Piano Construction Improvements

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There are several problems with the concert grand piano forte whose design has hardly changed in 100 years. This document proposes solutions to these problems. The proposed solutions have never been tested in practice; further research and development is needed:

1. Always, when I listen to a piano recital, I hear unpleasant twanging or buzzing noises when certain notes are played. These are caused by resonance of some of the string ends that protrude from the adjuster posts, or by the short lengths of string between each adjuster post and the bridge.

2. Piano tuners and pianists alike complain that the individual strings, (sometimes there are two or three for a single note), are never precisely in tune with one another, and the adjuster mechanism does not allow finer tuning. This is caused because tuning is done by rotation of the tuning posts which are held in place by friction within their mounting bosses. A rotation of only 3 minutes of arc can make a significant difference to the tuning. Usually, the very minute adjustments required are totally impossible to achieve in practice.

3. If a piano is moved from one performance space to another, it can take 2-3 days and two or three separate tuning procedures to get the piano properly in tune. This is because the wooden case is rigidly attached to the iron or steel frame, but the wooden case flexes differently from the iron frame when the piano is moved. The case flexes when the grand piano is turned on its side, mounted on a trolley, has its legs removed, wheeled along a sometimes bumpy floor, moved through doorways and then reassembled and stood up on its legs again. Sometimes the new performance space also has a different temperature and humidity from that with which it has equilibrated, and this can take several weeks to equilibrate properly.

   I spoke to someone recently who was managing an Edinburgh Fringe venue that had three performance spaces, each of which was in use for different performances 5-8 times a day. He had hired one grand piano which was in use each day in two different performance spaces with narrow doors and corridors between. He engaged a piano tuner for the venue who tuned the instrument after each move, but several performers complained that the piano went out of tune during every performance.

Solutions:

The first problem is solved if the ends of the wires are cut short and then bound to the adjuster post before the wire is tightened. As the wire wraps several times around the tuning post and the cut end of the wire, it will secure the end tightly and prevent any buzzing or twanging.

Where a heavily loaded bass wire, (bass wires are loaded with a smaller diameter wire wound tightly around the main wire), has a substantial distance between the adjuster post and the bridge, it can resonate when a much higher note is played. This can be solved by damping the bass string with felt blocks or wedges between frame and string on the adjuster side of the bridge.

The second problem is solved by borrowing an idea from modern guitars, which often have a worm-screw adjuster for the string posts. The standard guitar adjuster cannot be used directly, it takes up too much space on the frame, but a somewhat narrower

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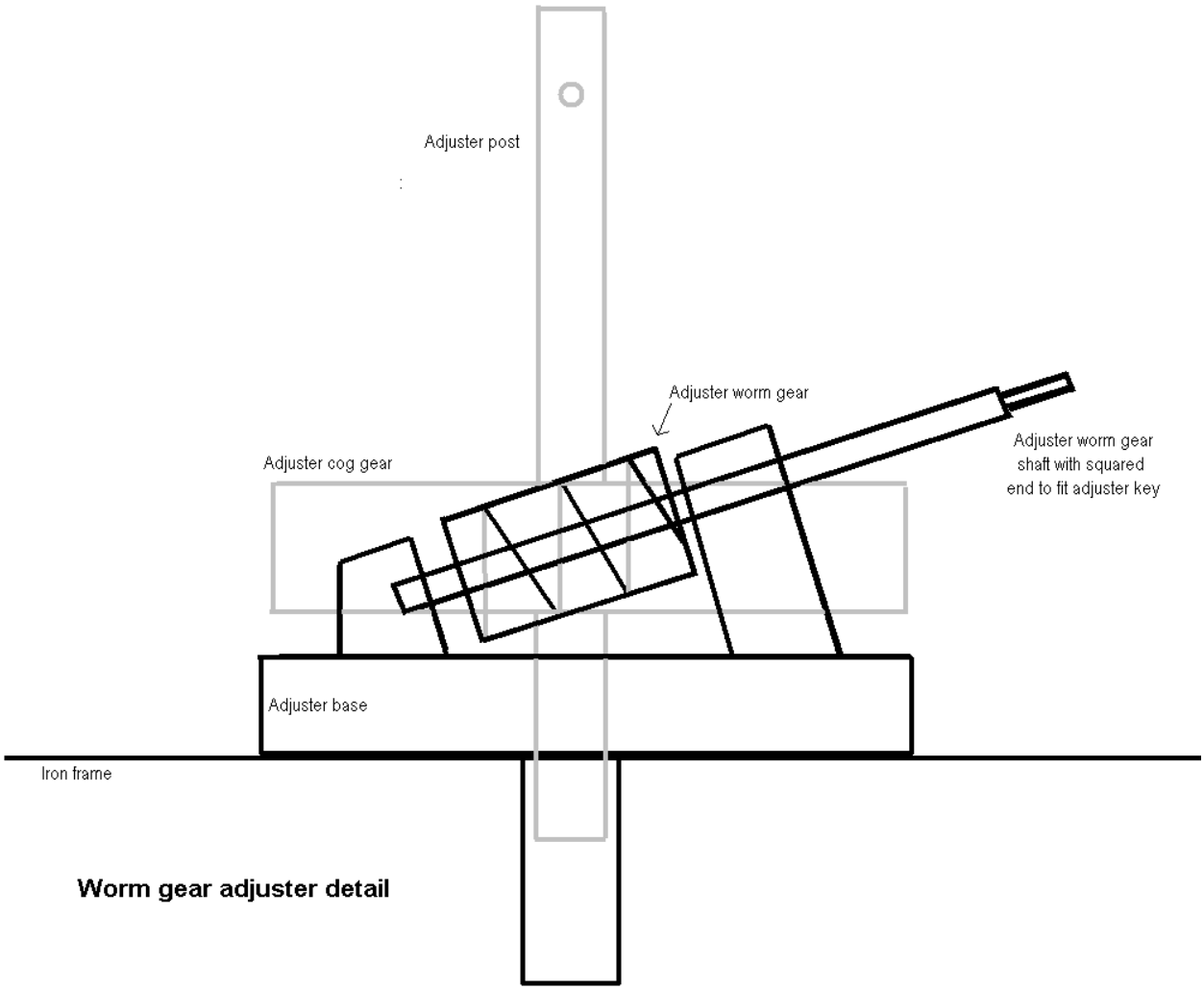
one can be made with a worm screw to turn the post. The worm screw has a squared end to its shaft instead of the guitar's butterfly. The worm screw allows very fine adjustments to be made easily. This allows a conventional tuning key to be used by the piano tuner.

The third problem can be solved by having a strong but flexible means of attaching the iron frame to the case. Rubber bushes and washers on the bolts that join the frame to the case will allow the necessary small amount of flexing.



Worm gear adjuster detail