

Technical Description of the Rhodes Piano

Introduction

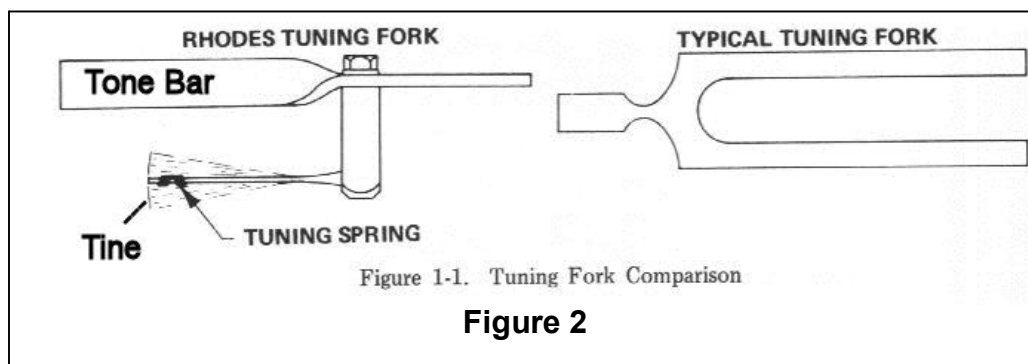
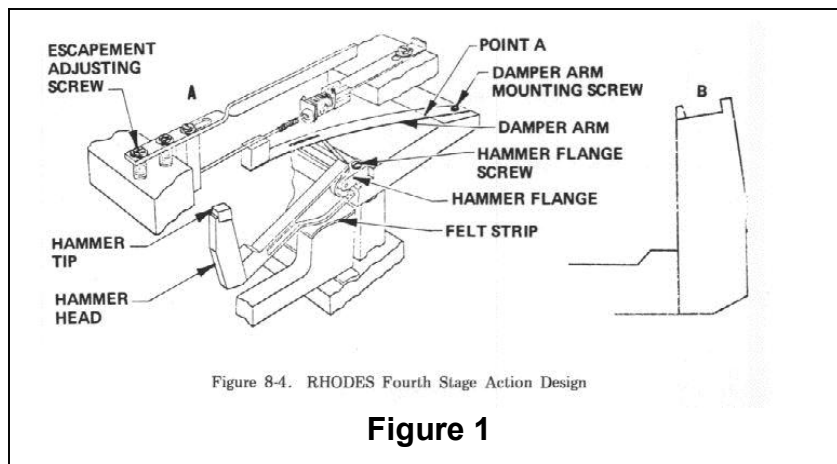
The Rhodes piano is a vintage electro-acoustic piano that was used extensively by the music industry in the mid 1960's to mid 1980's. The Rhodes is a keyboard instrument that is a combination of a traditional piano, guitar, and tone bar percussive instrument. It was developed to be an amplified, affordable, and portable alternative to a traditional piano.

Like a piano, the Rhodes uses keys to move felt covered hammers (Figure 1). To make an audible sound, a traditional piano uses the hammers to strike strings, whose vibrations cause the sound. The Rhodes, however, uses the hammers to strike short, stiff metal rods called "tines" (Figure 2). The tines are located directly below pieces of short metal bar stock called "tone bars".

The tines and tone bars work in conjunction with each other like a typical tuning fork. When a tine is struck by a hammer, it resonates the tone bar at a certain pitch. The tone created is audibly faint; therefore, it needs to be amplified.

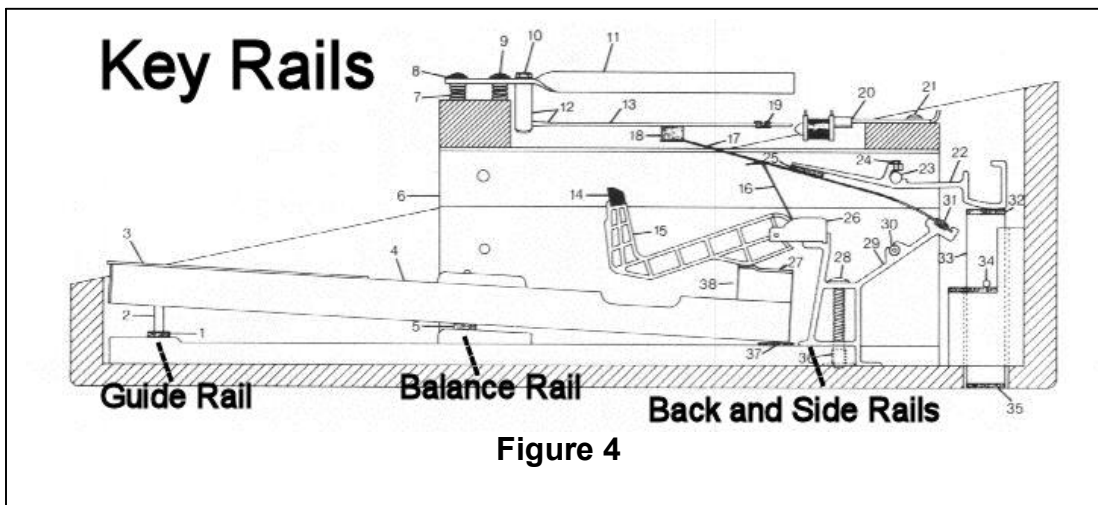
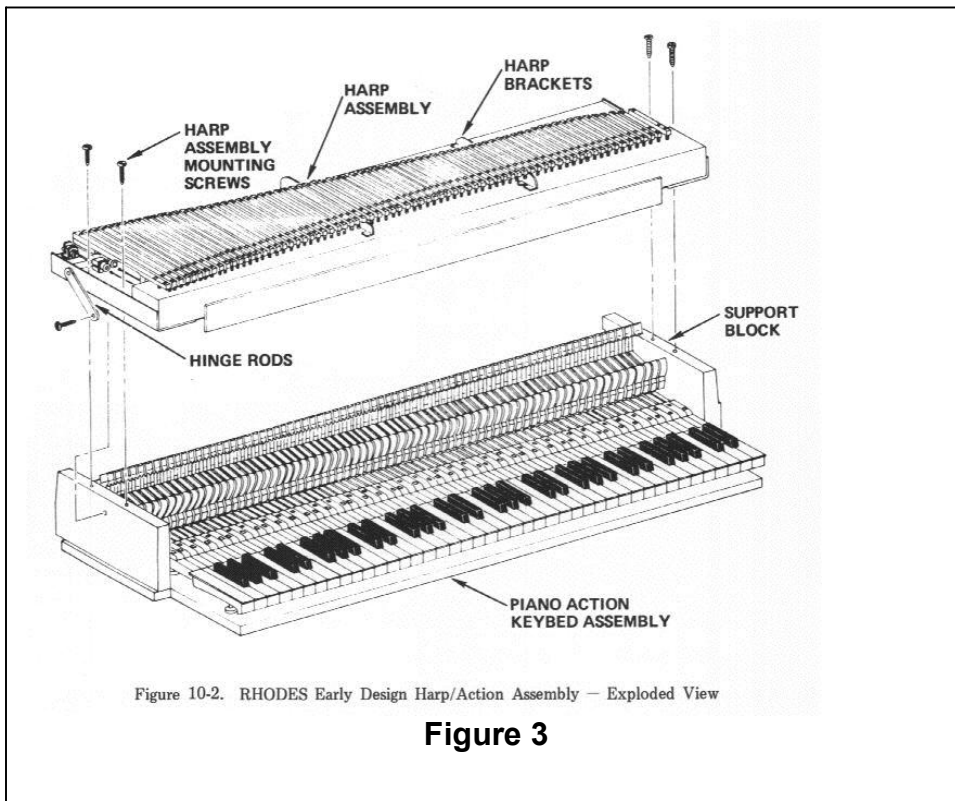
The Rhodes amplifies the vibration of the tone bars much like an electric guitar amplifies the vibrations of its strings, through a magnetic pickup. The signal from the magnetic pickup is then transferred to a 1/4" jack on the front of the Rhodes. This jack connects to an external amplifier (typically a guitar amp) to amplify the signals from the pickups.

The Rhodes piano is comprised of 4 different groups of parts: keys, hammers, tuning forks, pickups. The sound of the instrument is affected by three adjustment groups: the sustain pedal, tone/volume control, and the action.



Description of Parts/Adjustments and Their Function

Keys. The keys are made of a soft wood (sugar pine or bass wood) and are the mechanism that controls the movement of the hammers. These lay flat on the key bed (Figure 3) and are positioned on four rails: the side, back, balance, and guide rails (Figure 4). These rails are attached to the frame in a rectangular pattern. The balance and guide rails are attached to the side and back rails, which hold them in place. The balance rail is the center rail, which is positioned, raised and angled to pivot the keys. The guide rail is located under the front of the keys and allows them to be pushed down. At the back end of the keys are key felts. The hammers lay on the butt end of the keys (Figure 1). The rails allow the keys to pivot. As the keys are pushed by the user, it pivots the key downward, thus moving the hammer upward. On top of the keys are key caps, which are made of plastic and provide a comfortable playing surface. It is on this surface that the human hands “play” the instrument.



Hammers. The hammers are a wood and plastic hybrid, with it being mostly wood except for the neoprene tip. The hammers are in an L shape with the leg of the L facing upward to strike the tines (Figure 1). The keys work with the hammers in a rolling and sliding motion. The hammer is attached to the action rail by means of the hammer flange (Figure 1). The hammer flange allows the hammer to move up and down. As the end of the key rubs up against the hammer, it moves the hammer upward towards the tine. After the key has been retracted, the hammer returns to its original position.

Tuning Forks. The tuning forks are comprised of the tines and tone bars (Figure 2). The tines are small, stiff metal rods. The tone bars are pieces of short metal stock in a vertical position. They're both attached to the harp assembly (Figure 3). The tines and tone bars work in conjunction with each other like a typical pitch fork. While a typical pitch fork has symmetrical tone bars (Figure 2), the Rhodes does not. The tines and tone bars do not share the same mass, shape or size. They do, however, share the same pitch. When one end of a pitch fork is struck, it causes the other end to resonate a certain note. Likewise, when one end (the tine) of the Rhodes "tuning fork" is struck by the hammer, it causes the other end (tone bar) to resonate the note they are both tuned for.

A tine dampener is located underneath the tine. The dampener is a 1/2" wide strip of aluminum with a felt tip on top. It is bent in a way so that the felt tip touches the tine with some pressure. This allows the tine to stop resonating after it has been hit. The dampener is attached to the sustain push rod assembly, which allows for longer sustains of the tines (Figure 5).

Near the tip of the tine is a wire spring wrapped around it. This is the tuning spring (Figure 6). The pitch of the tine can be changed by moving the spring up and down the tine.

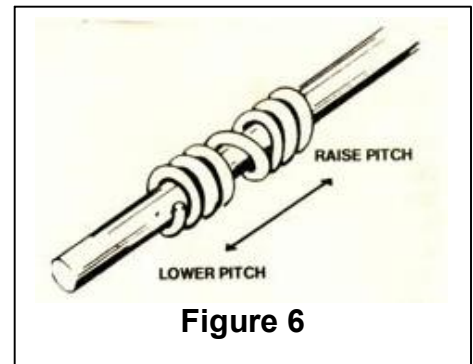
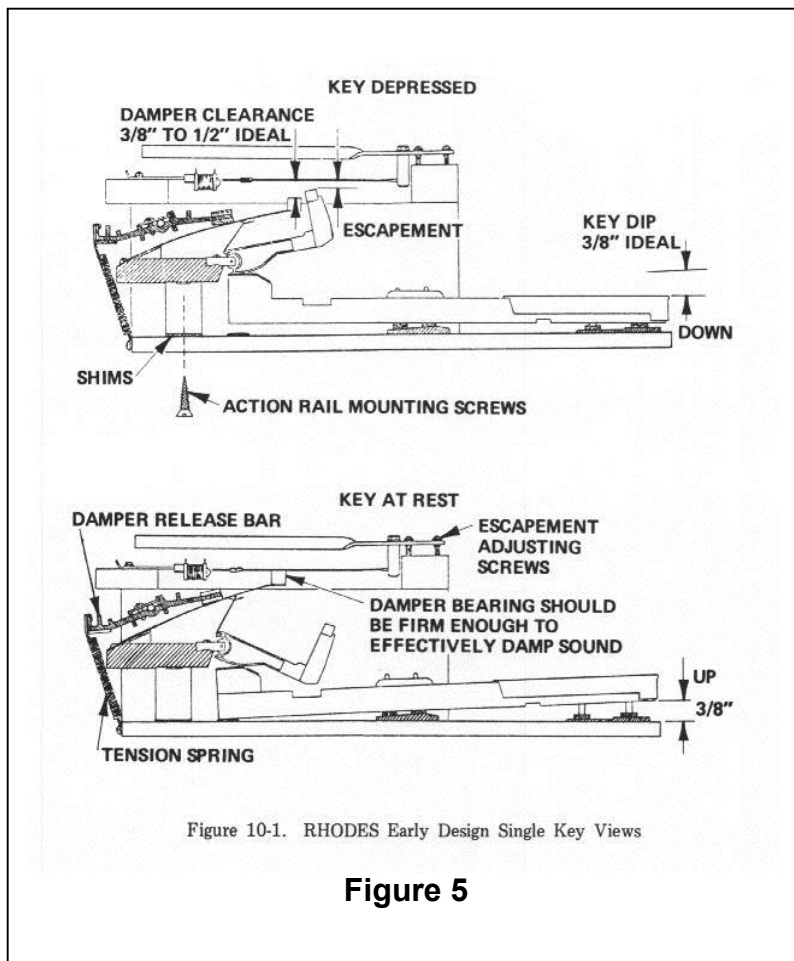
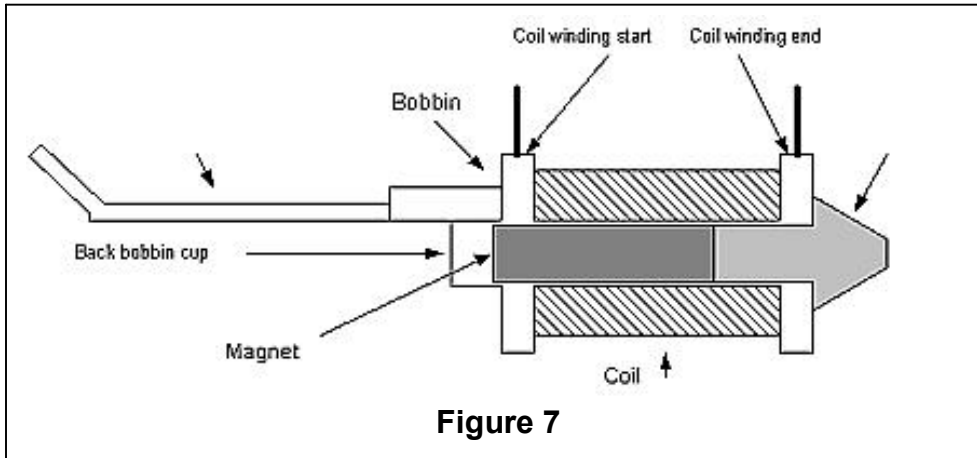


Figure 10-1. RHODES Early Design Single Key Views

Figure 5

Pickups. The pickups are basic pickups; they are small magnets that are wrapped with a few thousand turns of copper wire (Figure 7). The pickup is mounted on the harp rail below the tone bar and behind the tine. The vibration of the tine along with the resonance of the tone bar modulates the inductance of the wiring on the pickup, thus creating a tone. This tone is then transferred to the volume and tone control circuit, and then to the ¼" instrument cable jack.



Adjustment. The Rhodes can be adjusted in many ways to change the tonal characteristics of the instrument. The sustain push rod assembly (Figure 8) allows the dampeners to be removed from the tines for an extended amount of time. This allows longer sustain of notes. All of the dampeners are connected to the assembly. This assembly is controlled by a sustain pedal, which is controlled by the musician pressing on it. The sustain rod is pushed up into the Rhodes by the sustain pedal. The rod then controls the sustain assembly which then lowers the dampeners.

The tone and volume can be controlled by the musician on two knobs that are on the front of the keyboard (Figure 9). The signal from all of the pickups is fed into these two control knobs. The tone (bass boost) knob acts as a user adjustable high pass filter, allowing the musician to control how much of the higher tone frequency is let into the final output. The volume knob controls the final amount of the signal that is fed into the ¼" instrument cable jack.

The action can be changed by moving the hammers closer to the tines and changing the position of the key rails. The amplified loudness of different tines can be changed by adjusting the amount of space between the pickups and tines.

The piano is hoisted on four legs which are screwed into the base of the instrument (Figure 10).



Figure 8



Figure 9

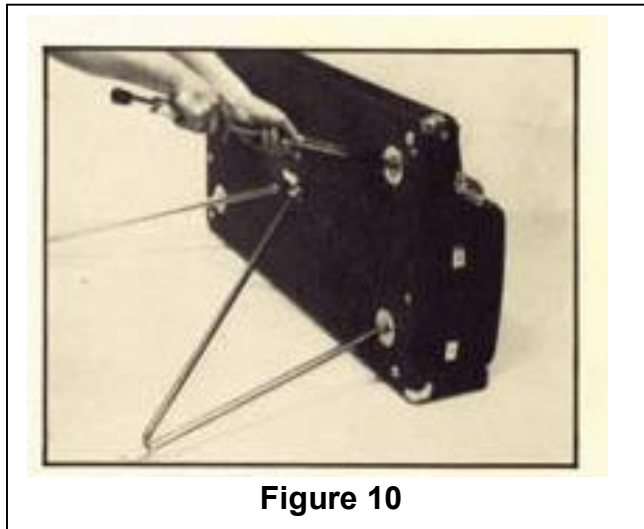


Figure 10

Conclusion and Operating Description.

One plays the Rhodes piano by striking the keys in varying velocities. The keys then move in a rolling and sliding motion to move the hammers up and down. The hammers move up to strike the tines of the tuning forks. The tines then vibrate to resonate in the tone bars, which are of the same pitch. The sustain of the notes are controlled by the dampeners, which can be released for extended amounts of time by the use of the sustain pedal.

The magnetic pickup modulates from the vibration of the tines and resonance of the tone bars. This modulation creates a tone which is then sent to the volume and tone controls via wiring. The user adjusts the tone and volume to liking and then the final passive (un-amplified) signal is sent to the 1/4" instrument cable jack. This signal is then sent to be amplified through a public address system or guitar amplifier.