“Wah Wah” Trumpet Adaptation

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Background to the Adaptation

From the age of nine (1981) to my motorcycle accident in 1991, although not particularly adept, I enjoyed playing keyboards and woodwind instruments, namely clarinet, flute, and saxophone. The motorcycle accident left me with a permanent brachial plexus injury (C4, C5, C6, C7, C8, and T1). This is basically an injury to the group of nerves that work the arm, in my case, the right arm. Five of the six nerves (C5, C6, C7, C8, ant T1) in this group were torn from the spine. Surgery restored some movement to C5, control of the bicep, but the remainder of the arm and hand have no motor function and little to no sensation of touch…. Chronic nerve pain, however, has not diminished in the 27 years since the accident.

Keyboard playing was still possible using a Roland PK5 MIDI pedal board. However, believing that playing woodwind was no longer going to be an option, I began learning to play trumpet, and later, with the restoration of some bicep function, the trombone; using an adapted ten pin bowling wrist support to hold the trombone to my mouth while playing left handed.

Early in 1992, I re-joined my local community band, Chester Symphonic Wind Band, on 3rd trumpet. About this time, my trumpet was modified to have the little finger hook moved from the right side of the instrument to the left [*Fig. 1*]. This was intended to help hold the instrument while playing; previously, I had hooked my little finger under the bell pipe. The instrument was also supported by positioning the thumb under the main tube to the bell and the lead pipe and pressing it against the body of the first valve.

The only issue I had playing the instrument at this time was the frequent jamming of the three valves in the down position. I suspect this jamming was caused by me pressing the valves at an angle rather than directly straight down, which was a result of holding and playing the instrument with one hand. I attempted to resolve this issue my mounting each valve in a drill and polishing a small amount of material from each. This helped, but caused the notes to sound "breathy" or muffled when the valves were dry.

However, from time to time the band would play something that required a "wah wah" effect or hand placed over the bell to mute it, which was not something I could do.

Fig. 1: Relocation of Finger Hook.

Adaptation Design

The adaptation is mainly constructed from brass parts for ease of soldering, and to match the colour of the instrument. It consists of a push rod, which is operated by the thumb, a support shaft, a flat gear (rack), a small gear wheel (pinion), a pivot rod for the gear, which is mounted on the bell of the instrument, and a brass plate of suitable size to cover the bell.

Push Rod and Mount

The push rod was made using 3.8mm diameter steel bar sourced from a local modelling shop. This rod fits inside a length of brass pipe that is supported by two supporting legs soldered to the right hand lead pipe of the instrument [*Fig. 2*]. For this, I used 7.8mm diameter pipe and soldered a small steel washer at each end so that the push rod could easily slide through the pipe without too much wobble or friction. In order to ensure the push rod returned to the correct position, a small collar with securing grub screw was fitted to the push rod, and an extension spring fitted between this collar and one of the supporting legs. The collar was sourced from a Meccano set.

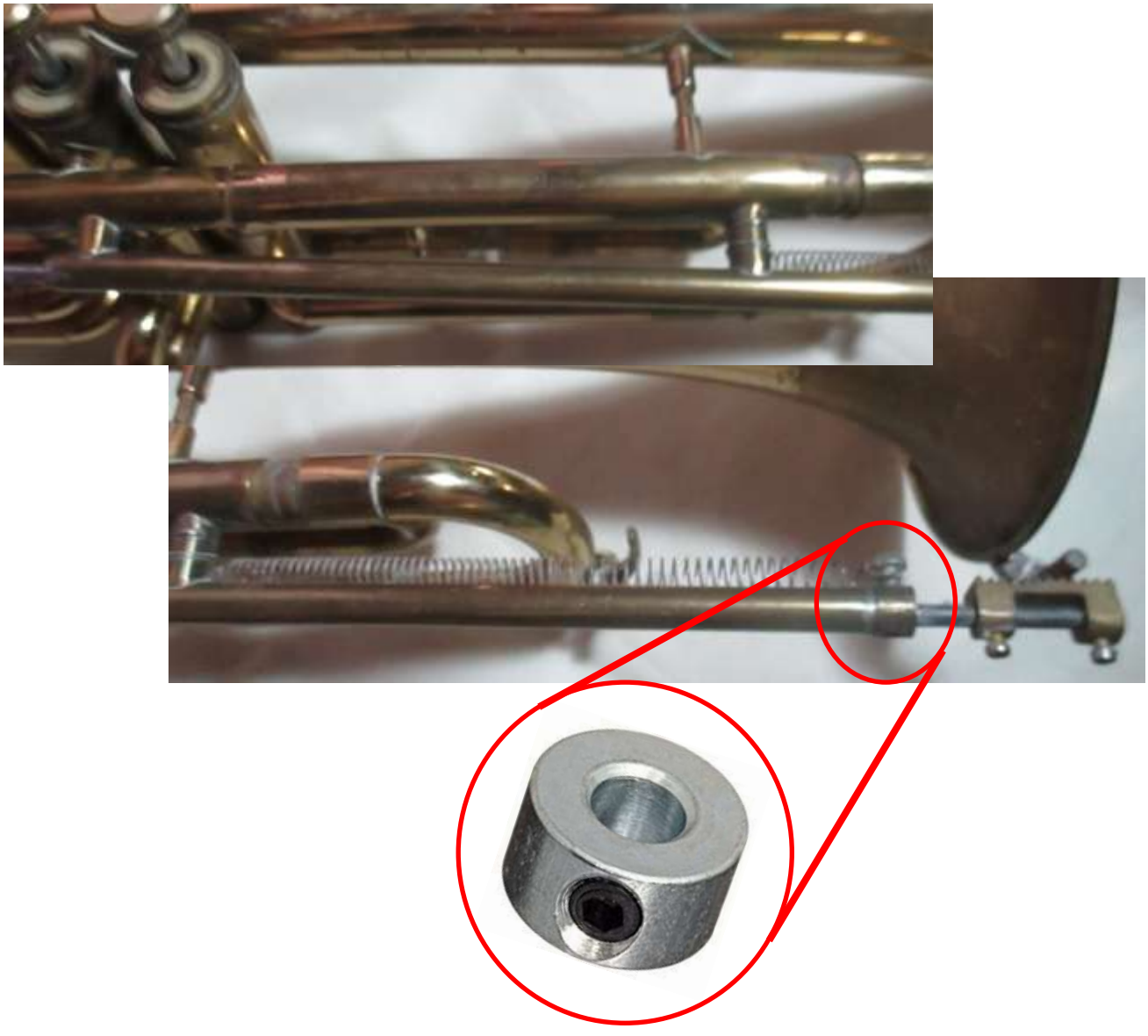

Fig. 2: Push Rod and Support Shaft

Flat Gear (Rack)

The flat gear (rack) is attached to the end of the push rod and converts the linear motion of the push rod to the rotary motion of the plate covering the bell. The rack was made using the pins from a standard UK electrical plug [*Fig. 3*]. The body of the rack was made using the earth pin [A], and twelve teeth filed into it one by one using some needle files. In order to attach this to the push rod, the heads were cut from the live and neutral pins [B], which were then soldered to the back of the rack. These two heads are the part of the plug that secures each wire to each of the three pins. These were ideal as they have a suitable hole to fit over the push rod (requires drilling to larger size), and a screw to lock them in place.

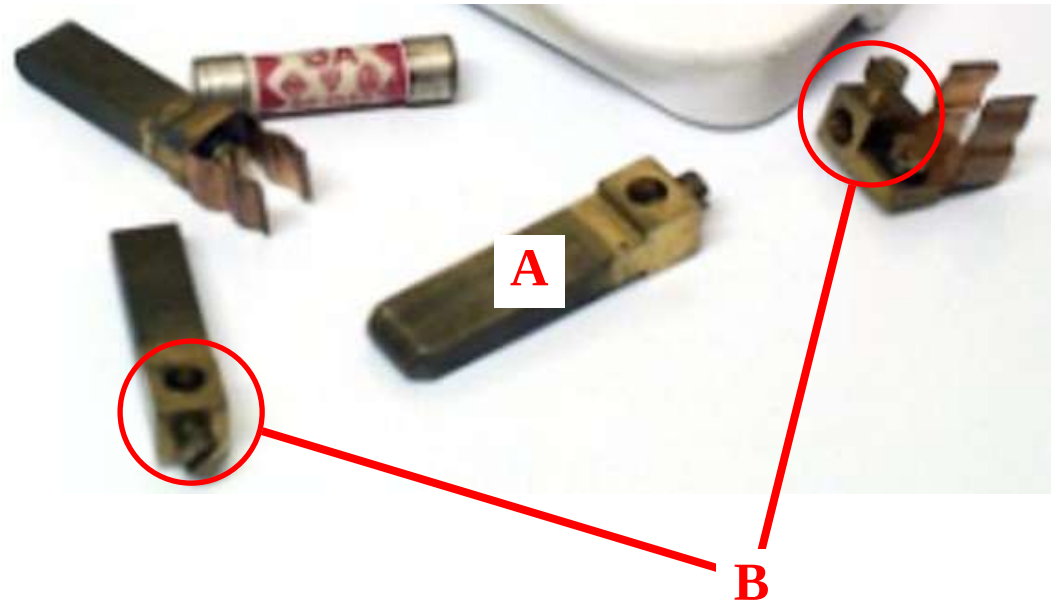

Fig. 3: UK Electrical Plug Parts

The completed component is shown in figure 4.

Fig. 4: Completed assemble of the Rack.

Bell Mounted Pivot Rod

The pivot rod is used to locate the front plate and gear to the side of the bell. The body of this was made using the remaining head and top section of the earth pin, which was left over from making the rack. A small length of the steel bar used to make the push rod was pressed into the round hole of the plug terminal, then the assembled part soldered to the side of the bell [*Fig. 5*].

Fig. 5: Pivot Rod and Mount.

Round Gear and Plate

The round gear (pinion) used in this adaptation is a 15 tooth gear sourced from a Meccano set. This gives a wide range of rotation over the length of the rack – 12 teeth of the rack vs 15 teeth of the pinion. The plate was sourced using the lid from an old ornamental pan [*Fig 6*]. The gear was soldered to the side of the plate using a piece of brass taken from another electrical plug [*Fig. 7*].

Fig. 6: Ornamental Pan Used For Bell Plate.

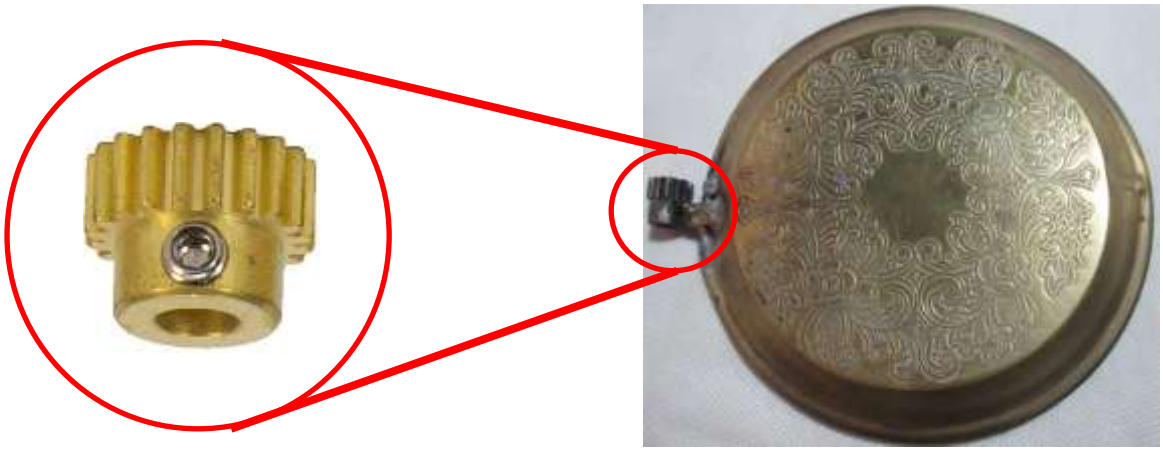

Fig. 7: Bell Plate Gear Assembly.

Final Assembly

Due to the pressure required to move the push rod while playing, a small brass thumb support was attached to the end of the rod. This piece of brass was found on the ornamental pan used to make the bell plate.

The push rod was bent so that it fitted over the lead pipe of the trumpet and located in an area where it could be reached by the thumb without hitting the body of the first valve.

At this time, the brass ring fitted to the third valve tuning slide was relocated on the bell pipe so that it could help the thumb to support the weight of the instrument and offer leverage when pressing the push rod [*Fig. 8*].

The bell plate was fitted with some soft cloth so that it did not create a noise or cause damage when closing.

Fig. 8: Relocation of Third Valve Tuning Slide Ring.

Limitations

There are a number of issues with this adaptation which, over time, put me off using it unless it was really necessary.

1. The main issue with this adaptation is weight. The parts permanently attached to the instrument do not add any significant weight to the instrument and are not really noticed when playing. However, with the addition of the bell plate, particularly in the open position, causes increased moment at the end of the instrument. Even with the relocation of the third valve tuning slide ring, playing the instrument while the bell plate is fitted and in the open position can be difficult due to the extra effort required to hold the instrument steady. Maybe a lighter material and cloth would reduce this load.

2. The design of the push rod and rack is such that it allows the rack to rotate. When in use, the natural movement of the thumb can cause the push rod to rotate slightly, which in turn causes the rack to rotate. If excessive rotation occurs, the rack can slip out of mesh with the small pinion gear on the bell plate, which may result in the bell plate not fully closing.

3. The design does not cater for "wah wah" effect in conjunction with a mute, which is probably where the "wah wah" effect is more commonly used.

4. After these modifications were made to the instrument, provisions needed to be made to the case in order for the trumpet to sit correctly. These included a slot cut into the case liming to cater for the relocation of the finger hook from the lead pipe to the bell pipe, and the entire case lining made to sit lower in the case to cater for the push rod and support pipes. A section was also cut from the lining to house the bell plate.

Closing Comments

This adaptation, although functional, is very crude and was not something I used often due to the weight it added to the instrument. I make no apology for the crudeness of this design or the poor quality of construction; it was made less than one year after my accident using whatever I could find to do the job.

However, the design does lend itself to other possibilities with the trumpet, such as using the thumb to manipulate the third valve tuning slide.

I openly share this design in the hope that it may be of use to someone, or that it may be improved by someone with access to better tooling and instrument repair ability. For example, a light weight version that can be quickly and easily clipped to the bell or a mute and operated by electronic switch and small servo motor or solenoid. This would allow the device to be completely removed from the instrument when not in use.

About the Developer

The developer of this adaptation, Simon Moxon, has a background in mechanical engineering. He served an indentured apprenticeship with British Aerospace Plc, now Airbus, Chester, from August 1988 until his motorcycle accident on 7th August, 1991. He has some ten years' experience in engineering having worked as a design engineer post-accident, designing hydraulic and pneumatic pressure vessels, accumulators, and compensators.

In later years, he attained a first class honours degree in Applied Computing and Software Engineering from Staffordshire University, and also attained Microsoft Certified Professional status for programming in Visual C#.NET. He has worked as a software developer on ticketing solutions for venues including Royal Opera House, Sepang International Circuit, West Indies Cricket, and football clubs such as Liverpool, Manchester United, Aston Villa, Arsenal, and West Ham.

In November, 2007, following a short period of lecturing in UK, he emigrated to Thailand, where he has worked as a teacher to students aged 5 to 15. He is a licensed teacher in Thailand, and has a Master of Education degree in Teaching and Technology from Assumption University, Thailand.

In his free time, he enjoys jogging, web design, and scuba diving. He is a PADI certified Dive Master and regularly dives at the national parks in the Koh Lanta area.