

Rebuilding The Gulbransen Roll Motor

(As pictured on page 147 of this catalog)

Step by Step Instructions

1. Remove all accessible wood screws, except the mounting braces. The flange pins can be pulled which will separate crank shaft arms for easy removal of crank shaft. The set screw on driver of outside rotary slide valve is loosened. Then crank shaft with arms may be slipped out and laid aside.

2. There are four glue joints to break on the remaining assembly. The three pneumatics, and the joint in the channel boards. A blow with a hammer will knock these joints apart. Hit the pneumatics away from the glue joint.

3. There is a thin wafer of end grain wood glued on each side of the upright channel board over the "timing holes" which have three holes that lead to the pneumatics, and a center hole that connects to the vacuum supply. The outside timing holes control the outside half of the double pneumatics; the reverse side for the opposite side of pneumatics.

These wafers can easily be pried off. They should be thrown away. They are subject to warpage. And they would need to be broken off and reglued in any event, because the original glue has deteriorated. Spare yourself a lot of bother by the removal and just sand both sides of the channel block on a belt sander with fine sandpaper. This will be the new slide valve surface. You may mask off the circular area for the rotary slide and spray paint. Later the masked area of raw wood can have stock no. 321 graphite applied.

4. Sand off all the cloth and glue on the pneumatics and surfaces of the glue joints on a belt or disc sander.

5. Seal the channel boards' internal holes with lacquer. The joint between where the two were broken apart, is where to pour the lacquer. But first all other holes must be taped with masking tape so it will not run out. Use a thin lacquer, as in a fresh can, or for spraying. Thick lacquer may restrict the internal passages if too much of it cannot run back out freely. In this case, the motor would never run right after rebuilding. This sealing step must be taken to prevent leaking between channels and wood porosity. The motor will operate inefficiently if you don't seal it in this manner. As soon as lacquer has been poured in to the top of the holes, reverse this end and let it drain out.

6. The wedge shaped piece of wood between the stationary leaves of the double pneumatic needs to be broken loose in order to reglue it. This wedge piece, which is hinged to the middle leaf, cannot be assumed to have a good glue joint. It is best to reglue, rather than find out the flaw after recovering the pneumatics.

So that realignment will be no problem, drill through the original screw holes with a 13/64" drill bit before breaking. This will allow for the insertion of stock no. 1472 brass tubes at the time of regluing the three pieces, and act as guide pins and a casing for the wood screws. A metal washer should be placed between the end of the nipple and the head of the wood screw.

The weakest of the two glue joints will break by squeezing the outer leaves together; the other joint may be severed by laying a knife's edge along the glue joint's broad side and tapping the back of the blade with a hammer. Sand off the remains of the old hot glue.

Using stock no. 320 plastic glue and a small brush, swab the inside wall of these two holes going through the wedge piece, to seal against any cross grain seepage.

Push the no. 1472 brass nipple through the enlarged screw holes of the stationary leaf which originally faced the head of the mounting screws, so they are flush with this surface. For regluing these joints use the original type (stock no. 303) "hot glue" or stock no. 301 epoxy. Place the pneumatic board on the work table with the brass nipples sticking up. Brush glue around the nipples and the area around the holes. Spindle the wedge piece over this. If it is tight, tap with a hammer to compress into the glue. Next, apply more glue to the unglued surface of the wedge, then spindle down the remaining pneumatic leaf, which has the supply holes connecting from the channel board. Immediately clamp these parts and leave to dry overnight. Later, the spare 1/4" of the brass nipple may be sanded off on the belt or disc sander, as well as the glue squeeze out. The pneumatic is now ready to recover with new bellows cloth. For bellows covering material, use stock no. 46, applying glue to rubber side. Cut six strips of material, 2 1/2" x 16". Glued. Cut six strips of material, 2 1/2" x 16".

7. To glue bellows cloth to motor pneumatics: First the new cloth is glued to the widest span, called the "feet" of the pneumatic. To get the widest span, tape the moveable center leaf to one of the stationary sides with a piece of masking tape on the side. Stand the double pneumatic on the hinge end. Apply stock no. 320 plastic glue to feet of the widest span. Crease the strip of pneumatic cloth in middle of length. This will

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indicate center position. Press the material down upon the glue on the center leaf, aligning the crease approximately centered on the width of this board and with the edge of the cloth to the edge of this board. Then press the material onto the opposite glued side. The excess width of the material hanging over the edge of the stationary board will be trimmed off later. Allow this first step, repeated on the other two motor pneumatics, to dry for 30 minutes.

8. Next the sides are glued. The piece of masking tape at the side is no longer needed, and is removed. Lay the pneumatic on its side and apply the no. 320 plastic glue to continue gluing the strip of cloth to the side and across the hinge of the middle leaf. Press the cloth in place and smooth it down with the palm of your hand toward the hinge end. Invert and do the same for the opposite side. Apply glue to remaining part of pneumatic and lap cloth over. Allow glue to dry for 30 minutes.

9. Trim the overhang of cloth on the stationary side with scissors. To trim the excess material hanging over the moveable leaf use a sharp knife or razor blade, cutting against a straight edge, such as a ruler. Lay the pneumatic on its side. Position the straight edge along the middle leaf to cut a line across the canvas hinge to the middle of the foot. Do this to both sides and connect the cut across the foot. Peel the excess material off. This will leave one side of the double pneumatic finished and trimmed.

10. To glue the strip of cloth on the remaining side of the double pneumatic, it is done the same as in steps 7, 8, and 9, starting with the piece of masking tape to keep the already covered side closed. The cut upon the center leaf with the straight edge as a guide would fall approximately over the same cut made for removing excess material in covering the first side. The two edges of cloth should meet on the edge of the center leaf. A bead of the 320 plastic glue should be drawn over this seam completely around the pneumatic. The pneumatic should now be laid aside with the moveable leaf centered between the stationary sides for about 24 hours; this will allow the glue to cure. Although the glue has dried, the sticking ability of the glue is improved, especially over the area of the canvas hinge, if a day is allowed before putting the pneumatic into use.

11. The two die cast rotary slide valves are identical, so it is not necessary to return them to the same side. They should be resurfaced, to take out any warpage that may have occurred over the years. To do this: tape a sheet of very fine "wet-or-dry" type emery paper to a sheet of plate glass. This is the type of water proof sand paper used in refinishing work, and is recognized by the fact that it is brittle and will break apart if the corner is folded over sharply. The reason this type is used, rather than the soft type, is that even on a sheet of glass, the regular type of sandpaper would mound up ever so slightly under the pressure of pushing the slide valve across it, causing the rounding of the lead edge. Grasp the slide valve with thumb and forefinger and push it evenly across the emery paper in one long stroke. Without releasing grasp, examine it to determine if more sanding is necessary. When all the low spots are sanded out, change position of fingers 180 degrees and take one more final and lighter stroke, or with less pressure. The new surface may be sprayed with stock no. 1700, McLube.

12. After removing the connecting arms from the crank shaft, but leaving the one set screw collar if you wish, polish off the rust with a wire brush attachment in a drill motor. Then spray several coats of no. 1700 McLube on the crank shaft to protect it.

13. Check the bushing cloth on the three connecting arms. If there is extreme wear indicated by looseness over crank shaft or looseness around the flange pin, the worn bushing felt should be replaced with stock no. 1284 felt. For lining the hole for flange pin, follow installation instructions in the catalog.

14. Reglue the three pneumatics to the top channel board. It is important not to restrict the passage of air through the two holes on the pneumatic. Draw a bead of no. 320 plastic glue around these holes as far away as you can, so that when the screws are tightened, the glue will not squeeze out into the holes. Use a washer under the heads of the screws, so pressure will be on the wood instead of the brass nipple. Use a square to align the pneumatics before the screws are completely tightened.

15. Reglue the side channel block to the top channel. Again, use the no. 320 plastic glue. Use a sparing amount of glue. Both surfaces should be flat so that it is not necessary to use a lot of glue. Both surfaces should be flat so that it is not necessary to use a lot of glue. Remember that the edge of this side channel block which is tapered to the top, is on the side which the pneumatics are glued. It is advisable to check the glue on this joint, after the two screws are tightened, by removing them again and inspect the distribution of glue to see if too much or too little was used. These six channel holes are minimal, and restriction from glue squeeze out could be ruinous to the performance of this motor.

16. Find the screw hole on moveable leaf at the foot of the pneumatic by punching through with an awl. Use a narrow pointed Exacto knife or a scalpel to clean out cloth and glue over this hole. Run the screw into this hole without the flange, past the normal depth. Then remove the screw. The reason for this is that when the screw is finally inserted through the flange, it will not become hard to turn just before the flange is tightened against the cloth.

17. Reassemble the rotary valves to the crank shaft: There are three parts between the set screw driver and the slide. Next to this set screw collar is a spring, then a metal washer, then a washer of pneumatic cloth, with an I.D. smaller than the crank shaft diameter; this is to keep an air tight seal on the center hole. A new pneumatic cloth punching should be made. To compensate for the spring being weakened with age, stretch it out. Assemble all these parts in order and replace the thin board to the top. The hole through this board should be stuffed with scraps of bushing cloth to temporarily keep the crank shaft centered for testing.

18. Return the pins which connect the crank shaft arm to the pneumatic flanges.

19. To rough in the position of the set screw drivers for the rotary slide valves: hold the motor assembly so the rotary valves are to your right and down as you look at the crank shaft from the rear of the motor. Bring the loop of the crank for the pneumatic which is nearest the inside valve, so that it comes straight out toward you, or with the inside pneumatic section completely closed. Then position the head of the screw on the slide valve driver so it is straight out in the direction of the crank shaft loop. Position the set screw on the outside driver in the same position.

20. You may now visually fine tune the adjustment of the rotary valves. Remember that the outside slide controls the outside pneumatics and the inside valve the inside pneumatic section. Determine the direction of rotation by sucking on the 1/4" supply hole. As you look at the outside rotary slide from the side view, the rotation will be clockwise. Through the slot in the slide valve, the hole in the wood beneath, which is nearest the straight, or left side should just start to be uncovered as outside pneumatic furtherest away prepares to open. The crank shaft loop should be past the dead position slightly as this hole in the wood begins to open, allowing atmosphere into this pneumatic. Reset the set screw for this position.

Now, going to the inside slide valve watch through the slot in this slide valve as it starts to uncover the hole in the wood, which is exactly opposite the one just adjusted. This controls the atmosphere entering the other side of the pneumatic farthest away. This inside pneumatic will be completely closed as this hole beneath the inside slide valve is just starting to be uncovered by the slot in the rotary slide valve. The loop in the crank shaft will be past the dead position, to the extent that you can manually pry the closed pneumatic apart and the crank shaft will whip in the direction of proper rotation. Tighten the set screw of the inside driver in this position.

There should be a slight amount of play in the drivers for the rotary slide valves, that is, when the crank shaft end is pushed in and out, it should be able to move at least 1/32".

Tools and Materials Required to Rebuild The Gulbransen Roll Motor

Tools:

Screwdriver
Knife (stock no. 471)
Hammer
Belt or disc sander, stationary type
Exacto knife with narrow-tapered blade
Ruler (for straight-edge)
Masking tape
Awl
13/64" drill bit
Small brush (stock no. 305)

Materials:

Stock no. 320, plastic glue
Stock no. 46, cloth
Stock no. 303, "hot" glue or no. 301 epoxy
Stock no. 1700 McLube
Stock no. 1284 bushing cloth
Stock no. 321 graphite
Stock no. 1472 brass nipples (6)
Sheet of fine "wet or dry" emery sandpaper
Clear lacquer