$$a\ a\ a\ a\ b\ b\ b\ b\ c\ c\ c\ c$$
$$a\ a\ a\ a\ b\ b\ b\ b\ c\ c\ c\ c$$
$$a\ a\ a\ a\ b\ b\ b\ b\ c\ c\ c\ c$$
$$a\ a\ a\ a\ b\ b\ b\ b\ c\ c\ c\ c$$
$$a\ a\ a\ a\ b\ b\ b\ b\ c\ c\ c\ c$$

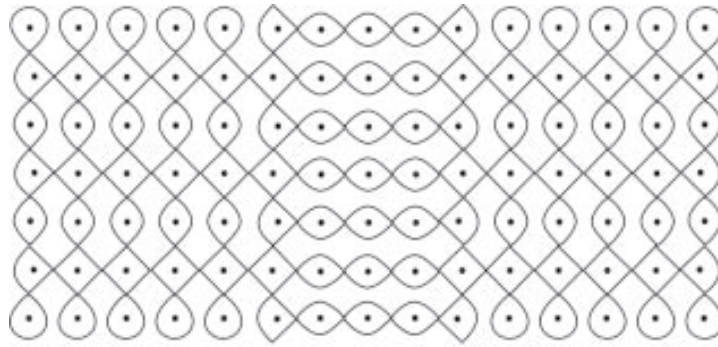Fig. 3. Array of three equal size blocks of *a*'s, *b*'s, *c*'s.

Fig. 4. A P System Kolam.

strings are sent to membrane 4 wherein pictures as in Fig. 2 are generated.

The picture language generated by Π_2 consists of rectangular arrays of three equal size blocks of *a*'s, *b*'s, *c*'s (Fig. 2).

4. Application to "Kolam" Pattern Generation

"Kolam" refers to decorative artwork drawn on the floor with the kolam drawing generally starting with a certain number pattern of points and curly lines going around these points. Classification of kolam patterns based on their generation by different array grammars has been considered by SIROMONEY *et al*. (1974). The Sequential/parallel rectangular array P systems introduced here, being more powerful than the 2D matrix grammars, are suitable in generating kolam patterns that cannot be generated by regular 2D matrix grammars. The approach for generation of kolam patterns adopts a technique referred to as Narasimhan's method of kolam generation (SIROMONEY *et al*., 1974). The kolam patterns are coded as rectangular arrays of symbols. These arrays are generated using the P systems introduced here and then substitution of the basic units of the kolam pattern takes place yielding the desired patterns.

As an illustration we consider the kolam pattern in Fig. 3.

The kolam pattern in Fig. 3 can be expressed as an array (Fig. 5) using primitive patterns by NAGATA and ROBINSON (2006).