substances. Therefore for the consumer represents alive interest knowledge of concrete size of "a free flow" in natural and relative units (in shares or %). Depending on purpose and necessities the consumer uses a woven fabric with various density of an arrangement of threads: from a gauze, which sizes of pores exceed thickness of threads at 5-10 time, up to superdense technical woven fabrics without free space between threads.

On the basis of this practical purpose the designer by development of new structure of a woven fabric should be guided well in the field of knowledge of through pores, their dependence on parameters of threads and a woven fabric, a phase structure.

2. Literature considerations

Concept «Porosity of a woven fabric» for the first time has entered into practice of the analysis of woven fabrics F.T.Peirce (1937). According to designations on Figure 1 the area of an unit cell of a woven fabric of a plain weave will be equal $A_{uc} = f_{wp} \times f_{wft}$. Then at known diameters of threads of a warp d_{wp} and a weft d_{wft} the area of one pore:

$$A_p = (f_{wp} - d_{wp})(f_{wft} - d_{wft}) \qquad (1)$$

Porosity of one unit cell $P_{CF(uc)}$ is defined as ratio of the projected area A_p of the pore to the area A_{uc} of the unit cell:

$$P_{CF(uc)} = \frac{(f_{wp} - d_{wp})(f_{wft} - d_{wft})}{f_{wp} \times f_{wft}} \qquad (2)$$

However, on the area of the whole repeat of a woven fabric interlacing everyone is pore can have a various configuration and the area. Such distinction depends on a kind of threads interlacing. Therefore, in our opinion, it is expedient to define further porosity of a woven fabric on all area of one repeat of woven fabrics.

Porosity of interlacing repeat $P_{CF(ir)}$ is defined as ratio of the projected areas of the all pores in repeat to the all

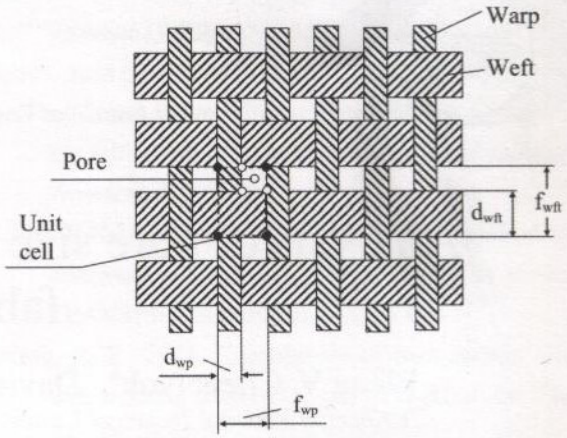

Fig. 1. Geometrical model of Peirce.

area of the repeat of interlacing of warp and weft threads in woven fabric. On our opinion this definition $P_{CF(ir)}$ is permit more accuracy the value of the all POROSITY of the woven fabric calculation.

In some cases there is a need to characterize porosity in relative units. Therefore Peirce (1937) has offered for use still and the relative characteristic of porosity $P_{CF(r)}$, which is defined as the RATIO of the projected areas of the warp εwp or weft ε_{wft} threads or sum of areas of the warp and weft threads to the total area of the woven fabric:

$$P_{CF} = (1 - \varepsilon_{wp})(1 - \varepsilon_{wft}) = 1 - \varepsilon_{wF} \qquad (3)$$

where: $\varepsilon_{wp} = D_{wp} \times d_{wp} / 100$;
$\varepsilon_{wft} = D_{wft} \times d_{wft} / 100$; (4)
$\varepsilon_{wF} = \varepsilon_{wp} + \varepsilon_{wft} - \varepsilon_{wp} \times \varepsilon_{wft}$,

Where: D_{wp} and D_{wft} - number of warp and weft threads on 100mm of woven fabric.

Novikov (1946) characterizes porosity and air permeability of woven fabric concept «The Direct Air Flow» which is understood as the area of a pore. Put into all repeat a plain weave (Fig. 2) size of a direct air flow, i.e. the area of all pores repeat, it expresses in % the following equation:

$$P_{CF(ir)} = \frac{\ell_{wp} \times \ell_{wft} - 2(\ell_{wp} \times d_{wp} + \ell_{wft} \times d_{wft} - 2d_{wp} \times d_{wft})}{\ell_{wp} \times \ell_{wft}} \times 100 \qquad (5)$$