

Title (en)

HEAT EXCHANGER FOR USE WITH OSCILLATING FLUIDS IN PARTICULAR IN A THERMOACOUSTIC CELL

Title (de)

WÄRMETAUSCHER ZUR VERWENDUNG IN OSZILLIERENDEN STRÖMUNGSMEDIEN, INSBESONDERE IN THERMO-AKUSTISCHER ZELLE

Title (fr)

ECHANGEUR DE CHALEUR POUR APPLICATION AUX FLUIDES OSCILLANTS NOTAMMENT DANS UNE CELLULE THERMOACOUSTIQUE

Publication

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Application

EP 03796162 A 20031204

Priority

- FR 0303591 W 20031204
- FR 0215296 A 20021204

Abstract (en)

[origin: FR2848293A1] A heat exchanger has an exchange surface S made of unitary elements of dimension L_c with heat exchange approximately F between a primary fluid at temperature T_f and a secondary fluid giving a wall temperature T_s , such that approximately $F/(T_f - T_s) = S.C.A.F.Lcn$, where F and A are characteristics respectively of the primary fluid and the acoustic wave, and C and n are both characteristics of the type of flow. The associated Reynolds number RE_{Lc} is between 3×10^3 and 3×10^5 and the passage dimensions D much greater than the thickness of the thermal layer limit δ_{tak} along the walls of the exchanger. The exchanger is made of a bundle of tubes of diameter D or of parallel plates spaced at a distance D and the constant C is 2.06 and the power n is $-1/2$. $F = \lambda.Pr^{-1/6}$ where λ is the thermal conductivity coefficient of the primary fluid and Pr its Prandtl number. $A = (2.(u_l)^{1/2}/\delta_{tak}(\omega)^{1/2})^{1/2}$ where u_l is the particular speed and ω the pulsation. Alternatively, the associated Reynolds number Re_{Lc} is greater than 3×10^5 and the passage dimensions D much greater than the thickness of the thermal layer limit δ_{tak} along the walls of the exchanger. In this case, C is 0.118 and n is $-1/5$. $F = \lambda.Pr^{7/15}$ and $A = 2(4/5).(u_l)^{(4/5)}/(\delta_{tak}^{(8/5)}.\omega^{(4/5)})$. An Independent claim is included for a thermal machine operating with an oscillating fluid containing at least one head exchanger as described above, and at least one thermoacoustic cell.

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