Funny Noises

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Great Expectations II

Not just a matter of opinion.

A telegraph key or paddle has one or more levers which are moved by hand, emulating a simple electrical switch. As such, there must be some sort of mechanism to return the lever to its resting position after it has been moved. If you push it to make contact, then something must push it back when you let go. During the first hundred years of telegraphy, this return force was provided by a spring of one sort or another. Admittedly, a wide variety of springs and spring materials were employed, starting with springy pieces of brass in the very oldest of "strap" keys and evolving through various coil springs, leaf springs, and even torsion springs. But by far the most common, and most successful, has been the simple helical or "coil" spring, whether used as a compression spring or a retraction spring, on straight keys, bugs and paddles.

After World War II, small and powerful magnets became readily available and so there was a movement by some keymakers to use magnets to replace the springs in keys and paddles. But those keymakers were generally not engineers or scientists. They didn't even have to be competent Morse operators,. So perhaps it is no surprise that magnets, like ball-bearings, are a less than ideal solution to the problem posed by the key or paddle. Like ball-bearings, magnets must be severely over-engineered in order to effectively replace a much simpler device.

There are three basic problems with magnets as compared to springs.

1. **Magnets are expensive**. You can't use just any dime-store horseshoe magnet, you have to use strong, miniature rare-earth magnets which tend to be expensive all by themselves. You can have two magnets-- one on the lever and one on the post– or one of the two magnets can be replaced with a ferrous material. Either either case you need to provide a means of adjusting the gap between the magnets (or magnet and anvil) to provide the correct amount of tension.. You must also decide whether the magnets will work in attraction or repulsion mode, which determines how they are mounted on lever or post.

2. **The magnetic field is not linear**. It follows something similar to the inverse square law, which says the strength of a radiated field or energy is inversely proportional to the square of the distance from the source. In practical terms, this means that when you move a lever that is magnetically tensioned a given distance, working against the pull of a magnet, the force required to continue the motion will get less and less, the farther you go. That is what gives many magnetic paddles a distinctive "snappy" feel as you must overcome more resistance to start the

movement than to complete it. Some guys think that's cool, but a competent high speed operator will find it intrusive. You can design around this "snappy" effect by placing the useful adjustment range away from the extreme maximum of attraction. In other words, you can use magnets that are much stronger (and expensive) than strictly necessary, and place them farther apart so that the effect appears to be more linear. But regardless of how you configure the factors described above, there will still be a relatively small range of useful adjustment, and adjustment will need to be very precise (implying more expense, for more finely-threaded adjustment screws). Again depending on a whole lot of variables, you may be able to feel (or need to adjust for) a difference of a couple thousandths of an inch.

3. **Magnetic materials have a very high coefficient of thermal expansion**. This means that they expand when they get warmer, and contract when they get colder. A change in shack temperature of as little as ten degrees can send a magnetic paddle right out of adjustment because the dimensions of the magnet(s) have changed by a few thousandths of an inch. So unless you are operating in a wine cellar or other fixed-temperature environment, you can expect to have to adjust your magnetic paddle more frequently than your spring-tensioned paddle.

That's three more or less scientific reasons for preferring springs to magnets in keys and paddles. From a strictly technical point of view, if you spend more on a magnetic paddle than on the equivalent spring-tensioned paddle, you are wasting your money, which is foolish. If you design and make a paddle with magnets rather than springs, you are wasting your customers' money, which is sinful. Or would be if we were all 100% objective scientific types instead of amateurs. Guys do indeed think that magnets are cool, and it would be remiss of me to underrate that as a marketing factor.

The only real bright-line in paddle and key design is precision machining. Once you make a "precision" paddle or key, the variables are all conceptual and subjective; the cost will be whatever the maker wants to spend on materials and labor, and the price will be whatever the market will bear. You can't make a silk purse out of a sow's ear, but you can make something that looks like a purse and convince your customers that it is better than silk.

Around 1998 when the original QRP-L internet reflector was coming into its own, the list was flooded with reports one afternoon of a mysterious "ditter" on 40M. Starting around 1pm, an endless string of dits was heard across the country. At around 2:30, the mystery dit string turned into an endless string of "di-dahs" or alternating dots and dashes. Around 5:30, the mystery signals suddenly disappeared, and a list member posted an apologetic note saying that he was responsible. He had left his newly built QRP transceiver turned on when he went to work in the morning. Around 1pm the sun came in his window and warmed up his magnetic paddle, sending it into constant dit mode. An hour later the sun was shining on both sides of the paddle, resulting in the endless string of "di-dahs."

A few months ago a customer called to talk about a high-end spring-tensioned paddle that he had recently purchased. He simply could not believe how "stable" it was. It replaced a relatively inexpensive magnetic paddle that, he said, required constant readjustment. He told me that he had never had another paddle, and just assumed that the first thing you do when you start an operating session is to adjust your paddle. The sping-tensioned paddle that I had sold him was the same one that I use in my drafty basement, and which requires adjustment perhaps once a year when I clean

the contacts.

So is a magnetic paddle better than a spring paddle? Probably not. Is it more expensive? Probably. Are hams prepared to pay more for something they think is “cool?” Absolutely. Variety is still the spice of life, and one man’s magnet is another man’s rhodium-plated contact.

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