

Planar Burrs

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Usually “burrs” are considered to be three-dimensional puzzles. The most common are the six-piece burrs, which occur in many different designs. The most interesting are those with internal voids, because these can be so constructed that several moves are needed to separate the first piece. Since about 1985 a “Most Moves Competition” for six-piece burrs has been running. Bill Cutler’s “Baffling Burr” and Philippe Dubois’ “Seven Up” were the first attempts. I am not completely aware of the state of the competition, but as far as I know Bruce Love is the record holder with his “Love’s Dozen,” which requires twelve moves!

Recently, I received from Tadao Muroi, in Japan, an ingeniously designed puzzle that he called “Four Sticks and a Box.” The puzzle has no more than four movable pieces, but nevertheless requires twelve moves (!) to get the first piece out of the box. Muroi wrote me that his idea was inspired by a design of Yun Yananose, who was inspired by “Dead Lock,” a puzzle of mine. Though Muroi’s puzzle is three-dimensional, all interactions between the four pieces take place in one plane, so in some sense it might be considered a planar burr. However, it cannot be realized as a planar burr because in two dimensions each piece should be disconnected.

True planar burrs are rarely found. The first design I saw is Jeffrey Carter’s, depicted in A. K. Dewdney’s *Scientific American* column (January 1986, p. 16). Carter’s puzzle has four pieces. The puzzle is not very difficult to solve, with only three moves needed to remove the first piece.

The idea of a two-dimensional burr immediately appealed to me, and in April 1986 I made some attempts to find a design of my own. One result is the “Zigzag” planar burr, depicted in Figure 1.

This puzzle has two congruent large pieces and two congruent smaller ones. It takes five moves to separate the first piece. To solve the puzzle, the two large pieces move into each other along a zigzag line, until the two smaller pieces are free. The same movements, in backward order, will separate large pieces.

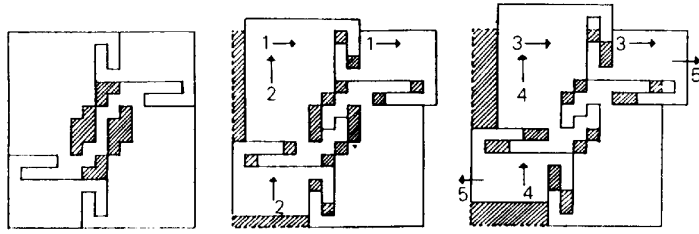


Figure 1. Zigzag.

Some months ago, particularly inspired by Muroi's "Four Sticks" (so closing the circle of mutual inspiration), I took up the challenge again and succeeded in finding a new design of a planar burr, which I have called "Nine and One-Half Moves."

This is a true two-dimensional burr of only *three* pieces and it needs no less than nine and one-half moves to separate one piece from the other two. The three pieces of the puzzle form a square with internal voids.

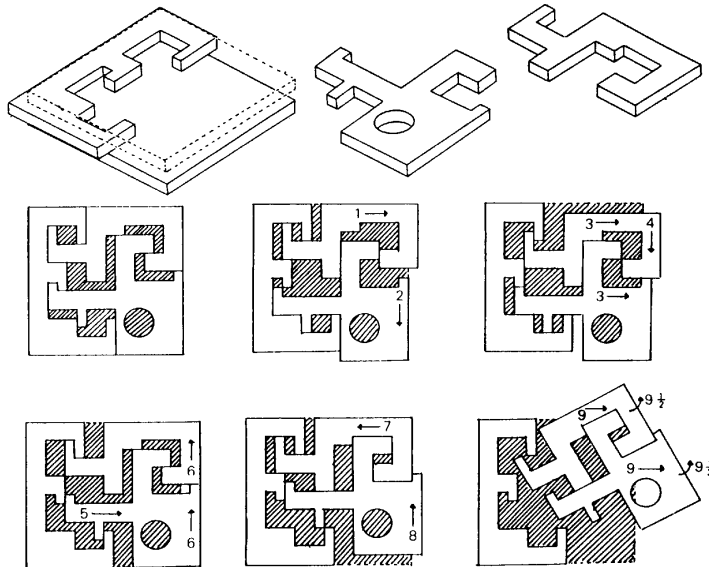


Figure 2. Nine and One-Half Moves.

The pieces, and the moves required to separate the pieces are depicted in Figure 2. The ninth move is a slide-plus-rotate move, so I count it as a move and a half.

In order to prevent us three-dimensional people from cheating, we can glue one piece of the puzzle between two square plates as indicated in the top left corner of Figure 2. By using opaque plates the design is hidden as well. A round hole can be used to hide a coin.