

CLUTCH BOX

BY LEE KRASNOW

This puzzle box is quite difficult! I consider this to be a three-move box. However it would be more accurate to call it a three-phase box. The external dimension of the puzzle is a cube 67 millimeters on each side. I have made two versions of this box—the hinged lid variety has a hollow inner cavity measuring (in millimeters) 29.7 x 47.2 x 37.2 whereas the removable lid variety has a cubic cavity 37.2 millimeters on each side.

In August of 2003, this puzzle design won the Puzzlers' Award at the IPP23 Design Competition in Chicago, USA.



Clutch Box #1

The idea for the main locking mechanism (for which the puzzle is named) was suggested to me by Dave Rossetti at the beginning of 2003. I thought about it for a while and came up with a few ideas, but given my busy schedule I was unable to work on it. I set aside a few days in March and built the lid of the box, which contains the clutch mechanism.



Clutch Boxes #1 & #2—Note the hinged lid and the untapered lock on #1 and the spiral pattern of the top panel on #2.



Clutch Box lid mechanism

Having a working prototype in hand, I realized the concept was quite good, and within a few more weeks I worked out the design for the remainder of the box and completed the prototype. The nature of the clutch mechanism (as I designed it) requires that a panel slide around freely in both directions. I did not want the unsolved puzzle to have such readily apparent playability, which is why I surrounded the box with a sheath which holds the sliding panel in place when the box is closed. Of course, the sliding action of the sheath was just as big of an aesthetic problem for me, thus I decided to hold it firmly in place with the four rocker locks, which are not at all apparent, even for puzzle experts. The end result of this design process is a puzzle that feels solid in your hands—nothing at all moves until you find the rocker locks. One of my favorite aspects of this puzzle is that each of these steps serves a definite purpose—the whole point of the puzzle is to demonstrate the clutch mechanism, the rest of it is simply an attempt to do so in an elegant manner.

I have made these boxes on three different occasions. My submission to the IPP23 Design Contest was modified slightly from the original prototype—I made the contest boxes so that the rocker locks can hold the inner box in the extended position, which not only makes the puzzle easier to manipulate, but also helps to ensure that the tips of the rockers do not break as the box is handled. Additionally, I tapered the lock which holds the lid shut so that it may be closed by simply pushing on it, rather than having to solve it all over again in order to close the lid. Other than these changes, the design remained the same however I did do a more elaborate spiraling inlay on the top panel. (Meant as a clue.)

The third time I made this box, I redesigned the structure so the lid is removable, rather than being connected to the body of the box by

hidden hinges. This changed the size of the internal cavity (as mentioned above) however it did not really change the functionality of the box. The only other modification was that I tapered the sliding panel so it is somewhat self-centering when pushing the box back into the outer sheath.



Clutch Box #7 with removable lid

Clutch Box Solution

1 The first step is to orient the box. Find the lid, which is easy because it has the spiralling inlay pattern. Notice that of the four adjacent faces to the lid, two of them overlap the other two. In this photograph, see how the blue arrows point to the bottom left face overlapping the other two faces. Now that you have the cube oriented like this photograph, gently press on the triangular inlay wedges where the red arrows point. Do this on the left and right sides, front and back.



2 In this photograph I've flipped the cube up on its side so that you can see how these wedges, which I call rocker locks, move.



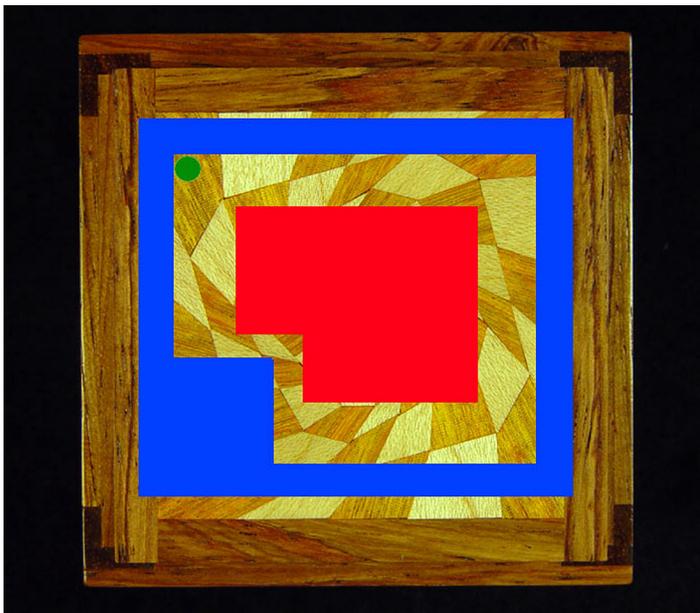
3 With all four rockers unlocked, press the center of the cube up from the outer sheath. Once it's as far as it will go, lock the rockers back in place so that they don't accidentally get chipped or broken.



4 The section that has risen out of the sheath is the lid to the box. The top five millimeters of the lid is a panel that slides freely in both directions. Do not attempt to twist the top panel! Twisting will break the box.



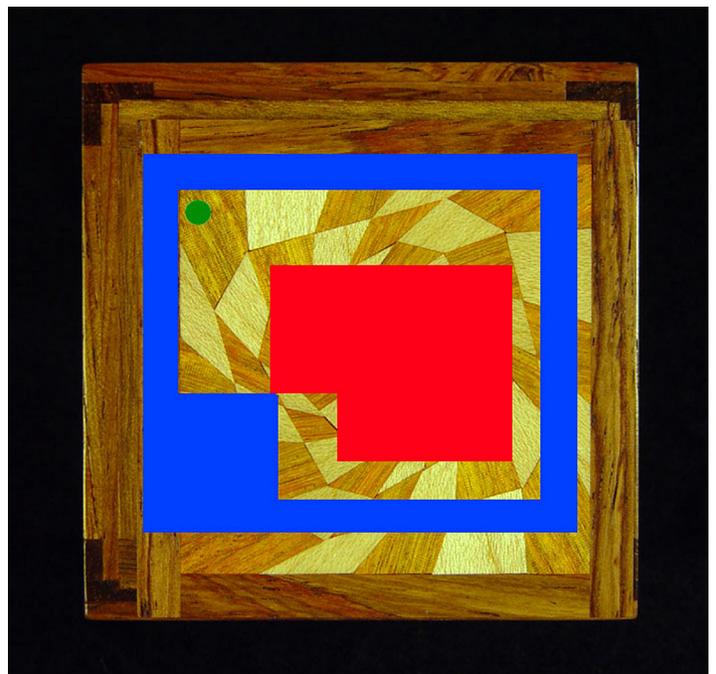
5 Hidden inside the lid is a tiny metal ball rolling around in a simple maze. The sliding top panel is connected to a red block which sits in the center of the maze. The blue walls of the maze are connected to the lock which holds the lid in place. This diagram shows the relationship between the red and blue walls when the top panel is centered on the lid. Notice that the green ball can roll all of the way around the perimeter of the blue walls. If you listen very carefully to your Clutch Box, you will be able to hear the ball rolling around, and you should be able to tell which corner has the step in it.



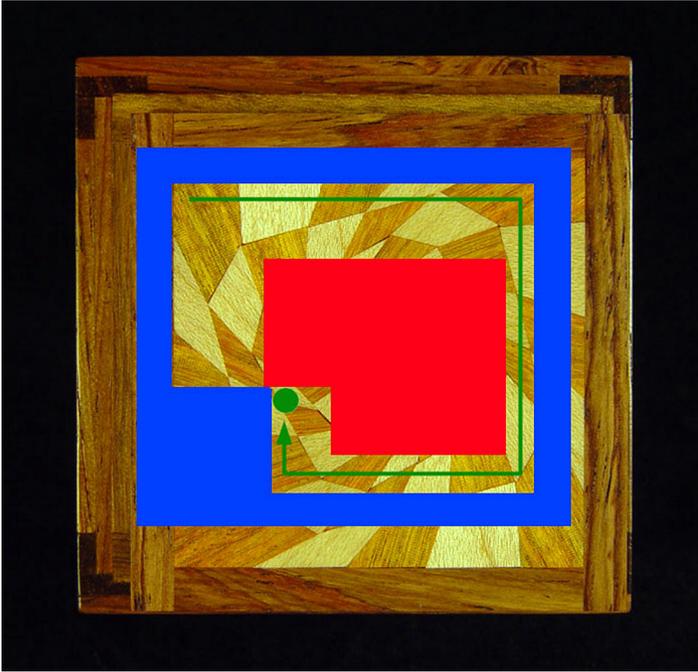
6 This photograph shows that I've moved the top panel into the lower right corner. Study this photograph, and the photograph in step 4 to see the difference. Notice the orientation of the adjacent panels—the ones that overlap (the ones with the rocker locks) are on the top and bottom of the picture.



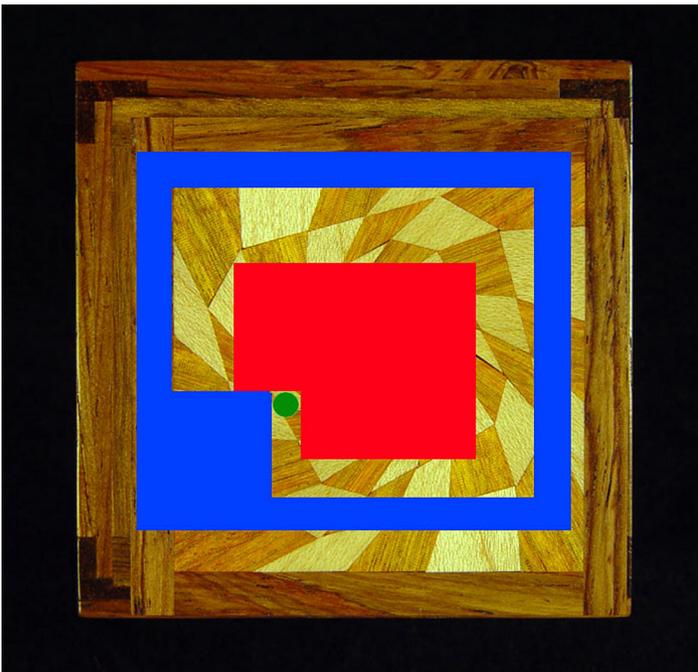
7 See how moving the panel to the lower right corner has changed the relationship between the red and blue shapes in this diagram. Now the ball is not able to travel the full perimeter of the blue walls because the red block has gotten in the way.



8 If you hold the top panel in the lower right corner, you can roll the ball clockwise around the perimeter of the blue walls and it will get stuck in the pocket that has formed between the red and blue blocks. As you do this, it is not necessary to flip the box on its side and roll it around—instead simply tilt the box slightly and roll it as if you were rolling a marble on a dinner plate.



9 Now that the ball is trapped in the pocket, move the panel towards the bottom left corner. The panel will move about half way and then stop because the ball is in the way. If you push with moderate force, the blue walls will move, and the lid will unlock.



10 The lid is spring loaded, so when you open the lock, it will rise up out of the box, as shown in the photograph. Congratulations! To close the box again simply push the lid back down into place, and the lock will automatically reengage.



11 If you have followed these instructions correctly, but the box still won't unlock, try these tips: Most likely you have got the box flipped upside down. Rotate it 180 degrees and try again. Listen carefully to how the ball rolls around. If the sound the ball makes doesn't match what you would expect, then you've probably picked the wrong corner. If you've tried every corner and it still doesn't work, then try moving the panel a very small distance away from the lower right corner, and listen to know if the ball is now able to roll around the perimeter and into the pocket. It is possible that your climate has caused the wood inside the lid to expand enough so that the ball cannot roll between the red and blue walls.

