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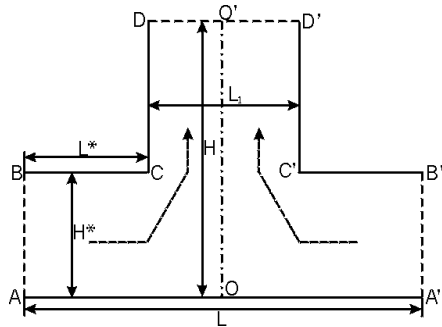
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### On a Problem of Thermal Convection with Unset Flow Rate

Danaev N.T., Darybaev.B.S., Urmashev B.A.

Institute of Mathematics and Mechanics, Kazakh National University, Al-Farabi,  
Kazakhstan, Nargozy.Danaev@kaznu.kz

**Abstract.** In the two-dimensional region  $\Omega$ , as shown in the figure, we consider a system of equations of thermal convection in the following dimensionless form /1/:



$$\frac{\partial \vec{u}}{\partial t} + (\vec{u} \nabla) \vec{u} + \nabla p = \frac{1}{\text{Re}} \Delta \vec{u} - \frac{Gr \vec{g}}{\text{Re}^2 |\vec{g}|} T,$$

$$\text{div} \vec{u} = 0,$$

$$\frac{\partial T}{\partial t} + (\vec{u} \nabla) T = \frac{1}{\text{Pr Re}} \Delta T,$$

where  $\vec{g} = (0, -g)$ ,  $Gr = \frac{g \beta \Delta \theta L^3}{\nu^2}$ ,  $\text{Re} = \frac{L \sqrt{\rho \Delta p}}{\mu}$ ,  $\text{Pr} = \frac{\nu}{\lambda}$

dimensionless parameters of Grashof, Reynolds and Prandtl,  $\Delta \theta$  - a characteristic temperature difference,  $\nu$  - kinematic viscosity,  $\lambda$  - coefficient of thermal diffusivity.

The boundary conditions are as follows:

on top of the solid wall (BC, CD):

$$u = v = 0, T = 0,$$

on the bottom wall (AA'):

$$u = v = 0, T = 1,$$

entrance boundary (AB):

$$v = 0, p = 1, \frac{\partial T}{\partial x} = 0;$$

on the outflow boundary (DO'):

$$u = 0, p = 0, \frac{\partial T}{\partial y} = 0.$$

On the basis of the proposed iterative algorithm /2/, carried out numerical calculations and obtained the flow pattern for different Grashof and Reynolds numbers. It was established that at sufficiently high Reynolds number ( $\text{Re}(\delta p) = 500-700$ ), that is, for sufficiently strong flow, caused by the pressure drop, increasing the temperature difference between the walls (eg, numbers  $Gr = 5 \cdot 10^5$ ) does not lead to a marked increase in flow rate.

1. Alibiev D.B., Danaev N.T., Smagulov Sh.S. Numerical solution of a heat problem with the consumption of unset flow rate // Computational technologies. – Novosibirsk, 1995. -B.4. - №12. –P.10-28.

2. Danaev N.T., Urmashev B.A. Iterative schemes for solving the auxiliary grid of Navier-Stokes equations // Journal of KSU, a series of mathematics, mechanics, computer science. – 2000. - №4. - P.74-78.

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