**From the Workbench of Allen Miller . . .**

# Swell Shades and Push Rods and Things That Go "BUMP" in the night

*One of the noisest and most aggravating non-musical noises which can occur in an organ, other than the blower and wind noise, is that produced by swell shades. I can recall one concert where the shades were so noisy, the organist yelled "Timberrr!" upon closing the shades following a quiet passage.*

Most shades exhibit some sort of noise, and due to the problem of keeping shades quiet, I shall offer some suggestions and observations. These are specifically aimed at Wurlitzer shades, but the principles will fit other makes.

First of all, it is possible for standard Wurlitzer shades to be almost silent. Let's examine the components of standard shades with individual shade motors.

There is a frame in which the shades are set. The blades are usually graduated in width. A set of pneumatic motors is affixed to the frame with a motor pneumatic positioned to move each blade. The connection is through a steel push-rod which passes through a bearing block on each blade and motor pneumatic.

There is a primary valve and its pneumatic to control each motor, and the blade is returned to its normal position by a return spring, also having some sort of bearing device at both ends.

The blade turns in some type of bearing, usually a ball race at the bottom and a pin in a wood bearing at the top.

There is normally some system of bumpers or pneumatic checks to keep the shades from slamming against each other when closing. Before making any adjustments or rebuilding parts of the system, you should understand what each component has to do to make the shades work efficiently and quietly.

It was the intent of the builder to have the shades work as fast, yet as quietly, as possible. The shades should provide a wide range of expression which is graduated evenly from soft to loud without obvious audible "lumps." The playing of modern organists requires that the shades not only provide expression gradually from closed to open, but should be responsive to either accents from the closed or open position.

While there are some organists who follow the George Wright method of playing with the shades mostly closed, choosing to accent and open the shades for effect, most organists today follow the Lyn Larsen method whereby the shades are mostly open and the accents are inverted, closing the shades for effect. There has been much observation and audio-visual documentation of these two different systems of expression, and they obviously each have their own benefits and characteristics.

I have observed organists pumping the swells wildly without any return using one of the above systems, yet organists using the other system will get quick expression from the same organ. The Mesa Organ Stop shades responded well for only one artist playing that organ during the recent regional, and I could but wonder if the other organists knew why the swell shades were not effective when they played. Those shades opened fast, but closed slowly, so kicking the shades closed from full open had little effect other than a bit of jiggling of the shades.

### The point is to adjust the shades so that they respond in both directions!

Going back to Hope-Jones patents, Robert Hope-Jones had a lot of thoughts and inventions which affected the response of swell shades. He recognized that shades had to be either thick (have density) or include a vacuum to impede the transmission of sound. He also recognized that shades could NOT touch each other when closed, and patented the sound trap, grooves cut into the mating faces to trap sound which would otherwise filter through the space between the shades when closed.

If you want shades to be quiet, you must concentrate on each of the factors which determines their operation.

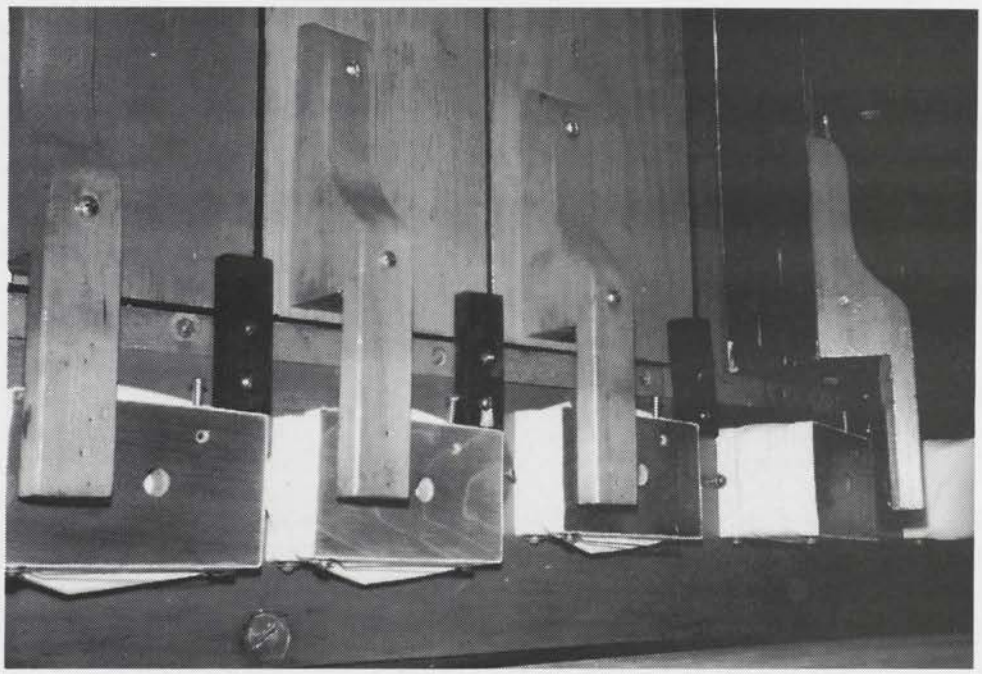
First, rebuild the shades in their entirety! Remove and clean the bearings. Use a strong solvent to dissolve the old grease and remove dirt and grit. Check each bearing to be sure it isn't defective. It is not unusual for individual balls to be rusted or broken, or for there to be grooves or depressions worn into the races. You will have to replace any bearings which do not turn freely when dry of the old grease.

Lubricate the bearings with a white, lithium-based grease, such as Lubriplate. Keep sawdust and other dirt and contaminants away from the bearings during the rebuilding process.

Insert each blade in the frame, applying lubricant to the upper wood bearing surface. This often involves application of graphite, although most old bearings will probably be just fine as they are.

Test each blade to be sure that it turns easily and quietly without any thumping or grinding noises.

Be absolutely certain that each blade exactly matches the position number in the frame. Blades are NOT interchangeable.



SWELL SHADES SHOWING SPACE BETWEEN BLADES, FELTED WOOD BUMPERS, PNEUMATIC CHECKS. RIGHT SHADE IS IN OPEN POSITION.

Locate the small bumper blocks. These are 1" x 2" wood blocks usually mounted on the OUTSIDE of each blade. These MUST be in place and properly felted. Some rebuilders have removed these blocks during shipping of the organ and never replaced them. The blocks must be felted so that each blade when closed lies parallel or flat to the frame and no two blades touch each other or the frame. There should be about 1/16" space between the blades when closed.

Often painting the shades will produce lumps of paint between the blades, or they will warp. You must deal with these problems as necessary. In worst cases, you will have to plane matching surfaces. In most cases, you can block the shades closed and pass a handsaw through the cracks, relieving the high spots as necessary.

You must be able to pass the cover of a book of matches through all of the gaps without any binding. If the cover sticks, those areas must be relieved or the felt on the bumpers increased.

Next, make sure all of the bearing blocks on the shades are screwed on tightly. Clean any rust or dirt off spring screw eyes. A wire brush on a bench grinder is appropriate for this task. Lubricate the screw eyes lightly. WD-40 is good for this. Make sure each eye is turned so that the fibre bearing rotates on the screw eye when the shade operates. The fibre bearing must not slide sideways around the radius of the eye. If it does, the shade will squeak, often only periodically, and almost never when you are trying to find it.

Recover the motors exactly as they were done originally. Note that there are different widths and the amount of opening (span) varies to compensate for different width blades. Sloppy rebuilding often has caused the motors to be mixed up, and heaven forbid that motors were mixed up between different sets of shades, which were later sold to different buyers. I have encountered entire engines and motor pneumatics which had been mixed up and sold off to different buyers, never to be reunited with their proper mates again.

A wide variety of materials has been used and tried on shade motors. Only two appear to have any worth. Swell Shade Pneumatic Leather available from Organ Supply Industries and Black Percussion Leather from International Leather. I can most safely vouch for the Swell Shade Pneumatic leather. The black leather has only recently been available again, and only time will tell if it has the same properties as the original material.

Any other material is likely to snap or thump when inflating, or be short in life and need replacement in a few short years.

Check and relubricate the wood bearings on the heads of the motors. Thoroughly clean and polish the ends of the push rods and install them. Thoroughly clean and restore the spring eye rods, making sure the threads are good their full length. You will need to be able to adjust these rods.

Completely restore the shade motor primary action, including the primary pneumatics, the valves, and magnets. I highly recommend replacing all felt, leather and gasket materials. Klann Alathon nuts are recommended for the valves, and new valve wires will help adjustment later on. Be sure to use a nut on both sides of the inside valve, but only one on the outside of the outer valve. This will facilitate critical adjustment of the valve travel.

Recover the pneumatic checks and check bumper arms. The pneumatic checks are often called bumpers or bumper pneumatics. There are a few options which will improve the efficiency of these checks.

They should be covered with leather, not rubber cloth. The leather must be soft and supple, such as 2 oz. Cabretta, Alum Tanned Gusset leather, Valve Leather, or Black Percussion Leather.

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Be absolutely certain to replace the check valve leather inside the pneumatic. Most of the Wurlitzer checks had the check valve glued at both ends. This typically impedes the airflow such that the pneumatic does not recover fast enough. If you use a heavy valve leather or a flap of the swell shade pneumatic leather, and only glue it at one end, the check will work much more efficiently. Bear in mind that the valve leather must be of a size and thickness which will not tend to blow out of the exhaust hole!

Make sure you do not reduce the span or amount of opening of this pneumatic. If you are going to err, it is better to increase the opening slightly if anything.

You should replace the leather on the bumper arm which engages the pneumatic check. Usually you will not have to replace the felt underneath. I recommend adding another layer of felt, a minimum of ¼" to ½" added to the original. Experiment with this. You want the pneumatic check to collapse as far as possible when the shade closes. The pneumatic should be about ¼" open when collapsed for the best results.

Either valve leather or black percussion leather will do to recover the bumper arm. You will need to graphite the leather where it rubs on the pneumatic. Dry graphite or tumbler lubricant will work for this, or as an alternative, you may use spray DRY Teflon lubricant. Do not use any oil or grease based lubricants as they will eventually cause the leather to squeak.

I have found that in cases where extreme quiet is necessary, the bare felt on the arm (without the leather covering) is preferable. The felt has to be of a type which is woven so that it will not delaminate or skew sideways as the felt rubs over the pneumatic check.

Now, reassemble everything and do whatever you have to do to make it work. Wurlitzer included regulators or equalizers (what some people call "Winkers") for the swell engines, and the pressure should be set for 12". You may vary this later if you need to. This was the usual factory setting, however, as evidenced by Wurlitzer installation drawings.

Next, adjust the blade return spring tension so that each shade opens and closes at the same rate. Specifically, the opening and closing rate of each individual shade should also be equal, no matter what the differences are between individual shades.

Now, you may have noticed when rebuilding the action, that the first two stages have a smaller opening on the pressure side. This seems to vary, but the pressure side is usually about ½" in diameter, while the exhaust is about 1". If your action was NOT this way, you may want to modify the action. You can do this by fabricating a piece of shirt cardboard with a ½" hole punched in it, and glue it centered over the valve hole on the inside of the chest.

This slows down the opening of the first stages which do not have to move the blade very far.

The next step is to adjust the outside valve or the overall valve travel to restrict the speed of the shade when closing. That's right, you are going to slow down each shade as it operates. It is difficult to specify the operating speed in writing, but if too fast, the shades bang, and too slow, they literally "ooze." The right point causes the shade to move completely in about ¼ to ⅓ second.

It is possible to adjust the opening and closing speed so that the shades are quiet WITHOUT the pneumatic check even installed. Since Wurlitzer provided the first two stages with restricted opening, this can serve as a reference for the other stages when you are adjusting the valve travel.

Next, adjust the pneumatic checks so that they just slow down the closing enough so that they do not thump closed. You may want to experiment with the two adjustments until you achieve the best balance between speed and noise. Once you have accomplished this, go back and increase the spring tension until the shades close just a bit faster then they open. The reason for this is acoustic. When any given shade opens, the biggest audible change is in the first few degrees of motion. When the shade closes, it has to close almost all the way before you hear a change. If the shades are adjusted to open faster than they close (as many seem to be) the organists who keep the shades open and accent them closed meerly keep the shades flapping in an exercise of futility.

Indeed, I have been to many concerts where the only effect of expression I got was from watching the right foot to see what the organist thought he was doing. There is possibly a not-too-well understood nerve which runs from the foot to the ear, which tells an organist he is imparting expression to a piece as long as his foot is moving, even if the sensation is not audible to the listener.

Now that we have adjusted the shade speed, we may want to compensate for shade size. Long shades require more force to move than short shades. For short shades (less than 6') you may want to drop the pressure to 10". For longer shades, you may want to go as high as 14". I would not recommend anything higher than 14", however, as you will have to adjust the valve travel too short and adjustment will become very critical.

If you have followed these procedures, you will probably find that the biggest noise created by the shades is the pneumatic check exhaust. I have been able to adjust a set of 40 shades to the point where the only noise was the "psssst" made by 40 pneumatic checks collapsing. I have tried all sorts of mufflers over the exhausts to no avail. If the shade situation is intimate, and the hissing bothers, then the only solution is to make up some small wood blocks to cover the exhaust holes with a piece of neoprene hose ¼" ID to route the exhaust air to somewhere it can be buried out of hearing range.

Earlier, I mentioned that the most audible change in expression is in the first few degrees of opening. The blades are graduated in width and degree of opening so that the first shades open less than each successive shade. Usually the original design did not compensate quite enough and the first stages produce rather large changes in loudness. It has been customary to reduce the opening of the first two blades by restricting their motion somehow. Often this is done with twill tape or some other mechanical limiting device.

This can also be done by taking advantage of the mechanics of the shade design. The location of the push rod bearing block on the blade determines just how far the blade opens. The further this block is from the center of rotation, the less the blade will open. Relocating this block further toward the edge of the first blades will reduce their opening, and if necessary, you can maximize the opening of the larger blades. You probably will not have to move the block much more than ½" from its original location. Bear in mind that increasing the opening also requires more power, so don't get too carried away with this idea.

I have found that Wurlitzer apparently "customized" their shades in this manner as no two sets seem to have exactly the same push rod block location.

If you follow these instructions, you can surely eliminate most swell shade noises and "Things that go bump in the night." ■