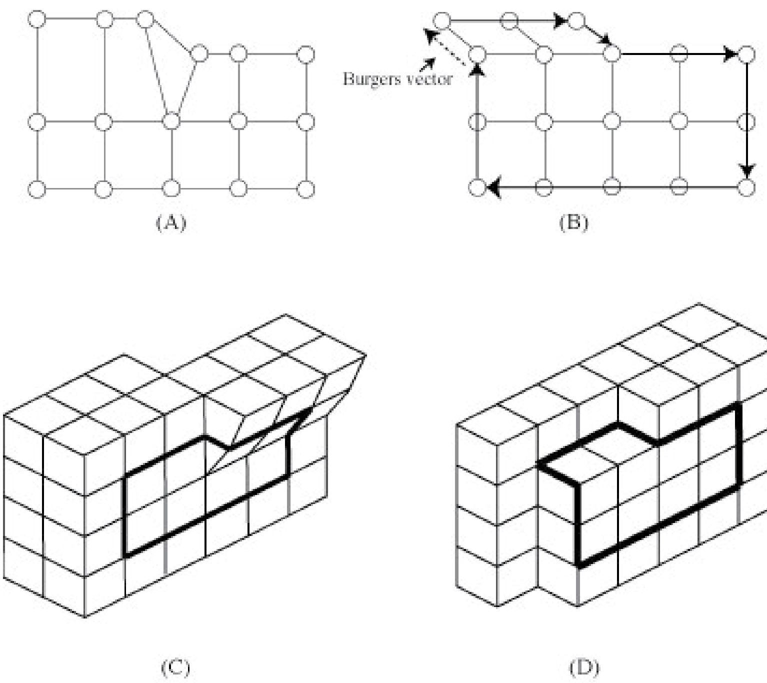

Fig. 2. (A) Lattices with a screw dislocation. (B) Corresponding perfect lattice and Burgers vector. (C) Three-dimensional expression of the screw dislocation. (D) Corresponding perfect lattice.

In a simplical complex, we can define Betti numbers that are topological invariants of a crystal lattice (the complex), i.e., they depend only on the topology of the space, so it is shared by any topological space homeomorphic to the space (see SINGER and THOPE, 1967 for rigorous definition). The zero Betti number b_0 is defined by the number of geometrical connection of K, that is, b_0 is the number of connected components. For instance, in Figs. 1, 2(A) and 2(B), we have $b_0 = 1$ in each crystal lattice. On the other hand, if the four crystal lattices constitute a set K while separated from each other, we have $b_0 = 4$. The first Betti number b_1 is defined by the number of independent circuits. According to Homology theory, the alternative sum of the nth Betti number b_n gives the Euler characteristic of a crystal lattice (the complex) χ:

$$\chi = \sum_{n=0}^{1} (-1)^n b_n = b_0 - b_1. \tag{2}$$

Euler characteristic is also called the Euler number or the Euler-Poincare characteristic. The Euler characteristic of a lattice is made of 0- and 1-simplices. On the other hand, Euler formula for a crystal lattice (the complex) gives