June 16, 1964 H. J. VENEMA 3,137,142

HEAT TRANSFER SYSTEM AS IT PERTAINS TO THERMOELECTRICS

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Fig. 1

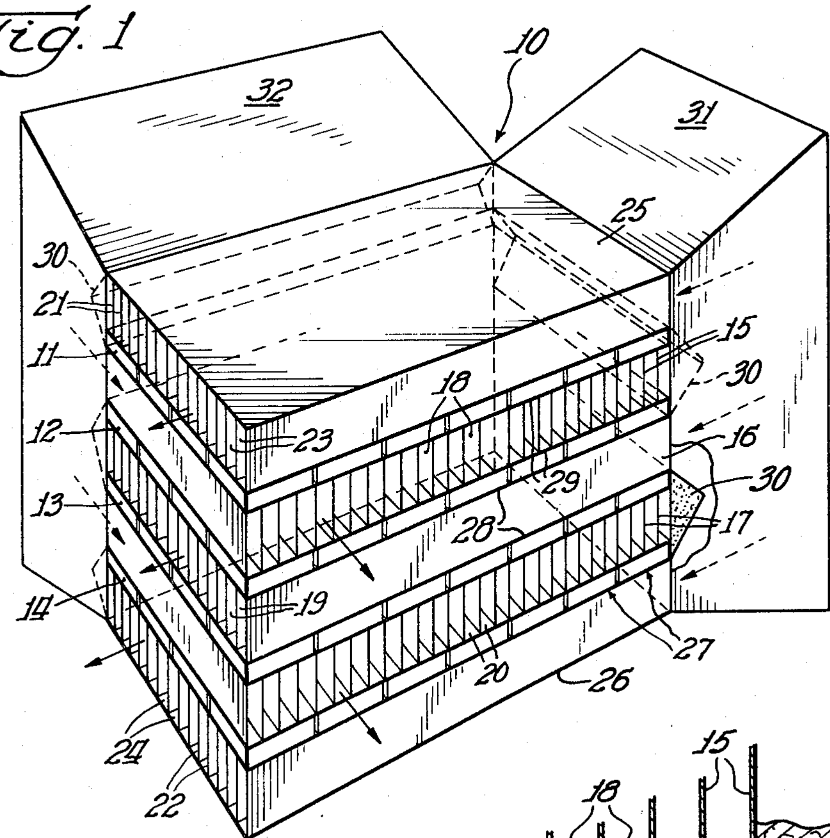
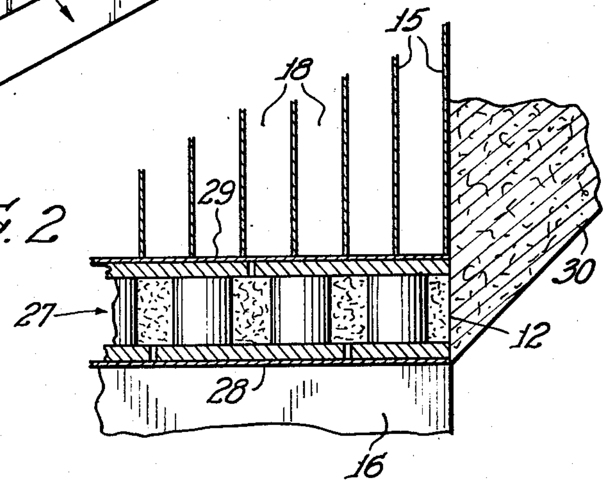


Fig. 2



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HEAT TRANSFER SYSTEM AS IT PERTAINS TO THERMOELECTRICS

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The present invention relates to air conditioning and matrices therefore, and more particularly to matrices employed in thermoelectric heat pumping means.

In thermoelectricty the hot junctions are in close proximity to the cold junctions. This presents a problem with regard to isolating the hot and cold junctions from each other for more efficiency without increasing the length of the junctions beyond current practice because of cost.

It is contemplated in the present invention to keep the fluid media in channels between hot junctions and cold junctions, respectively, to flow at right angles with respect to each other.

It is, therefore, the primary object of the present invention to provide an improved matrix in a thermoelectric system whereby maximum efficiency is produced by special arrangement of fluid flow with respect to the hot and cold junctions.

The invention consists of the novel constructions, arrangements and devices to be hereinafter described and claimed for carrying out the above stated objects and such other objects as will be apparent from the following description of a preferred form of the invention, illustrated with reference to the accompanying drawing, wherein:

FIGURE 1 is a perspective view showing the arrangement of the panels and heat exchanger fins according to the present invention; and

FIGURE 2 is an enlarged fragmentary view of one of the panels in FIGURE 1, illustrating the arrangement of modules, groups of heat exchanger fins and insulation.

Like characters of reference designate like parts in the several views.

Referring now to FIGURE 1, a matrix **10** comprises vertically spaced horizontal panels **11**, **12**, **13** and **14** which are interconnected by arrays of horizontally spaced vertical heat exchanger fins **15**, **16** and **17**, which in turn define arrays of horizontal fluid channels **18**, **19** and **20**, respectively. The vertically spaced horizontal panels **11** and **14** have attached to their outer faces arrays of horizontally spaced heat exchanges fins **21** and **22**, respectively, which provide arrays of horizontal fluid channels **23** and **24**, respectively, that are covered by suitable means as, for example, metal cover panels **25** and **26**, respectively.

The vertically spaced horizontal panels **11**, **12**, **13** and **14** have incorporated therein a multiplicity of thermoelectric couples **27** having hot and cold junctions **28** and **29**. The panel arrangement is such so that the hot junctions **28** face each other in adjacent panels and the cold junctions **29** also face each other in adjacent panels. The panel arrangement is such so that the arrays of horizontal fluid channels **19**, **23** and **24** convey fluid between the arrays of heat exchanger fins **21**, **16** and **22** and extend substantially at right angles to the arrays of horizontal fluid channels **18** and **20** which, because of channel arrangement, convey fluid between the arrays of heat exchanger fins **15** and **17**.

The outer faces of the outermost fins of the arrays of horizontally spaced vertical heat exchanger fins including the faces of the adjacent ends of the vertically spaced horizontal panels may be covered with generally triangular shaped insulation blocks **30** as shown on the intake sides of the matrix **10** which are provided with ducts **31** and **32** that encompass the entrances to the arrays of horizontal fluid channels **19**, **23** and **24**; and **18** and **20**, respectively.

The exhaust sides of the arrays of horizontal fluid channels may also be provided with suitable ducts.

In operation, the matrix **10**, incoporated in an air conditioning unit, receives the air through duct **32**, from the outside or from the area to be cooled, depending on the amount of recirculation desired. The air then passes between the cold junctions through the arrays of horizontal fluid channels **18** and **20** into the area to be cooled. Outside air, or the air in the area to be cooled, depending again on the amount of recirculation desired, is taken into the duct **31** and passed between the hot junctions **28** and through the array of horizontal fluid channels **19**, **23** and **24** and thence to the outside. By this arrangement of air movement through the respective channels, maximum isolation of the air columns is procured. The columns of air are further isolated at the intake and exhaust areas by the triangular shaped insulation blocks **30**. The arrangement thus shown in accordance with the present invention provides a minimum heat transfer from one air stream to the other air stream.

While this invention has been described in connection with a specific embodiment thereof, it is to be understood that is by way of illustration and not by way of limitation and the scope of this invention is defined solely by the apended claims which shrould be construed as broadly as the prior art will permit.

I claim:

1. In a heat transfer system,

at least four panels disposed horizontally and spaced vertically from each other, each panel comprising a plurality of thermoelectric couples positioned to effect heating along one panel surface and cooling along another panel surface, said panels being so oriented that the heated surfaces of adjacent panels face each other and the cooled surfaces of adjacent panels face each other,

a first array of heat exchange fins connected to the heated surfaces of adjacent panels to define a first plurality of fluid-confining channels extending in a first direction,

and a second array of heat exchange fins connected to the cooled surfaces of adjacent panels to define a second plurality of fluid-confining channels extending in a second direction at substantially right angles to said first direction, thereby to improve system efficiency by positioning the inlet and outlet portions of the first channels as far as possible from the inlet and outlet portions of the second channels.

2. In a heat transfer system,

at least four panels disposed horizontally and spaced vertically from each other, each panel comprising a plurality of thermoelectric couples positioned to effect heating along one panel surface and cooling along another panel surface, said panels being so oriented that the heated surfaces of adjacent panels face each other and the cooled surfaces of adjacent panels face each other,

a first array of heat exchange fins connected to the heated surfaces of adjacent panels to define a first plurality of fluid-confining channels extending in a first direction,

a second array of heat exchange fins connected to the cooled surfaces of adjacent panels to define a second plurality of fluid-confining channels extending in a second direction at substantially right angles to said first direction, upper and lower cover panels disposed horizontally and spaced vertically from the uppermost and lowermost of said four panels,

and additional arrays of heat exchange fins, connected between the upper cover panel and the uppermost one of said four panels, and between the lower cover panel and the lowermost one of said four panels, to provide additional fluid-confining channels extending in one of said first and second directions.

3. In a heat transfer system,

at least four panels disposed horizontally and spaced vertically from each other, each panel comprising a plurality of thermoelectric couples positioned to effect heating along one panel surface and cooling along another panel surface, said panels being so oriented that the heated surfaces of adjacent panels face each other and the cooled surfaces of adjacent panels face each other,

a first array of heat exchange fins connected to the heated surfaces of adjacent panels to define a first plurality of fluid-confining channels extending in a first direction,

a second array of heat exchange fins connected to the cooled surfaces of adjacent panels to define a second plurality of fluid-confining channels extending in a second direction at substantially right angles to said first direction, and a plurality of insulation blocks, each of a length approximately equal to the length of said heat exchange fins and substantially triangular in section, each block disposed adjacent and parallel to a fluid-confining channel extending in one of said first and second directions to reduce undesired heat transfer, each block being effective to modify the fluid stream of an adjacent fluid-confining channel extending in the other of said first and second directions, and thus further reduce undesired heat transfer between the fluid streams moving at right angles to each other.

4. In a heat transfer system,

at least four panels disposed horizontally and spaced vertically from each other, each panel comprising a plurality of thermoelectric couples positioned to effect heating along one panel surface and cooling along another panel surface, said panels being so oriented that the heated surfaces of adjacent panels face each other and the cooled surfaces of adjacent panels face each other,

a first array of heat exchange fins connected between the upper cover panel and the first of said four panels, a second array of heat exchange fins connected between the second and third of said four panels, and a third array of heat exchange fins connected between the fourth of said four panels and the lower cover panel, said first, second and third arrays of heat exchange fins defining first, second and third arrays of fluid-confining channels all aligned in a first direction,

a fourth array of heat exchange fins connected between the first and second of said four panels, and a fifth array of heat exchange fins connected between the third and fourth of said four panels, said fourth and fifth arrays of heat exchange fins defining fourth and fifth arrays of fluid-confining channels, both of which channels are aligned in a second direction substantially normal to said first direction, thereby to improve system efficiency by positioning the inlet and outlet portions of the first, second and third channels as far as possible from the inlet and outlet portions of the fourth and fifth channels,

and a plurality of insulation blocks, each of a length approximately equal to the length of said heat exchange fins and substantially triangular in section, each block disposed adjacent and parallel to a fluid-confining channel extending in one of said first and second directions to reduce undesired heat transfer, each block being effective to modify the fluid stream of an adjacent fluid-confining channel extending in the other of said first and second directions, and thus further reduce undesired heat transfer between the fluid streams moving at right angles to each other.

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