

# Master Lock's

by  
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# Answer to Bumping

**In** the world of padlocks, Master Lock is king. Since its difficult beginning in 1921 to its position as the world leader, producing over 200,000 locks a day, Master Lock has been involved in innovation since the beginning, (*see photo 1*). Their latest innovation is the development of BumpStop™.

As you all know, in 2006 the media went nuts about bumping. Bump keys were available all over the internet. Videos on how to use bump keys could be viewed on the internet by anyone that was interested.

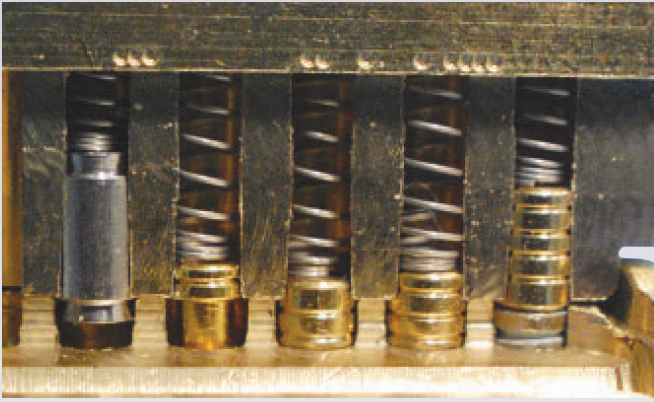
Unlike picking, little skill is needed to bump the average locks. To show how simple bumping can be in some cases, children were used to demonstrate the method. In an effort to satisfy the consumers' fears of bumping, manufacturers immediately worked on solutions to the problem.

Master Lock did not want to redesign the entire shell and plug, so they went inside the assembly to find a solution. However before you can fix something, you have to know exactly what the problem is.

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1. Here are several of the Master Lock and American Lock products that are using BumpStop.



2. This is a cutaway that allows you to see the parts in action. Stainless steel springs can be seen at the top.

Master Lock discovered that during the bumping process, the top and bottom pins when struck, launch upwards as a single pin while compressing the spring. The bottom pin receives its rebound energy and drops below the shear line allowing the plug to rotate inside the shell.

To fix this problem, Master Lock changes two things inside the assembly. The simplest change was to replace the conventional springs with stainless steel springs, (see photo 2). It was found that after a number of bump attempts, the springs became weak, making bumping easier. The new stainless steel springs will take many times the abuse when compared to the conventional springs. But this was only a part of the solution. The real magic is in what they did next.



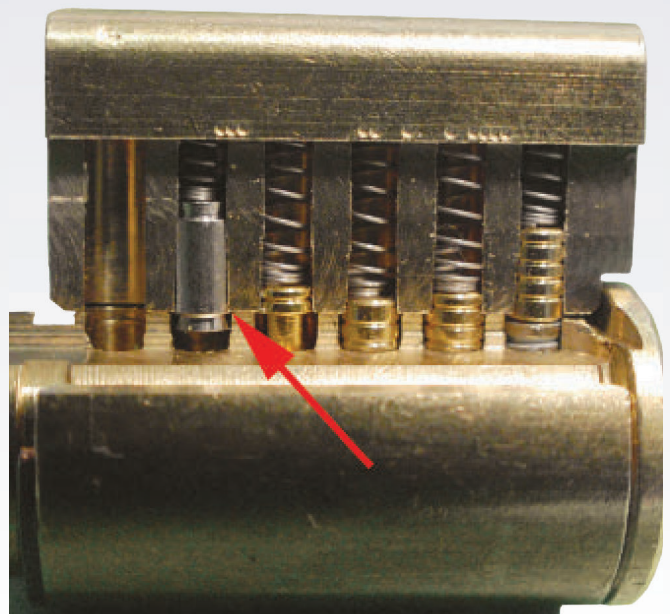
3. The BumpStop pin has a unique design feature. The reverse taper at the end of the pins is smaller in diameter than the rest of the pin.

When you measure the inside of a pin chamber, you may expect to have the same dimension in the plug as you would the shell. Well, this is not the case. If this were true, the slightest bit of an alignment problem would stop the pins from smoothly moving

across the shear line from plug to shell or shell to plug. The problems are obvious.

To solve this problem, manufacturers have always made the pin chamber hole in the shell a little larger than the pin chamber hole in the plug. We are not talking about a lot of difference, but enough to ensure smooth operation of the assembly. This is why Master Lock was able to put their new pin into action.

For this example I am using a Master Lock padlock. The standard top pin has a diameter of 93 thousandths, just like the bottom pins. The pin chamber in the plug is 94 thousandths. This leaves only 1 thousandth of an inch of slop for the pin to move. Don't forget that the shell has a larger diameter.



4. As you can see, the BumpStop pin sits on top of the plug after the key is removed.

The magic with BumpStop is in a single top pin. This pin is made of stainless steel. The BumpStop pin has a length of 188 thousandths, and a diameter of 101 thousandths over the majority of the pin, (see photo 3). The ends of the pin have a reverse taper with a diameter of 90 thousandths.

Because the BumpStop pin is larger, it sits on top of the plug instead of sitting on top of the bottom pin like all the others, (see photo 4). Only the smaller diameter projection on the pin sticks into the plug. This leaves an air gap between the bottom pin and the new BumpStop top pin.

During the bumping process, the energy that usually drives both pins up at the same time, only drives the bottom pin upward. The energy of the bottom pin has to be transferred to the top pin so it can be lifted above the shear line. This is much less efficient. Why? I had the same



5. Most Master Lock and American Lock products have BumpStop available.

question and I got an unusual answer from Billy Edwards with Master Lock.

Since the BumpStop pin is larger than the pin chamber in the plug, it covers the hole like a lid on a pot. This is where it gets interesting. When the bottom pin starts its upward travel caused by a bump key, the pin has to push through the air that is trapped inside the pin chamber in the plug. This additional resistance prevents a sufficient amount of energy from transferring to the top pin. That small portion of the top pin that does enter the pin chamber of the plug is enough to prevent rotation.


If you have a hard time believing this, let me give you another example. You will need a piece of PVC pipe and a small ball or marble that is very close to the inside diameter of the pipe. If you drop the ball into the pipe it will pass through at almost the same speed that it passes through the air when dropped. If you hold your finger over the bottom of the pipe and drop the ball, an amazing thing happens. The ball will pass through the pipe like it is moving in slow motion.

With your finger blocking the exit for the air inside the pipe, the air has to pass around the edges of the ball and back out the top. I noticed this when I was building a hand operated water pump a few years ago. It is the same principal but at a larger scale than the pin chamber. What a great idea! I guess that is why there is a patent pending on the BumpStop technology. Along with BumpStop, you will still find spool pins and serrations on other pins.

To test these locks for bumping, I started with the Master #3 padlock. I made bump keys and sat in front of the TV for 2 hours bumping. I had no luck, so I got out an older #3 Master Lock. I had it bumped in about 2 minutes. I guess that proved my technique wasn't all that bad. I failed to bump the Master deadbolt as well as the American Lock.

Master Lock and American Lock have both received a Grade 6 rating for bumping when tested using the new ASTM F883-09 standard. The quality of the lock assembly is only improved by the addition of BumpStop. Master Lock and American Lock have BumpStop available on almost every product in their lineup, (see photo 5). It is a simple solution to a problem that was presented to the public only a few years ago. It looks like for all practical purposes they have the bumping problem solved.

Their door locks are cost effective, offering BumpStop protection starting at only \$30. Their commercial and high security padlocks with BumpStop range from \$10-\$90.

For more information on BumpStop or any of the other products from Master Lock Co, visit their web site at [www.bumpstopsecurity.com](http://www.bumpstopsecurity.com). Circle 246 Rapid Reply. 

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