Top Spin / No. Crunch

Patented by F. Lammertink 1989, made by Binary Arts.
(left "Top Spin", right "No. Crunch"; both plastic, 6 inches)

Numbers slide around the loop, and spinning the disc reverses the order of 4 numbers; the goal is to mix up and then restore to increasing clockwise order.

Notation:
- **R** = rotate the numbers right (clockwise) one position
- **L** = rotate the numbers left (counter-clockwise) one position
- **S** = spin the disc (180 degrees)

*Note:* S advances one number 3 positions clockwise, one number 1 position clockwise, one number 1 position counter-clockwise, and one number 3 positions counter-clockwise.

**Solution from the directions:**
1. Solve 7 to 20 by working from 19 down to 7, one number at a time:
   A. Advance 3 positions clockwise until within 4 positions of destination.
   B. Move counter-clockwise until exactly four units from destination.
   C. Spin the disc.
2. Get positions 1 to 6 as close to solved as you can.
3. The following transformation advances a number in the left position of the disc 4 positions clockwise without affecting any other numbers:
   
   \[
   \text{S L S R S L S}
   \]

   (That is, **LRL** with interspersed **S**'s.)

   So to exchange two adjacent numbers, repeat this sequence 5 times to make a number go all the way around and come back exactly one position to its right (remember each time to put the number in the left position of the disc).

**Further Reading**


*Chang Patent*, from: www.uspto.gov - patent no. 5,622,368

*Protheroe Patent*, from: www.uspto.gov - patent no. 332,211

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