

Rebuilding The Gulbransen 3-Tier Glued Type Pneumatic Stack

This rebuilding process is unavoidable. There are no shortcuts or partial measures which are less than the step by step, complete rebuilding process as noted in the following steps. The pouch is normally a rubber coated cloth and ultimately deteriorates. This silences each note. In a few cases, leather pouches were used. Since the pneumatic must be recovered, and the leather will soon be at the end of its useful life, it is not at all advisable to leave it.

There are ways to sever the tier boards from the connecting upright channel board, but you just have one chance to get it glued back together correctly again, even under the best of conditions. The risk is too high; the price for failure would mean doing the job completely over again. If you have thought of gaskets on this joint — forget it. Due to the design of the action, there is too much stress on this joint due to pneumatic force springing it, with a soft gasket. With a firm gasket, there is not enough screw positions to compress it. Even if there were enough screws, a hard thin gasket material, would expose it to humidity change that would allow enough seepage to drastically affect the performance by the time a year had passed. The Gulbransen designers thought of these things and that is why it is a "sealed unit".

Therefore, plan on making two saw cuts lengthwise through the 3/4" thick front board. This can later have gaskets the thickness of the saw cut and be bolted back together vertically with four 6 1/2" bolts.

Step By Step Instructions

1. Disconnect tubing. Remove all hardware (hinges, braces, etc.) Number and remove the three wooden strips that cover the row of bleed cups on the front. Remove the few screws that go into the three tier boards. These are securely glued to the other side, and removal of these screws will make no difference. Now, you should have a flat surface to run over the table saw.

2. Before making the saw cuts, the four holes for the bolts must be drilled. Otherwise, the holes could never be lined up properly after the saw cuts are made. Use stock no. 464, Brad point center drill for drilling these holes. The bolt holes will be drilled vertically through the front board (at a right angle to the saw cuts). Drill one hole at each end, and one hole in each of the rail breaks (spaces in the pneumatic scale, about one third of the way over from the ends). These holes will pass through the vacuum distribution trough at the top, but safely out of the way from any other vertical channel holes. Use a vacuum cleaner to withdraw sawdust from the distribution channel, through the 3/4" stack supply elbow and by tilting the opposite end up.

3. Set the rip fence of the table saw so that the saw cuts leave the middle and top sections with a cut flush to the glue line of the pneumatics. That is, a continuation of the glue line, so that after the pneumatics are removed, there won't be a stair step. Set the height of the blade to just come through the 3/4" thickness, but missing the hinge end of the pneumatic. The side from which the bleed cup covers were removed, goes down on the table saw. Use a sharp blade, so the saw cut will be straight; not heat up and run crooked. If a planer or jointer is available, the saw cut roughness may be skimmed off. However, the gasketing method later used, will fill in such unevenness with glue.

You should check for lengthwise warp, by using a long straight edge, in the direction of the saw cut to be made. If it will not lay flat on the table saw — that is, if it rocks from the center, it may need to have shims added temporarily, to guide it through evenly.

4. Next, the old valve covers must be removed. Pry through the center hole of this wooden washer with a screwdriver blade, splintering it away. These will later be replaced with stock no. 668 fibre valve covers.

5. Pull out the valves, which are under these wooden covers. If the valve tears away from the stem, use tweezers to pull out the stem. Sand off the remaining splinters or remains of the wooden valve covers.

6. Remove the pneumatics. Place a block of metal on a concrete floor. Set the tier-board on this, with the open ends of the pneumatics hanging over the edge. There needs to be sufficient space between the floor and the pneumatics to clear. Use stock no. 648 impact transfer plate or a block of metal about 3/4" thick by 1 1/2" wide and 3" long, to place squarely on the hinge end of the thick pneumatic board. Hit the top of this with a sharp hammer rap. This should shock-shear the glue connection without much splintering, if the blow of the driving bar is straight down. In order for this method to work on the bottom row, the part of the upright board that extends past the glue line will have to be sawed off. If this method is not successful, then as a last resort, the pneumatics will have to be heated off with an iron (electric, clothes) set at a medium heat for one minute over the thick board with the moveable leaf removed. A screwdriver can be wedged between it and the adjacent pneumatic board and kept under leverage until the glue softens enough to allow sideways slippage and removal.

If there are any chips or splinters from the thick boards left on the tier board, (the long shelf to which the whole row of individual pneumatics are glued) then, sand these off so there is no roughness, so masking tape for later sealing will stick without leaking.

7. Remove the bleed cups. This applies to the top section only. These are seen through a recessed hole, after removing the three cover strips. Use a tap handle or a pin vise to chuck up a #27 size drill bit. The flutes will catch after a couple of turns. You can extract the bleed cup easily. Place a strip of masking tape temporarily over the bleed access holes. Prepare for sealing with lacquer by pouring it through the 3/4" brass supply elbow. But first: the tracker bar nipples must be jampered with short pieces of scrap tubing. Turning each one over on the next one, also, seal the bottom saw cut with two strips of stock no. 260, 3/4" wide masking tape. Also, run strips of masking tape along the first two holes on the underside of the tier-board where the pneumatics were.

Place individual pieces of masking tape firmly down over all the brass ring valve seats on the reverse side. Now, pour lacquer in the 3/4" supply tube, until full.

Immediately stand on end and drain out all excess lacquer through the same elbow. Wait ten minutes and remove all masking tape and tubing jumpers. Blow out any remaining excess of lacquer.

For middle and bottom rows, holes are taped with masking tape, from the bottom side (the area to have a gasket). Next the first two holes on the underside of the tier-board, then, a patch of the masking tape over the brass valve seat ring on the other side. Pour lacquer into the individual top holes, until full, then immediately drain.

8. Wait until the lacquer is dry and replace bleed cups. Regasket and replace the cover strips.

9. Polish the brass valve seat ring, in the valve well, with a pad of fine steel wool, over your thumb, with a twisting action. Blow out dust.

10. The easiest way to remove the old pneumatic cloth and pouches from the pneumatics is to soak them in water. This will save a great amount of time, even though it takes several days to dry out afterwards. It will be like starting with new wooden pieces, ready to seal, pouch, hinge and cover, with every speck of the original glue and fabric washed away. Since this at all must be done anyway, why not? Warpage? Yes, if you don't take one precaution — sand the outside finish from the exterior of the moveable leaf. Warpage is caused by soaking unevenly, and when thin wood is involved. Since the external side of the moveable leaf is coated with the original sealer and the inside is not, the swelling action of the water bends the thin, 11/64" thick board concave on the sealed side; some of this is permanent warpage after it dries out, leaving a .010" dip. However, if this sealer had been sanded through before the soaking, the permanent warpage would be only .004". This is negligible and would be sanded out in the process of finishing the pneumatic cloth trim in preparation for the new sealer or finish coat. The thick section with the pouch cavity will resist warpage due to the stability of the thickness. Therefore, sanding the sealer from moveable leaf, is the only preparation before water soaking.

The original lifter disc may be pulled off the old pouch before water soaking and be laid aside for reuse if leather pouches were used; the more common type with rubber-cloth pouches, had a spacer glued between the lifter disc and the old pouch. This is best to soak loose with the rest of the unit. The red fibre disc is saved, but the spacer is to be replaced.

11. Lay the pneumatic boards on edge to dry, for the greatest air circulation and even drying. Occasionally, the thick boards will be made of spliced wood; when you discover one of these, just keep them together for later regluing. Forty-eight hours is sufficient drying time unless the humidity is very high.

12. The first operation after drying, is to sort out all of the thick boards which may have left splinters behind on the tier board when they were sheared off. Fill these places with a mixture of stock no. 301 epoxy. Allow six hours to dry and then clean out excess in holes and rough sand the surface, but not taking the surface below the original level.

13. Seal the pouch well and the 3/4" supply hole with stock no. 320 plastic glue. Place the spout into the small hole at the hinge end and squeeze glue into the floor of the pouch well. Follow up by blowing through from same direction to clear hole and then brush the glue throughout entire pouch well cavity with a stock no. 305 brush, over the ledge to which new pouch will glue, and up to the glue line of the board. Tilt to dry away from the small hole. As a last measure, stick the point of a lead pencil in this hole as it comes out from the bottom of the pouch well and swirl it around to remove any excess glue from the entrance of this hole.

14. After the 320 plastic glue has started to turn clear in the pouch well, the 3/4" supply hole may be sealed. An easy way is to hold your finger to block one side of the hole and with the spout of the no. 320 glue bottle, squeeze out some glue and rotate the spout to distribute around the sides, as if you were mixing in a bowl. Then stand the pneumatic board on the hinge end, so that excess will drain to the side closest to the pouch well.

15. To lay a new pouch you will need stock no. 1802, 1 1/4" dia. rubber cloth pouches; the stock no. 628, a special contour pouch setter; and stock no. 1112 sponge washers for a spacer between the original 3/4" O.D. lifter disc and the new pouch. It will require stock no. 319 Griptix as an adhesive to glue this pouch in place and also stock no. 320 glue to lock it in from above. If you do not have the original red fibre lifter disc, then stock no. 663 will serve as replacements.

Put a small drop of stock no. 319, Griptix in the center of the no. 628 disc recess. Lay the 3/4" dia. lifter disc in the recess of the no. 628 pouch setter. Glue the stock no. 1112 spacer in the center of this disc, by first putting a dot of no. 320 glue in the center of the disc. Push down the no. 1112 spacer over this dot of glue with the cloth side of the spacer into the glue. Put another drop of no. 320 glue onto the smooth side of the spacer. Invert the pouching tool. The disc should not fall out because of the tackiness of the first dot of no. 319, Griptix put on the tool. Lower this over the no. 1802 pouch, laying on the work table with rubber side up. As you lower the pouching tool with disc, center the pouching tool within the diameter of the rubber-cloth pouch, so all edges sticking out beyond the tool are even.

Pour a small puddle of the no. 319, Griptix onto a metal lid and transfer a small quantity, by using the end of a matchstick, all around the pouch glue ledge of the pouch well. Only a very small quantity, even distributed, is desirable. There is not enough contact coming out of the squeeze bottle directly, and you might have too much. By jabbing the match stick or similar flat end down up and down along the ledge, dipping frequently into the puddle of Griptix, the proper amount will indicated by the evenness of the white color. It will soon turn clear. This is the time that the pouching tool with new pouch may be pressed into place. While this first glue ledge is drying clear, you may apply same to several others. The Griptix acts like a pressure sensitive glue when dry, therefore, there should be no hurry involved in pressing the new pouches in place.

Sight the pouching tool over the pouch well cavity and lower it down so the extended edge of the new pouch cloth will be pressed upon the pressure sensitive Griptix glue at the same time the dome of the pouching tool causes it to be somewhat pulled under the ledge of the tool, resulting in the proper dip.

The purpose of the 1/16" spacer between the lifter disc and the pouch material is to force the pouch to immediately start lifting the disc from the edge. The dip of the pouch from edge to edge of this disc, or across the diameter always has the center dip, caused by this spacer. This is what causes the snap action to quickly return the pouch to the down position and reset the connected valve. The reason for this is that the center of the pouch can never rise above the glue line at the edges, and snaps back to the bottom more rapidly, since it is already favoring that direction.

Run a bead of the stock no. 320, plastic glue, around the ledge of the new pouch, but keeping it away from the moveable area. This will permanently lock it in. Allow this glue to dry before the next step.

16. Seal the thick pneumatic boards on the side opposite the pouch well with shellac or lacquer by holding them in hand and brushing over the original finish. Allow this sealer to dry before next step.

17. Follow the instructions for making the new hinge as outlined on page 157 of this catalog. Original bumper felts inside the pneumatics are also replaced at this time.

18. For covering the pneumatics, follow the instructions for using stock no. 170 pneumatic covering jig, as outlined on page 158

19. The finished pneumatics need to have the exterior wood surfaces sanded smooth. This removes untrimmed glue and cloth overhang. This removes the hard to trim cloth around the pneumatic finger, and prepares the bottom for gluing by having a perfectly flat surface in order to use the minimum amount of glue. A small dot of no. 320 plastic glue may be added to the corner on either side of the pneumatic finger to seal the area where the cloth is split to go around this finger.

20. Before the finished pneumatics are reglued to the tier-boards, it is advisable to chamfer the opening of the 5/32" hole which will match up with the channel hole on the tier-board coming from the tracker bar. Chamfer means a bevel, such as can be easily done with a standard countersink drill

This will leave a place for excess glue to collect without so much chance of closing this hole with glue when mating the two holes in the process of regluing the pneumatics.

To help you make this blind alignment as accurate as possible, make an alignment template to draw lines around for guiding the pneumatic, as it is later pressed into the glue on the tier-board later. The lines may be seen through the transparency of the glue. Cut a piece of cardboard the same size as the pneumatic, 4-1/8" x 1-7/16". Place this over one of the pneumatic units and take an impression of the holes on both sides of the pouch well, and cut them through the cardboard. Now, you can place these over the respective holes on the tier-board and draw your lines around it with pencil or ball point pen.

21. Use stock no. 303, "hot" glue to reglue the pneumatics to the tier-board. Clamps are not necessary. Keep only two holes ahead, in applying the glue to the tier-board with the glue brush. The glue should be applied thinly and evenly, and by patting the brush instead of raking it, so that none gets in the small hole. Just before the pneumatic is pressed into place, turn it up and run one swab of the glue completely across the pneumatic between the pouch well and the supply hole. This is the only place for an internal leak which cannot be sealed afterwards. As each pneumatic is immediately pressed down between the pencil lines, apply the glue for the position ahead of the next one to be glued. This is so you will not have to work with the glue brush close to a pneumatic in position.

Test the first pneumatic glued. Pull it right back up after firmly pressing down into the glue. By examining the glue imprint on the bottom of the pneumatic you can determine if too much or too little was used, and be able to make any changes in your method before gluing all of the pneumatics in place. There should be a solid transfer of glue to the pneumatic. If not, then the glue may be setting up too soon, because it is either too thick or because the room temperature is less than the ideal 80 degrees; this would cause chilling of the glue before there was time to press the pneumatic in place.

22. After one row is completed, go back and again press down on each pneumatic, and at the same time checking for any slippage or popping up. Test for any plugging of the passageway of the 5/32" hole. This is done by blowing through a tube placed on the small channel hole of the sawed vertical board, or in the case of the top row, by using the respective tracker bar tube nipple. You should be able to hear the pouch movement as a thumping sound inside, if this passageway is clear when you alternately blow and suck on the tube. If you feel any unusual resistance in the first try, it should be pulled up and inspected before the glue is fully set up. There is no such thing as the hot glue being sucked on through this passageway at the glue line. By this time the glue is not mobile enough to do anything but close up again after the air flow ceases.

23. Make new valves. A new valve can be prepared by gluing one thickness of stock no. 661 leather to both sides of stock no. 667 fibre disc. This is 3/32" diameter by 3/32" thick. This is slightly thinner than the original wooden valve base, and will compensate for the sanding of the top of the valve board to clean it up and also the slightly thicker valve facings, since leather of the original thin quality is not obtainable today.

The new valve base will have no warp. It is best to work on a sheet of glass when gluing the valve leathers on, to preserve this flatness. First apply stock no. 320 plastic glue to the new fibre disc, holding it with the aid of masking tape wrapped around your finger, sticky side outward. Saturate a scrap piece of felt with glue. Lay out the stock no. 661 leather facings on a sheet of glass, with smooth side of leather up.

Then touch the valve base with your taped finger, lift it over to the felt pad to receive glue, and then press it over the valve leather, and leave it in place to dry, while you go on to the next one.

Later, make a small dot in the approximate center of this leather, after the glue is dry, and they are turned over, with a ball point pen. This will later be used to center the valve cover washer as well as to distinguish between the two sides, as the other side, which seats on the brass valve seat ring, is applied differently. On the remaining side of the valve base, the glue is applied only at the very edge, and has the smooth side of the leather out. This tedious job may be facilitated by temporarily borrowing the 5/8" elbow from the pneumatic roll motor supply, and surfacing one end of this elbow flat with a file. This may be pressed down on the felt pad with the glue, to transfer an outer ring of this glue onto the fibre disc held by the other hand with the masking tape wrapped finger. Again, press the glued disc down on the stock no. 661 valve leather laying on the sheet of glass with the rough side up. The purpose of gluing only the edge, is to allow more flexibility of the leather to seat against the brass ring valve seat later.

24. Before the new valve is glued to the valve stem, the valve stem must be sized for length. It is very critical that the valve stem be long enough, with the addition of a new flexible joint added. This flexible joint is added to the original valve stem first. Cut off the remains of the old piece of leather and make new ones by dicing up small pieces of stock no. 1335 buckskin strips with knife or scissors; or a 3/16" leather punch. Glue these 3/16" circles or squares of the buckskin with stock no. 320 plastic glue, to the valve stem.

Drop the valve stem with the new flexible leather tip into the valve stem hole and press it down in position with the other end contacting the pouch lifter disc. Lay the end of a stock no. 471 knife over the brass valve seat ring, to use as a straight edge, in determining that the buckskin does not rise above the ring to touch the knife end. If it does, remove the valve stem with tweezers and shave off the leather with a razor knife, then try it again. When it is correct, remove once more and place a dot of no. 320 glue on the bottom end of the valve stem and press it permanently in place against the pouch lifter disc. The reason that the valve stem is glued to the pouch is to take advantage of the snap action of the rubber-cloth pouch, which greatly adds to the speed of repetition.

25. Glue the new valves in place. Put a dot of no. 320 plastic glue on the buckskin tip of the valve stem and place the valve in the valve well, centering it, with the ball point pen dot upward. Hold down the valve with your finger, at the same time blowing through the channel to inflate pouch, as was done in testing in step 22. This will raise the valve stem and glue to make contact with the valve leather. After sufficient drying time, go back, using the blow tube to raise each valve again to be sure it is not accidentally stuck, and to see that it raises about 3/32" above the top surface of the valve well.

26. Lay the new valve washers, stock no. 668, over each of the valve wells. Check each one for valve travel of the valve underneath, by holding the valve washer with your finger and inflating the pouch to determine that there is 1/32" valve travel. If the valve travel is not enough, the valve washer can be spaced upward by first gluing a stock no. 664 paper ring on the fibre valve cover washer to space it out more.

When spacing has satisfactorily been determined, use the following method of gluing: Center the dot on the leather valve through the hole in the fibre valve cover ring. Hold the valve cover in place with your finger while you run a bead of the stock no. 171, Titebond glue, around the outer edge. Do not put the glue on first, as was originally done. This method would run severe risk of squeezing out into the valve. Allow this glue to dry on this last step and the completed section may be tested in the next step.

27. A special test rig must be prepared to test the tightness and repetition of the bottom and middle rows, to know that all the valves and pneumatics are working properly before being joined to the top section. The top section is easy to check, since it is the section which has the bleeds and also has the vacuum distribution channeled from the 5/8" elbow. Just place a strip of masking tape on the bottom where sawed, to block the channels. Also tape bolt holes. With all the tracker bar nipples blocked by jumping with short scraps of tubing, this section should be tight when drawing on the 5/8" elbow. Pneumatics and valve action may be tested by opening the tracker bar nipples individually.

The vacuum supply of the remaining middle and bottom sections, to be checked individually, one at a time, are done with the help of a quickly fabricated testing rig: A series of individual tubes, supplying vacuum, will have to be plugged into some of these 1/4" holes at the top of the saw cut. The channel holes continuing on to the bottom, in the case of the middle section, are isolated. The 1/4" holes on the top of the sawed section, which are in line with pneumatic unit are the holes to be concerned with, in supplying this temporary vacuum. Run a strip of masking tape over the top side, covering all the holes. If testing the center

section, mark every other pair of large and small holes, which will be the pair on center with the pneumatic. Of these marked holes, punch through every third one of the 1/4" holes with a lead pencil. These will be connected to vacuum with a temporary line. The adjacent pneumatic valves will be supplied with the test vacuum through a narrow cross slot, internally, which you have not seen. It exists behind the glue joint on the tier board as it joins the upright channel board.

The bottom row is similarly tested. Each pneumatic should be responsive at low vacuum, without gasping. Eight inches water lift vacuum would be about the right test vacuum. A vacuum cleaner will draw much more, but a hole can be put in this line to drop the vacuum.

If you do not have a vacuum test gauge, here is an easy way to determine the setting of 8 inches. This makes use of the reroll pneumatic which is located on the front of the bottom pumping assembly to move the bar across the top of the pump to operate the gate valves. This unit will have to first be rebuilt with new pouch and valve. Access to this pouch is only through splitting the block apart on the glue line, which will be revealed by sanding off the black paint.

Cut a large leak hole in the supply line where it is attached to the vacuum cleaner. With the single function valve and pneumatic of the reroll unit attached, start closing off the leak hole in the vacuum supply with masking tape, a little at a time until there is enough vacuum reaching the valve to respond to opening and closing of the 5/32" nipple going to the pouch. Then allow just a little more vacuum until the pneumatic is snappy and without gasping of the valve. This will be the right vacuum setting to test each of the three individual sections of the player stack.

The temporary vacuum may be supplied with some type of distribution box, which can have the nozzle of a vacuum cleaner plugged into one side of the hollow compartment. Though the other walls of this box, drill ten holes with a size #14 drill bit, which will be a tight fit when driving in stock no. 72, straight nipples. Connect nine of these nipples with appropriate lengths of stock no. 4, 1/64" I.D. tubing, to reach the punched holes in the masking tape of the player section. The tenth nipple will be used to supply the temporary bleed for the note testing tube.

A taper can be put on the end of the rubber tube that is to be stuck into the player stack: twirl this end on a high speed grinding wheel. Then it will be easy to insert and seal against the taper.

Connect the distribution box to the player stack section with the 1/164" I.D. tubing. For the note testing tube, use about a two foot piece of stock no. 3, 5/32" I.D. tubing. Insert a stock no. 353 nipple on either end; cut the tube into and reconnect with a stock no. 350, Y connector. To connect from this remaining leg on the Y to the distribution box, use another length of 1/164" I.D. tubing, but before you slip it over the Y connector, shove a stock no. 388, bleed cup, down into the end of the rubber tube. This will be your temporary bleed for the one left behind in the top section.

With the distributor box you can first check for tightness of the section better if you will supply the vacuum to the distributor box with your own lung power. If it is tight, go on to check repetition and pneumatic action using the vacuum cleaner. If it is not tight under the lung power test, use the vacuum cleaner and a listening tube to locate any leaks around the pneumatic surface that was glued, or through the hole in the valve cover.

To check for the individual note action, after tightness overall has been determined, use the testing tube with the no. 353 nipple to punch through the small holes marked on the masking tape; the other end of the testing tube can be covered with your finger. When uncovered and covered alternately, the pneumatic should quickly respond, no matter how fast you tap your finger on the nipple. The pneumatic will stay collapsed after you leave this hole with the testing tube and punch through the next holes. After you open half a dozen, you can tape them back over to preserve the low test vacuum.

28. Remove all masking tape and prepare to make gaskets to go back together. It is suggested that two gasket strips be used per each saw cut. Normally the saw blade would remove about 1/4", but if it is more, a combination of a 1/16" (stock no. 398) and a 3/32" (stock no. 411) gasket strip would give slightly more.

Cut the four strips of the cork-rubber gasket material approximately 1" wide. Punch the holes for the four bolt holes in all of these strips. As each wood surface is glued with stock no. 320 plastic glue, cover with a blank gasket. Each joint will have the two dry sides facing each other, when reassembled. Insert four stock no. 635, 1/4" x 6 1/2" long bolts. Tighten the three sections together with the blank gaskets between, and immediately take apart a strip off the gaskets with the glue impressions. You may see where to punch the holes from this impression. Use a punch with a slightly larger diameter. The stock no. 232, revolving tube punch, is a handy tool for this operation. When all holes are punched in the four strips, again apply no. 320 plastic glue to the wood and replace gaskets in their respective positions. Bolt the three sections together tightly and leave overnight to dry. The next day, these joints can be taken apart and inspected. Any holes with excess glue squeezed into them may be cleaned out.

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29. Assemble the three sections with the bolts for what you hope will be the last time. A rubber washer, metal washer and nut should be inserted over the threaded end of each bolt, to prevent leakage past the bolt into the vacuum chamber. The head of the bolt could be sealed with no. 320 plastic glue. The rebuilding of the player action should now be finished. Return the hardware and retube to the tracker bar. The final test may be made with the stock no. 826 test roll and foot pumping. If ever there needs to be additional troubleshooting, you have easy access with just the four bolts to remove.

The commercial success of the Gulbransen player action was in the fact that it was about the best performing player action designed, and was also one of the cheapest player actions made. The response and easy pumping was made possible by the most minimal vacuum channels; no cavernous passageways to exhaust before starting to play.

In regard to major power tools: Table saw, stationary sander, and drill press — it is recognized that the average person, although having the desire and ability to follow these steps, does not possess such home workshop equipment. However, there is no substitute to insure producing successful outcome of the project without this machinery.

It is recommended that you search your list of acquaintances for someone that will help you with these operations involving work shop equipment that you cannot provide for yourself. As a last resort, a professional cabinet or pattern shop, with this service for a fee.

These catalog pages concerning the technical rebuilding process for the "sealed unit" Gulbransen stack, which has been considered the most difficult of all types to rebuild, are the only such instructions ever published. These instructions are a compilation of all the latest methods and materials, proven to be long lasting and successful, from a number of professional player action rebuilders that have specialized in this particular player action.

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List of equipment needed:

1. Table saw
2. Drill press
3. Belt or disc sander, stationary type
4. Hot glue pot
5. Screwdrivers
6. Drill bit, size #27
7. Drill bit, size #14
8. Pin vise or tap handle
9. Clear gloss lacquer, thinned to spraying consistency
10. Empty spout squeeze bottle for lacquer
11. Ball point pen
12. Countersink reamer
13. Tweezers
14. Vacuum cleaner
15. Ruler
16. Scissors
17. Hammer
18. Fine steel wool

Rebuilding the Gulbransen 3-Tier Glued Type Pneumatic Stack

List of materials, individual stock items that are combined in the stock no. 2400, Gulbransen rebuilding kit.

Step No.	Stock No.	Description	Quantity	Catalog Price	Page
2	464	Brad point center drill, 1/4"	1	\$ 4.38	29
6	648	Impact transfer plate	1	.50	58
7	260	Masking tape, 5/8" x 360 yds.	1 roll	2.75	—
12	301	Epoxy kit	1	3.50	20
13	320	Plastic glue (included in No. 170)			
13	305	Throw away glue brushes	1 doz.	.85	19
15	1801	1-1/4" dia. rubber-cloth pouches	100	11.68	
15	628	Special contour Gulbransen pouch setter	1	5.00	
15	1112	Sponge spacers, 1/4" dia. x 1/16"	100	2.25	90
15	319	Gripstix, pres. sensitive glue	1	3.10	20
17	471	Knife	1	3.60	28
17	1001	Felt-tape, 1/4" x 1/8" thick	11 ft.	4.40	92
17	1671	Duct tape	1 roll	2.50	
18	170	Pneumatic jig. cloth, glue, etc.	1	22.50	
21	303	Hide glue crystals	1 lb.	2.01	19
23	661	Valve facings, 5/8" dia. x .010	200	25.00	41
23	667	Fibre valve base, 5/8" dia. x 3/32" thick	100	7.50	43
24	1335	Buckskin, 7/16" wide strip	1 ft.	.60	92
26	668	Valve cover washers, 7/16" I.D. x 1-1/8" O.D. x 1/16" thick	100	6.75	43
27	4	Neoprene tubing, 11/64" I.D. x 1/4" O.D.	20'	2.40	10
27	72	Straight brass nipples, 3/16" O.D. x 1-1/4" long	1 doz.	.88	13
27	353	Tracker bar reducing nipple, 5/32" O.D. to 3/32" O.D.	2	.60	13
27	350	Y connector, 11/64" O.D.	1	.25	15
27	388	Bleed cups, #68 drill size	1 doz.	.40	46
28	398	Cork-rubber gasket material, 4" x 54" x 1/16" thick	1	4.50	25
28	232	Revolving punch	1	8.50	30
28	635	Bolts, 3/16" dia. body, w/1/4"-20 thread, 6-1/2" long	4	1.00	58
29	826	88 note test roll	1	2.60	95
	2400	ALL OF ABOVE ITEMS	1 complete	130.00	