality of tubes (211) for communication therewith. The header tank (230) comprises a tank main body (234) extending in a direction normal to the</i>

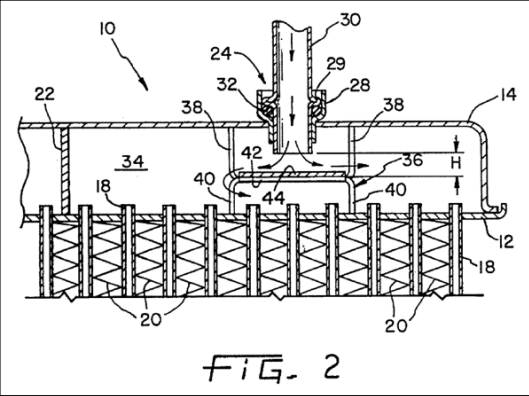
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	<i>longitudinal direction of the tubes (211) and caps (236) for closing longitudinal ends of the tank main body (234), and the tank main body (234) and the caps (236) are joined to each other through heat brazing with a sacrificial material comprising a metal having a lower electric potential than that of the tank main body (234) being disposed in the interior of the tank main body (234).</i> Ozaki EP'311 at [0013]. <i>[0027] In addition, a first radiator tank 220 for distributing coolant to the respective radiator tubes 211 is disposed at one of ends of the radiator core portion 210 where the side plates 300 are not disposed, and a second radiator tank 230 for recovering the coolant from which heat has been removed after heat exchange.</i> <i>[0028] An inlet 221 is provided at an upper end portion of the first radiator 220 for allowing coolant from the engine to flow therefrom into the first radiator 220, whereas an outlet 231 is provided at a lower end portion of the second radiator 230 for allowing coolant to flow out therefrom toward the engine.</i> Ozaki EP'311 at [0027]-[0028].

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	Fig.1  Ozaki EP'311 at Fig. 1, e.g., items 221, 220. Fig.2 

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	Ozaki EP'311 at Fig. 2, e.g., items 211. <i>Fig. 2 is a cross-sectional view taken along the line A-A of Fig. 1,</i> Ozaki EP'311 at [0019]. <i>[0041] Since the first radiator tank 220 and the second condenser tank 130 are similar in construction to the second radiator tank 230 and the first condenser tank 120, in the following description, unless otherwise stated, when used, the radiator tank 230 is meant to include both the radiators 220, 230, and similarly, when used, the condenser tank is meant to include both the condenser tanks 120, 130.</i> Ozaki EP'311 at [0041], describing that the description of the radiator tank 230 also applies to the first radiator tank 220 (at the inlet).

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	Fig. 3 FIG. 3  Ozaki EP'311 at Fig. 3, e.g., items 230, 211. <i>Fig. 3 is a cross-sectional view taken along the line B-B of Fig. 1,</i> Ozaki EP'311 at [0019]. O'Connor '783 also describes a radiator where at least a portion of the tubes are “within 10 inches” of the hot liquid inlet such that the tubes (or alternatively mechanical fixtures) holding the sacrificial anode(s) according to Masayuki JP'2069 would be adapted for installation in an engine radiator within 10 inches of a hot liquid inlet to the engine radiator: <i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends</i>

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	<i>of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i> O'Connor '783 at Abstract. 

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	O'Connor '783 at Fig. 1, e.g., items 18, 24.  O'Connor '783 at Fig. 2, e.g., items 24, 18.

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	O'Connor '783 at Figs. 3, 4, e.g., items 18. <i>Heat exchangers are increasingly being formed by a brazing operation in which the individual components of the heat exchanger are permanently joined together with a brazing alloy. Generally, brazed heat exchangers are lower in weight and are better able to radiate heat as compared to heat exchangers formed by known mechanical assembly techniques. An example of a brazed heat exchanger is the headered tube-and-center (HTC) type, which utilizes a number of parallel tubes which are brazed to and between a pair of headers, with finned centers being brazed between each adjacent pair of tubes. Conventionally, headered tube-and-center heat exchangers have been constructed by inserting the parallel tubes into apertures formed in each of an opposing pair of headers. A finned center is then positioned between each adjacent pair of parallel tubes. A tank is attached to each header so as to form reservoirs which are in fluidic communication with the tubes through the apertures. One or both tanks include one or more ports which serve as an inlet and outlet to the heat exchanger.</i>

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	O'Connor '783 at 1:31-49. <i>Erosion particularly occurs due to the coolant directly impinging the ends of the tubes of a headered tube-and-center heater core as it flows into the heater core through the inlet, causing significant erosion of the metal and premature deterioration of the heater core. Furthermore, the performance of the heater core is impaired because the flow distribution of the coolant among the tubes is not uniform, with the tubes closest the inlet handling the majority of coolant flow through the heater core.</i> O'Connor '783 at 1:66-2:7. <i>From the above, it is apparent that the prior art lacks a suitable solution to the problem of coolant tube erosion in an all-aluminum heat exchanger such as those used as an automotive heater core. Accordingly, it would be desirable to provide an all-aluminum monolithic heat exchanger which is characterized by significantly reduced internal erosion, particularly at the ends of the coolant tubes immediately downstream of the heat exchanger inlet, without reducing the flow capacity of the heat exchanger and without complicating the assembly and installation of the heat exchanger.</i> O'Connor '783 at 2:56-66. <i>According to the present invention, there is provided a method for reducing the internal erosion of a aluminum monolithic heat exchanger, such as a heater core used in automotive applications. Such heat exchangers are typically composed of a pair of tanks and headers that form a corresponding pair of chambers, a number of coolant tubes secured to each of the headers such that both ends of the tubes project into the chambers, and an inlet to one of the chambers. The inlet is disposed opposite to the tubes such that a coolant flowing into the heat exchanger through the inlet is directed toward the ends of the tubes. The method of this invention generally includes brazing a sacrificial erosion member to the tank equipped with the inlet, such that the erosion member is in the path of the coolant as it flows from the inlet into the chamber. As a result, the coolant impinges the erosion member as it enters the chamber, and is deflected from the ends of the tube so as to reduce erosion of the ends of the tubes.</i>

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	O'Connor '783 at 3:33-50. <i>As illustrated, an inlet/outlet tank 14 is assembled to one of the headers 12, while a return tank 16 is assembled to the other header 12. The inlet/outlet tank 14 is equipped with an inlet 24 and an outlet 26 through which a suitable coolant is delivered to and from the heater core 10. As is conventional, the tanks 14 and 16 define reservoirs, with the inlet/outlet tank 14 being divided with a pass partition 22 such that the coolant is forced to flow through one bank of tubes 18 to the return tank 16, after which the coolant flows through the remaining tubes 18, back to the inlet/outlet tank 14, and out through the outlet 26.</i> O'Connor '783 at 5:5-15. <i>Shown in greater detail in FIG. 2 is a partial cross-sectional view of the heater core 10 after brazing in accordance with a first embodiment of this invention. As illustrated, the heater core 10 includes a sacrificial erosion bridge 36 disposed within a reservoir 34 formed by the inlet/outlet tank 14 and its corresponding header 12. The erosion bridge 36 is positioned immediately downstream of the inlet 24 formed by an inlet cup 28 and inlet pipe 30. The inlet cup 28 and inlet pipe 30 can be formed and assembled in a generally conventional manner. FIG. 2 depicts the inlet cup 28 is being brazed to the tank 14, while the inlet pipe 30 is formed with a peripheral flange 29 that engages an O-ring 32 disposed in the inlet cup 28 in order to form a fluid-tight seal. As shown, the end of the inlet pipe 30 extends into the reservoir 34 and defines the inlet opening into the heater core 10. While the use of cups for both inlet and outlet pipes 24 and 26 is conventional and well known in the art, it is also conventional to braze the inlet and outlet pipes 24 and 26 directly to the tank 14 without the use of a cup 28. Therefore, this invention is not to be interpreted as being limited to heater cores which use the inlet cup 28 shown in FIG. 2.</i> O'Connor '783 at 5:55-6:8. <i>From the above, it can be seen that a particularly advantageous feature of this invention is that an all-aluminum monolithic heat exchanger can be readily assembled in accordance with this invention to include a sacrificial erosion member which is capable of substantially increasing the service life of the heat exchanger. In particular, erosion which would otherwise result from coolant impinging directly on the ends of the coolant tubes 18 is primarily sustained by an erosion bridge 36 brazed between the tank 14 and the header 12, or by a</i>

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	surface integrally formed with the inlet cup 54. Because erosion of the ends of the tubes 18 is significantly reduced, the tubes 18 can be formed from a tube stock material having a wall thickness of less than about 0.014 inch (about 0.35 millimeter), resulting in a significantly lower weight for the heat exchanger. Consequently, this invention is particularly suited for heater cores used in automotive applications which are particularly susceptible to erosion due to solid contaminants which are often suspended in the coolant. In addition, because a heater core formed in accordance with this invention can achieve the desired benefits with a standard-sized inlet pipe 30 that is aligned with and connected to the tank 14 in a conventional manner, the heater core is more readily able to be accommodated within the limited space typically available in an automobile. O'Connor '783 at 8:55-9:11. 1. A heat exchanger comprising: an aluminum alloy tank member having an inlet through which a coolant flows into the heat exchanger; a header attached to the tank member so as to form a chamber therewith, the header having a plurality of apertures formed therein; a plurality of tubes received in the apertures of the header such that an end of each of the tubes projects into the chamber formed by the tank member and the header; and an aluminum alloy sacrificial erosion member brazed to the tank member so as to be disposed within the chamber downstream of the inlet, such that the coolant entering the heat exchanger through the inlet impinges the sacrificial erosion member and is thereby deflected away from the ends of the tubes, so as to reduce erosion of the ends of the tubes, the sacrificial erosion member having a first support member and an oppositely disposed second support member, the first support member engaging the tank member and spacing the sacrificial erosion member from the tank member, the second support member spacing the sacrificial erosion member from the header, the first and second support members cooperating to immobilize the sacrificial erosion member within the chamber.

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	O'Connor '783 at Claim 1.
42. The electrolysis prevention device of claim 37, wherein the engine radiator comprises aluminum.	Masayuki JP'2069 discloses or renders obvious the electrolysis prevention device of claim 37 wherein the engine radiator comprises aluminum, according at least to Plaintiff's apparent reading for the claim terms. <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>[Conventional Technology] Heat exchangers mounted on vehicles such as automobiles that require weight reduction are radiators made of Al or Al alloy instead of Cu or Cu alloy (hereinafter, these are collectively referred to as Al alloy radiators).</i> Masayuki JP'2069 at [0002] (machine translation). <i>Aluminum materials have pitting corrosion in fresh water containing a large amount of anions</i>

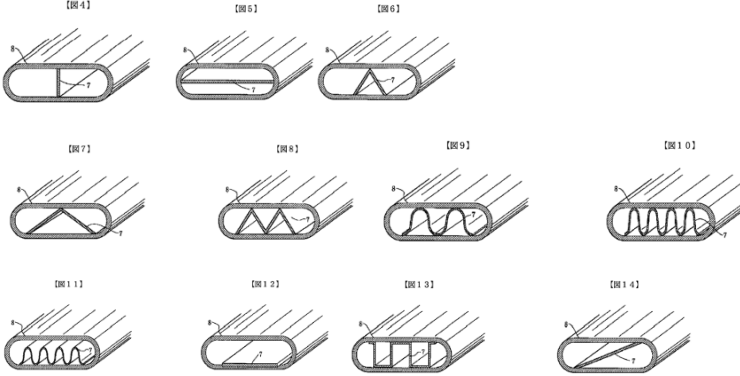
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	such as Cl- and SO42-. Therefore, in order to use an aluminum material as a structural material for a radiator, it is necessary to take measures to suppress pitting corrosion. As a means for improving corrosion resistance, it is the mainstream to use a clad material utilizing the sacrificial anode effect of Zn. For example, in order to impart corrosion resistance to the wetted portion inside the radiator, the wetted side has a layer structure of Al-Zn-based skin material / Al-Mn-based core material / Al-Si-based brazing material, which is an Al-Zn-based alloy. The radiator tube is made of clad material. Masayuki JP'2069 at [0002] (machine translation). For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates. Masayuki JP'2069 at [0005] (machine translation). The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20 \text{ mV}$ is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface of the tube. Is selected in the range of 1: 0.1 to 3. Masayuki JP'2069 at [0006] (machine translation). For the Al alloy tube, a clad material in which an Al—Si brazing material is laminated on both sides can be used. The Al-Si brazing material on the inside of the tube facilitates brazing of the sacrificial anode, and the Al-Si brazing material on the outside of the tube facilitates brazing of the fin material. A Si-containing Al alloy may be used for the sacrificial anode in

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	<i>consideration of brazing property. In this case, it is also possible to use a clad material having no brazing material on the surface on the wetted side of the tube. The sacrificial anode can be attached over the entire inner surface of the Al alloy tube by, for example, brazing.</i> Masayuki JP'2069 at [0006] (machine translation). <i>As described above, in the present invention, by attaching the sacrificial anode to the inner surface of the tube under the conditions of potential difference $\Delta E \geq 20$ mV and area ratio $S2 / S1 = 0.1$ to 3, the inner surface of the tube An Al alloy radiator that reliably suppresses pitting corrosion can be obtained.</i> Masayuki JP'2069 at [0025] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20$ mV between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). <i>2. The Al alloy radiator according to claim 1, wherein the Al alloy tube is a one-layer or multi-layer clad material in which an Al—Si brazing material is laminated on both sides of an Al alloy core material.</i> Masayuki JP'2069 at Claim 2 (machine translation).
43. The electrolysis prevention device of claim 37, wherein the anode holder enables the sacrificial anode to be located within fluid flow of the hot coolant inlet.	Masayuki JP'2069 discloses or renders obvious the electrolysis prevention device of claim 37 wherein the anode holder enables the sacrificial anode to be located within fluid flow of the hot coolant inlet, according at least to Plaintiff's apparent reading for the claim term "located within fluid flow of the hot coolant inlet." <i>PURPOSE: To realize the corrosion prevention of a radiator tube by fitting a sacrificed</i>

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	<i>anode on the inner surface of the Al alloy-made tube.</i> Masayuki JP'2069 at Purpose (machine translation). <i>CONSTITUTION: In the Al alloy-made radiator fitted with the sacrificed anode on the inner surface of its Al alloy-made tube, the materials of the tube and the sacrificed anode are selected so as to maintain the relation $E1-E2 \geq 20\text{mV}$ between corroding potential E1 of the tube 8 and mixed potential E2 of the tube 8 and the sacrificed anode 7. Further, the surface area ratio of the sacrificed anode 7 to the surface area in the inner side of the tube 8 is selected in the range of 1:0.1-3. As the tube 8 and/or the sacrificed anode 7, the material formed with an Al-Si series brazing filler metal layer is used and the sacrificed anode 7 can be fitted to the tube 8 by brazing. As the corrosion prevention of the tube 8 is realized by cathodic corrosion prevention with the sacrificed anode 7, the radiator wt. is made to be light and the material of the tube 8 being suitable to the thin thickness can be selected.</i> Masayuki JP'2069 at Constitution (machine translation). <i>INDUSTRIAL APPLICABILITY The present invention relates to an Al alloy radiator having improved corrosion resistance by attaching a sacrificial anode to the inner surface of a tube.</i> Masayuki JP'2069 at [0001] (machine translation). <i>The present invention is an Al alloy radiator in which a sacrificial anode is attached to the inner surface of an Al alloy tube in order to achieve the object, and the pitting potential E1 of the tube and the above. The material of the tube and the sacrificial anode is selected so that the relationship of $E1-E2 \geq 20 \text{ mV}$ is maintained between the tube and the mixed potential E2 of the sacrificial anode, and the surface area ratio of the sacrificial anode to the inner surface of the tube. Is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at [0006] (machine translation). <i>For the Al alloy tube, a clad material in which an Al—Si brazing material is laminated on both sides can be used. The Al-Si brazing material on the inside of the tube facilitates brazing of the sacrificial anode, and the Al-Si brazing material on the outside of the tube facilitates brazing of the fin material. A Si-containing Al alloy may be used for the sacrificial anode in</i>

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	<i>consideration of brazing property. In this case, it is also possible to use a clad material having no brazing material on the surface on the wetted side of the tube. The sacrificial anode can be attached over the entire inner surface of the Al alloy tube by, for example, brazing.</i> Masayuki JP'2069 at [0006] (machine translation). <i>The material of the sacrificial anode does not constrain the present invention, and as long as the Al alloy tube is maintained at a noble potential with a potential difference ΔE of 20 mV or more within a range that does not impair the brazing property, Al, Zn, Mg or these Alloys can be used.</i> <i>However, since it is mounted in the narrow internal space of the tube, an Al alloy having good workability that can be mounted with a large bonding strength by brazing or the like is preferable. For example, when an Al alloy is used as a sacrificial anode, the anticorrosion effect improves as the Zn content increases. A given purpose is achieved if the sacrificial anode has a thickness that can withstand the pressure of the liquid flowing in the tube, specifically, a thickness of 20 μm or more. The sacrificial anode is attached to the inner surface of the tube in various ways. For example, the sacrificial anode may be attached by mechanical fixing means such as caulking or screwing. However, brazing is preferable when workability is taken into consideration.</i> Masayuki JP'2069 at [0015] (machine translation). <i>Brazing of the sacrificial anode to the inner surface of the tube is easily performed by using the inner surface of the tube, that is, the wetted side, or at least the surface of the sacrificial anode attached to the tube containing Si.</i> <i>As such a material, for example, a clad material in which an Al—Si-based brazing material layer containing about 7 to 10% Si is bonded is used. When an Al—Si alloy layer is present at the bonding interface, the sacrificial anode is brazed to the tube by applying a non-corrosive flux, assembling the tube and the sacrificial anode into a predetermined shape, and heating the whole. Specifically, the Nocolock method is a suitable brazing method.</i> Masayuki JP'2069 at [0016] (machine translation).

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	<i>Example 1: A clad material having a plate thickness of 250 μm in which an Al-1.2% Mn alloy was used as a core material and an Al-10% Si-based brazing material layer was laminated on both sides with a clad ratio of 10% was used for the radiator tube.</i> <i>As the sacrificial anode, an Al-1% Zn alloy plate having a plate thickness of 60 μm was used. As shown in FIGS. 4-12, the sacrificial anode 7 was brazed to the inner surface of the tube 8 in various forms. The brazed tube 8 was subjected to a corrosion resistance evaluation test. For the corrosion resistance evaluation test, a corrosive solution prepared by adjusting an aqueous solution containing 1000 ppm of Cl ions, 1000 ppm of SO₄ ions and 10 ppm of Cu ions to pH 3 with ferric chloride was used. After flowing the corrosive liquid maintained at 88 ° C. at a flow rate of 35 liters / minute for 8 hours, resting for 16 hours was set as one cycle, and circulation and suspension of the corrosive liquid were repeated for 180 cycles. After the test was completed, the depth of pitting corrosion generated on the inner surface of the tube was measured to determine the corrosion resistance. As is clear from Table 1 showing the survey results, pitting corrosion did not substantially occur in any of the cases.</i> Masayuki JP'2069 at [0017] (machine translation). <i>1. A radiator made of Al alloy in which a sacrificial anode is attached to the inner surface of an Al alloy tube, and a relationship of $E1-E2 \geq 20 \text{ mV}$ between the pitting corrosion potential E1 of the tube and the mixed potential E2 of the tube and the sacrificial anode. The Al alloy is characterized in that the materials of the tube and the sacrificial anode are selected so that the above is maintained, and the surface area ratio of the sacrificial anode to the inner surface surface of the tube is selected in the range of 1: 0.1 to 3.</i> Masayuki JP'2069 at Claim 1 (machine translation). <i>2. The Al alloy radiator according to claim 1, wherein the Al alloy tube is a one-layer or multi-layer clad material in which an Al—Si brazing material is laminated on both sides of an Al alloy core material.</i> Masayuki JP'2069 at Claim 2 (machine translation). <i>4. The Al alloy radiator according to claim 1, wherein the sacrificial anode is brazed to the</i>

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	<i>inner surface of the Al alloy radiator.</i> Masayuki JP'2069 at Claim 4 (machine translation). <i>5. The Al alloy radiator according to claim 1, wherein one or more sacrificial anodes are attached over the entire inner surface of the Al alloy tube.</i> Masayuki JP'2069 at Claim 5 (machine translation). <i>8. The anticorrosion method according to claim 6, wherein a single or a plurality of sacrificial anodes are attached over the entire inner surface of the Al alloy tube.</i> Masayuki JP'2069 at Claim 8 (machine translation).  Masayuki JP'2069 at Figs. 4-14. To the extent it is determined that the “anode holder” may include the radiator itself or portions or

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	components thereof, Masayuki JP'2069 teaches this. In addition, as described above for Claim 37, Masayuki JP'2069 acknowledges that “the sacrificial anode may be attached by mechanical fixing means such as caulking or screwing,” which would include an “anode holder” as taught, for example, by MacKenna '149. <i>See, e.g.</i>, support for MacKenna included above for Claim 37.
45. The electrolysis prevention device of claim 37, wherein the hot liquid is coolant.	Masayuki JP'2069 discloses or renders obvious the electrolysis prevention device of claim 37 wherein the hot liquid is coolant, according at least to Plaintiff's apparent reading for the claim term “coolant.” <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation). To the extent that Masayuki JP'2069 does not expressly describe that the hot liquid is “coolant” as claimed, a person of ordinary skill in the art would have understood coolant to be the simple substitution of one known element (coolant) for another (the antifreeze of Masayuki JP'2069) to obtain a predictable result. To the extent that coolant is determined to be distinct over antifreeze, coolant was a known choice of liquid in radiator systems as of the claimed priority date of the '494 Patent. For example, the '494 Patent admits in the Background that “[a]utomobile cooling systems circulate water and coolant liquids through an engine's water jacket, head, and water pump to facilitate heat transfer” and that “[a]fter absorbing the heat, the hot liquid is piped back to the radiator/storage tank which is a liquid to air heat exchanger.” <i>See, e.g.</i>, the '494 Patent at 1:43-47. In addition, Ozaki EP'311, O'Connor '783, and Hopkins AU'202 each expressly describes that the hot liquid is “water,” as shown in the excerpts below. For example, Ozaki EP'311 describes the hot liquid is coolant: <i>[0004] Cooling water or coolant is filled in the radiator tank, and therefore a corrosion preventing layer needs to be formed on internal surfaces of the radiator tank. To this end, in</i>

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	<i>general, an aluminum sheet material having a corrosion preventing layer of zinc formed on the surface thereof is pressed into shapes and the members so pressed into shapes are then joined together through brazing, whereby a header tank is provided which has the corrosion preventing layer formed on the internal surfaces thereof.</i> Ozaki EP'311 at [0004]. In addition, O'Connor '783 describes the hot liquid is coolant: <i>A method for reducing the internal erosion of a brazed aluminum heat exchanger, such as a heater core used in automotive applications. The heat exchanger is composed of a tank and header that form a chamber, a number of coolant tubes secured to the header such that ends of the tubes project into the chamber, and an inlet to the chamber disposed opposite to the tubes so as to direct a coolant toward the ends of the tubes. A sacrificial erosion member is brazed to the tank so as to be in the path of the coolant as the coolant flows from the inlet into the chamber, such that the coolant impinges the erosion member as it enters the chamber. As a result, the coolant is deflected away from the ends of the tube so as to reduce erosion of the ends of the tubes. Furthermore, the erosion member serves to enhance the efficiency of the heat exchanger by improving the flow distribution of the coolant among the tubes.</i> O'Connor '783 at Abstract. <i>The present invention relates to heat exchangers, and particularly those of the type used as heater cores in automobile heating systems. More particularly, this invention relates to an improved monolithic aluminum heat exchanger whose service life is extended by the inclusion of a sacrificial member that significantly reduces the tendency for erosion within the heat exchanger, and more particularly reduces the amount of erosion which occurs at the ends of the heat exchanger's coolant tubes.</i> O'Connor '783 at 1:4-12. <i>Heat exchangers are employed within the automotive industry as radiators which cool the engine coolant, condensers and evaporators for use in air conditioning systems, and heater cores. In order to efficiently maximize the amount of surface area available for transferring heat between the environment and a fluid flowing through the heat exchanger, the design of</i>

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	<i>the heat exchanger is typically of a tube-and-fin type in which numerous tubes thermally communicate with high surface area fins. The fins enhance the ability of the heat exchanger to transfer heat from the fluid to the environment, or vice versa. For example, heat exchangers used in the automotive industry as heater cores serve to transfer heat from the engine coolant to the air entering the passenger compartment.</i> O'Connor '783 at 1:16-30. <i>According to the present invention, there is provided a method for reducing the internal erosion of a aluminum monolithic heat exchanger, such as a heater core used in automotive applications. Such heat exchangers are typically composed of a pair of tanks and headers that form a corresponding pair of chambers, a number of coolant tubes secured to each of the headers such that both ends of the tubes project into the chambers, and an inlet to one of the chambers. The inlet is disposed opposite to the tubes such that a coolant flowing into the heat exchanger through the inlet is directed toward the ends of the tubes. The method of this invention generally includes brazing a sacrificial erosion member to the tank equipped with the inlet, such that the erosion member is in the path of the coolant as it flows from the inlet into the chamber. As a result, the coolant impinges the erosion member as it enters the chamber, and is deflected from the ends of the tube so as to reduce erosion of the ends of the tubes.</i> O'Connor '783 at 3:33-50. <i>As illustrated, an inlet/outlet tank 14 is assembled to one of the headers 12, while a return tank 16 is assembled to the other header 12. The inlet/outlet tank 14 is equipped with an inlet 24 and an outlet 26 through which a suitable coolant is delivered to and from the heater core 10. As is conventional, the tanks 14 and 16 define reservoirs, with the inlet/outlet tank 14 being divided with a pass partition 22 such that the coolant is forced to flow through one bank of tubes 18 to the return tank 16, after which the coolant flows through the remaining tubes 18, back to the inlet/outlet tank 14, and out through the outlet 26.</i> O'Connor '783 at 5:5-15. 1. A heat exchanger comprising:

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	<i>an aluminum alloy tank member having an inlet through which a coolant flows into the heat exchanger;</i> <i>a header attached to the tank member so as to form a chamber therewith, the header having a plurality of apertures formed therein;</i> <i>a plurality of tubes received in the apertures of the header such that an end of each of the tubes projects into the chamber formed by the tank member and the header; and</i> <i>an aluminum alloy sacrificial erosion member brazed to the tank member so as to be disposed within the chamber downstream of the inlet, such that the coolant entering the heat exchanger through the inlet impinges the sacrificial erosion member and is thereby deflected away from the ends of the tubes, so as to reduce erosion of the ends of the tubes, the sacrificial erosion member having a first support member and an oppositely disposed second support member, the first support member engaging the tank member and spacing the sacrificial erosion member from the tank member, the second support member spacing the sacrificial erosion member from the header, the first and second support members cooperating to immobilize the sacrificial erosion member within the chamber.</i> O'Connor '783 at Claim 1. Hopkins AU'202 also describes the hot liquid is coolant: <i>Turning first to Figure 3, there is shown the typical components of an engine 28 including the engine block 22, cylinders 30, intake and exhaust valves 32, crankshaft 34 and sump 36. The cooling system components are also shown and include the thermostat 24, thermostat housing 20, radiator 26, upper radiator hose 38, lower radiator hose 40, water pump 42, cooling fan 44 and water jackets 46. In operation, coolant liquid is circulated by the water pump 40 through the water jackets 44 around the cylinders 30, through the upper radiator hose 38 into the radiator tank 26 where the heated liquid is then cooled through the radiator tubes by the cooling fan 42, and then back into the engine through the lower radiator hose 38. The sacrificial anode is located at the connection between the thermostat housing 20 and the engine block 22.</i>

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	Hopkins AU'202 at pg. 6, ll. 16-26.
46. The electrolysis prevention device of claim 37, wherein the hot liquid is water.	Masayuki JP'2069 discloses or renders obvious the electrolysis prevention device of claim 37 wherein the hot liquid is water, according at least to Plaintiff's apparent reading for the claim term "water." <i>Aluminum materials have pitting corrosion in fresh water containing a large amount of anions such as Cl⁻ and SO₄²⁻. Therefore, in order to use an aluminum material as a structural material for a radiator, it is necessary to take measures to suppress pitting corrosion. As a means for improving corrosion resistance, it is the mainstream to use a clad material utilizing the sacrificial anode effect of Zn. For example, in order to impart corrosion resistance to the wetted portion inside the radiator, the wetted side has a layer structure of Al-Zn-based skin material / Al-Mn-based core material / Al-Si-based brazing material, which is an Al-Zn-based alloy. The radiator tube is made of clad material.</i> Masayuki JP'2069 at [0002] (machine translation). <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation).
47. The electrolysis prevention device of claim 37, wherein the hot liquid is antifreeze.	Masayuki JP'2069 discloses or renders obvious the electrolysis prevention device of claim 37 wherein the hot liquid is antifreeze, according at least to Plaintiff's apparent reading for the claim term "antifreeze." <i>For example, the radiator is not always supplied with the ideal liquid, and tap water may be supplied instead of the antifreeze liquid. Moreover, the quality of tap water changes depending on the river water system supplied, and the corrosive action on the Al alloy fluctuates. The present invention has been devised to solve such a problem, specifying the</i>

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	<i>material combination of the tube material and the sacrificial anode material, and sacrificing having a specified surface area with respect to the inner surface of the radiator tube. By attaching an anode, the radiator tube is always maintained below the pitting potential, and the purpose is to reliably protect the radiator from corrosion even if the corrosive environment fluctuates.</i> Masayuki JP'2069 at [0005] (machine translation).