For example, with $\gamma=1$ one observes a dual effect of the injection $R_0$ on the critical value $R_*$. The results of the study indicate that with $R_0>150$ one observes almost ideal flow over a channel length of more than two to three diameters.

Use of the results of the study of stability obtained for $R_0>200$ is helpful for the investigation of the stability of ideal flow [1].

We note also that allowance for the nonparallel nature of the channel walls in Eq. (2.1) leads to a decrease in the critical Reynolds numbers.

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LITERATURE CITED


INDUCTION OF SUBSONIC WIND TUNNELS WITH SLIGHT PERFORATION

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In contrast to [1-3], where a single condition for the entire boundary, connecting the components of the perturbed velocity tangential and normal to the wall, is set up at the stream boundaries, which coincide everywhere with the walls of the perforated tunnel, in the present work the stream boundaries are divided into sections of two types.

In sections of the first type, which coincide with the wall, the gas pressure $p$ is greater than the pressure $p_K$ in the chamber and the gas flows over from the main stream into the chamber. In these sections $p$ cannot be less than $p_K$ or else gas would begin to enter the tunnel from the chamber and the main stream would be displaced from the wall. With arbitrary $k$ one should use the traditional ratio between the components of the perturbed velocity tangential and normal to the wall as the boundary condition at these sections of wall. If $k \to 0$, then with a finite pressure difference $p - p_K > 0$ the amount of gas forced out of the stream into the chamber also approaches zero, i.e., in these sections the wall becomes impermeable and in the limiting case the boundary condition $v_n = 0$ is valid at them, where $v_n$ is the velocity normal to the wall.

In boundary sections of the second type, which stand away from the tunnel walls, the moving gas borders on the stationary gas of constant pressure $p_K$ which fills the chamber and the volume included between the wall and the stream boundary. In these boundary sections $p = p_K = \text{const}$.

Now we can formulate the following boundary problem on flow over bodies by a subsonic stream of ideal gas bounded by cylindrical walls whose perforation factor approaches zero. This can be called the limiting boundary problem.

The components $u'_C = u - u_K$, $v'_C = v$, and $w'_C = w$ of the perturbed velocity along the axes $x_C$, $y_C$, and $z_C$, respectively, must satisfy the linearized equation

$$ (1 - M^2) \frac{\partial u'_C}{\partial x} + \frac{\partial v'_C}{\partial y} + \frac{\partial w'_C}{\partial z} = 0 $$

with the boundary conditions

$$ u'_C = 0, \quad p' = p - p_K > 0 \quad (u'_C < 0) $$

$$ p = p_K = \text{const} \quad (u'_C = 0), \quad \int_{-\infty}^{x} v'_C \, dx < 0 $$

at boundary sections of the first and second types, respectively.

Here $u_C$ is the velocity which corresponds to the pressure $p_K$, through the Bernoulli–St. Venant equation, while $u$, $v$, and $w$ are the components of the total stream velocity.

By the well-known change of the variables, the problem (1.1)-(1.3) is reduced to the limiting boundary problem for an incompressible fluid:

$$ \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0 $$

with the boundary conditions

$$ u = 0, \quad p' = p - p_K > 0 \quad (u < 0) $$

$$ p = p_K = \text{const} \quad (u = 0), \quad \int_{-\infty}^{x} v \, dx < 0 $$

at boundary sections of the first and second types, respectively.

Here $u_K$ is the velocity which corresponds to the pressure $p_K$, through the Bernoulli–St. Venant equation, while $u$, $v$, and $w$ are the components of the total stream velocity.

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