

Maintaining and Repairing Pneumatic Nailers

by Clayton DeKorne

Understanding air tools
can save you
costly down time

Last year I was sheathing a roof on a chilly November afternoon. It was cold enough that the nail gun I was using was slowing down a bit—the drive stroke and the return stroke of the piston were two distinct sounds. At the time I didn't understand why an air gun slows down when it's cold, and right then I wasn't too interested. The job kept me busy—at least until the drive stroke didn't return and I was left with most of the roof left to sheath and a gun spouting a steady stream of air. I finished the day with a hammer and fell short of the estimate.

Afterwards, I expected to be working my arm out for six weeks while the gun was sent in for repairs. But as it turned out, the contractor who owned the nailer had the repair kits to replace the O-rings, and he was able to rebuild it on his desk with phone assistance from the manufacturer. This impressed me enough to investigate how air nailers and staplers work, what maintenance procedures will keep them going, and what technical support manufacturers provide. I didn't want to be dependent on a black box. Here's what I learned.

Maintenance

Moisture and dirt are hell on air nailers. Moisture is the worst offender. It enters a tool in the form of water vapor with the air supply and condenses inside the gun. This moisture not only rusts the highly polished surfaces inside the tool, but it corrodes the rubber O-rings that seal the chambers (for a description of the inner works of an air nailer see "How A Gun Fires," next page). In cold weather, condensed water in the lines and tool can turn to slush and slow the tool down or stop it altogether.

Dirt also wreaks havoc on the internal works of a nail gun. It can enter through the nose piece, or, more commonly, through the air line. Asphalt is especially corrosive to the rubber parts; it often ends up covering a roofing fastener and working its way inside. Dry-wall dust is especially abrasive to the cylinders and rings in both the compressor and the guns.

Clean air supply. You can reduce the dirt and moisture in the air supply just by keeping your compressor in a clean, dry area. Occasionally blowing out the nose piece of the gun with compressed air will also help. But even a little dirt can cause problems, so other precautions are necessary.

An intake air filter on the compressor is a must. These should be checked periodically (every week if you use the compressor every day, or daily if the air on site is especially dusty) and cleaned.

The filter elements on portable compressors are usually made of foam or pleated paper, like a car's air filter. The paper elements are best cleaned by blowing compressed air through them in the direction opposite to their normal flow. As with your car's filter, they should be replaced when they get really dirty. The foam filters can be cleaned with a solvent such as kerosene and replaced. But this doesn't mean they're a better buy. I like the paper type because they generally fit tighter and stop dust from getting in around them. The pleated paper type also have more surface area to trap the dust, so they get clogged less frequently.

But an intake filter won't get it all. Rust from the inside of the tanks and carbonized oil from the compressor will deposit a good share of abrasives into the air supply. An in-line filter will get some of this. The filter elements should be rated to trap particles of at least 50 microns. The self-draining type filters will also get a lot of the moisture out and keep it from re-evaporating into the line.

Some debris and moisture will even pass an in-line filter. And inevitably, a hose will get disconnected up on the roof and thrown fitting first into the dirt. Or, because the male nipple on the hose is always open, debris gets in it while it is coiled up in the back of a truck. To keep this debris out of the tool, take a second to blow out the hoses. On a pressurized hose, push down on the valve at the bottom of the quick-connect with a nail punch. If you have more than one hose in a line, we hook them up one at a time and blow out each one to remove any debris that might be in there. In cold weather, this technique is especially important to clear away any water that might freeze up.

Draining the tanks is the surest way to reduce the moisture in the supply air. I used to think that I was supposed to drain the tank in my compressor just to keep the tanks from rusting. I've since learned this is only part of the story.

A compressed gas has less ability to hold water than an expanded gas. In essence, when air is compressed into the tank, water vapor is squeezed out of the air. This water accumulates, and as the pressure drops intermittently in the tank, the moisture evaporates back into the air. It doesn't take too long before the relative humidity in the tank is up around 100%. As a result, all of the air rushing through your tool is much damper than the air out where you are. To combat this, drain the tanks at least once a day. On very humid days or in cold weather, drain



Pneumatic nailers rely on the physics of air to operate. Mechanically they are simple tools; cleaning and light repairs can often be handled at the site on the tailgate of a truck.

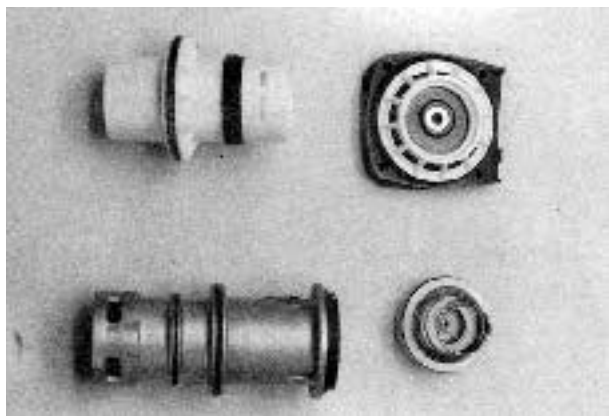


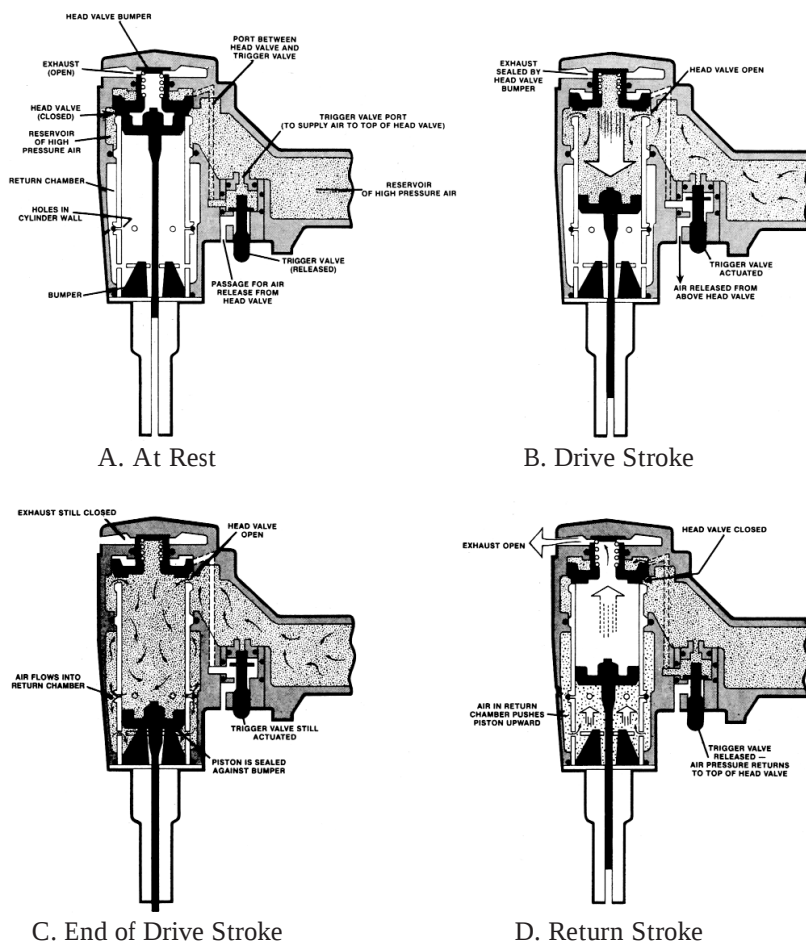
Figure 1. The Senco Power Plus line needs no oiling due to self-lubricating plastic cylinders and rubber diaphragms (top). A conventional air gun, with metal cylinder and mechanical valve (bottom), needs regular oiling.

How A Gun Fires

Pneumatic nailers are simple tools. They generally have only four moving parts: the head valve, the piston (also called the driver blade), the cylinder (also called the sleeve), and the trigger valve. The handle of the gun holds enough air to completely cycle the tool once. Some of this air is held in a small chamber above the head valve and exerts pressure on the head to keep it closed (see Figure A). When the trigger is pulled, the trigger valve releases the air in the head chamber, allowing the head valve to open (see Figure B). The force of the reserve air in the handle rushes into the cylinder and drives the piston downward. As

the piston moves down, air underneath it is squeezed through holes in the cylinder wall into the return chamber (see Figure C). The pressure differential now above the piston causes the exhaust valve to open and the air above the piston escapes. The pressure in the return chamber forces the piston back up (see Figure D). At the same time, the trigger resets to allow air into the head chamber to seal the head valve.

One important exception is the Hitachi air tools. These don't have a moving head valve. Instead the sleeve moves up and down to allow the reserve air into the cylinder to drive the piston.—C.D.



Stanley-Bosch

the tank every few hours.

Air pressure. In addition to maintaining a clean air supply, you must maintain the pressure, as well. A lot of folks think that the maximum air pressure printed on the side of the tool is the correct pressure to work with. Continued use at the maximum pressure, however, will put undue pressure on the O-rings and cause the piston to constantly bottom out on the bumper. To prolong the life of the O-rings and bumper, the pressure should be set to the minimum pressure needed to set the nails.

Constant pressure in the gun will eventually weaken the O-rings, too. So disconnect the air supply from the gun when you're not using it.

Slack guns. Oil is by far the best protection you can give your pneumatic nailers. Oil is needed to reduce the friction and heat build-up of the moving parts in the gun. It also protects

the metal from corrosion and helps wash out any debris that gets in a gun through the exhaust air port and nose.

But while everyone knows to oil the guns regularly, there remains some controversy about *what kind of oil* to use. Some detergent oils contain solvents that are destructive to the rubber O-rings in air nailers. Peter Readyhough, of Bostitch, claims that some lubricants—including some sold specifically for air tools—will “eat O-rings alive.” On the other hand, Eric Glasser, of Halstead, a California air nailer manufacturer, reports that two parts automatic transmission fluid and one part STP is a popular lubricant. And independent testimonials from two roofing contractors hailed Lemon Pledge as the best formulation for keeping the outside of roofing fasteners free of asphalt and the inner works running smoothly for years. So who are you to believe?

On the oil question, I side with Craig Russell of Fas'n'Go (P.O. Box 3908, Santa Fe Springs, CA 90670; 213/949-18881). Fas'n'Go sells and services every brand of pneumatic nailer made except Senco and Duofast. They have torn down a lot of different guns. Based on what they've seen, Russell confirmed that some oils are indeed harmful to O-rings. Marvel Mystery Oil and WD-40 are two commonly used formulations that will cause the rubber seals to swell and peel out of their tracks. Russell recommends simply using a non-detergent, 10W engine oil with no additives. A few examples are Gulf Teresstic No. 43, Shell Tellus No. 27, and Mobil DTE-LT. Some hydraulic and turbine oils (classified as ISO VG 32 to 68) will work as well.

One way to ensure your guns are well oiled is to install an automatic oiler. These fit on the nipple end of a nailer. They hold a small amount of oil in a reservoir. When the air rushes over the reservoir, a fine mist is sucked up off the surface and sprayed into the tool. Many name-brand nailers provide these as part of their accessories list. I've used one made by Norgren (5400 S. Delaware St., Littleton, CO 80120; 303/794-2611) with good results.

Not all air nailers need oil, however. An important exception is Senco's new *Power Plus* line of pneumatic fasteners. These tools have a diaphragm in place of the conventional main valve and a self-lubricating cylinder made from a composite plastic material (see Figure 1). These guns do not need to be oiled; in fact, oil is harmful to them.

Some manufacturers also recommend that the tools should be disassembled and greased regularly. Bostitch and Hilti tools come especially well greased from the factory. Both companies claim that the grease provides a thick wall of protection against moisture and harmful abrasives. Consequently, they recommend using only a very small amount of oil—just enough to slick up the surface of the grease, but not so much that the oil will wash the grease away. Yet there is some controversy here, too.

Russell claims that the grease attracts dirt and holds it. His experience has shown him that heavily greased guns “are a black mess inside.” Also, they tend to gum up, and they are not necessarily less worn. Grease is not necessary if the guns are oiled regularly.

However, grease does serve a purpose in special situations: winter for-

mulations help guns function well in cold weather. And, when a gun requires light repairs, grease helps get the O-rings on without breaking.

Cold Weather Maintenance

Moisture is a particular problem in cold weather because once it condenses in the line or the gun, it will freeze up. If the lines or the gun are freezing up on site, you can add about four ounces of antifreeze to the tank of the air compressor. The antifreeze completely mixes with any condensed moisture in a gun and prevents it from freezing. To do this, you have to remove the regulator. I know one Alaskan builder who has set up the

regulator with a quick connect on both sides so it can be removed easily and the antifreeze can be dribbled through a nipple into the tank.

A couple of drops of antifreeze into a line oiler or gun will do as well. A cold-weather pneumatic oil includes an antifreeze with the oil. One mixture that has worked well for me is Kilfrost. If you can't find it in your area, it's available off the Hilti truck. If you don't have a special mix and have to add your own antifreeze, make sure you use an ethylene-glycol-based antifreeze. Other compounds, particularly alcohol, can deteriorate the O-rings. Dry gas, for example, is not recommended. And a lot of car antifreeze

mixtures have additives that are supposed to "enhance" their product, but which swell rubber O-rings. Windshield washer fluid is often a safe bet. But don't use the self-sealing kind of antifreeze sold for leaky radiators.

Brittle rubber. In cold weather the rubber parts in the gun get brittle and have a higher chance of breaking. Bumpers often break apart in subzero temperatures. When this happens, the bumper no longer provides an even base for the driver blade to rebound off. Often the gun will misfire because the piston does not return or the driver blade can bend or even snap. To prevent this from happening, you can "warm up" the guns by taking the nails out and dry firing the gun at low pressure (about 30 psi).

Do not dry fire at high pressure, however, since the full impact of the driver blade against the bumper can overheat the bumper. Bumpers are made of a urethane rubber that remains stable between 0° and 275°F. If the temperature goes outside of this range, however, the rubber turns yellow and flakes apart (see Figure 2). In fact, the impact of very rapid firing (with nails in place) can heat the rubber to about 300°F. Consequently, roofing and sheathing nailers and staplers commonly blow their bumpers.

Grease is also recommended in cold weather to keep the O-rings and bumper from breaking. But there's a catch. The usual type of petroleum grease that's compatible with the rubber seals doesn't flow well in cold weather. Often if a tool bogs down in the cold, it's sticking because of the grease used to assemble the tool, so a cold weather grease is needed. These usually have a silicon base. Here are a couple different kinds that are compatible with most seals:

- **Syl-Glide**, American Grease Stick Company, P.O. Box 729, Muskegon, MI 49443; 616/733-2101.
- **Lubriplate Mag 1** or **3000W**, Fiske Brothers Refining Co., 129 Lockwood St., Newark, NJ 07105; 201/589-9150.
- **Super O-Lube**, Parker Seal Company, O-Ring Div., 2360 Palumbo Drive, P.O. Box 11751, Lexington, KY 40512-1751; 606/269-2351.
- **Ignition lube and dielectric compound.** In a pinch, you can use these silicon-based compounds. They are widely available from auto parts stores.

Be careful with nailers that are lubed with winter grease around any wood that will be finely finished. Silicon repels paints and stains and inevitably a fine spray of the lubricant comes through the exhaust port and nose piece. Generally this is not a problem since you would probably only need to grease a framing or roofing tool with winter grease. But if you use grease to reassemble siding, floor, and finish nailers, use a petroleum-based grease such as Parker O-Lube (Parker Seal Co.) or Lubriplate GR-132 (Fiske Brothers Refining Co.).

Greasing requires the complete disassembly of the tool. This is not difficult, however. In fact, once you're set up, it can be an enjoyable job to strip down and rebuild these tools.

Tearing 'Em Down

Before disassembling an air gun, make sure the air is disconnected and the nails are out of the magazine. The latter is less obvious but very important because the tool can sometimes cycle from the change of air pressure caused by removing the cap.

For almost all air guns, you'll need a good set of Allen wrenches. I use a long-handled set to get the leverage needed to break the bond on the head bolts. Make sure you use metric wrenches on a foreign-made tool like Hitachi and Haubold. A rubber mallet is also useful for knocking the piston out of the sleeve.

Cleaning. When I tear down a tool, I spend a long time cleaning it up. It's nice if you can immerse everything in a big tub of kerosene to soak the dirtiest metal parts such as the nose piece. *Note: don't soak rubber parts in solvent.* If the bumper or seals are in good shape, just wipe them off and set them aside. If they are damaged or worn, replace them. Also, if you soak a tool in kerosene, make sure it's well dried off before reassembling it. Guns often spark when fired and you don't want it to catch on fire.

Soaking the gun isn't always practical on site, so you can carry a can of "safety solvent." Safety solvent is non-flammable, but the fumes are still noxious. I use NAPA Brake and Electric Motor Cleaner. Here are a couple other kinds that are available at some industrial supply houses:

- **MR 77** (Modern Research Corp.; 800/521-2478).
- **L&M Safety Solvent** (L&M Manufacturing; 800/544-2910).
- **Loctite 755** (Loctite Corporation; 800/323-5106).

These are aerosol solvents. In addition to dissolving grease and grime, they are useful for blowing out little pieces of debris from deep within the cylinder.

Repairs. The most important reason for tearing down a gun is to repair it when it breaks down. For most repairs, you'll be able to trouble shoot over the phone with the manufacturer or the distributor. Here are some of the most common failures and their causes are shown in the table at right.

When replacing O-rings, be very careful not to damage them. Here, as mentioned, a little grease is helpful. Make sure that the track is free of debris, first (see Figure 3). Any obstruction will keep the O-ring from sealing. Finally, when reassembling the tool, use Loctite 242 on the threads of the housing bolts to keep them from loosening up over time.

Spare parts and information. If you're tearing the tool down to replace a part, of course you'll want to have the

Figure 2. The worn-out bumper on the left (below), shown with its seal, was removed from a roofing stapler and replaced with the new bumper on the right. Note the debris left in the chamber from the disintegrated bumper (inset).

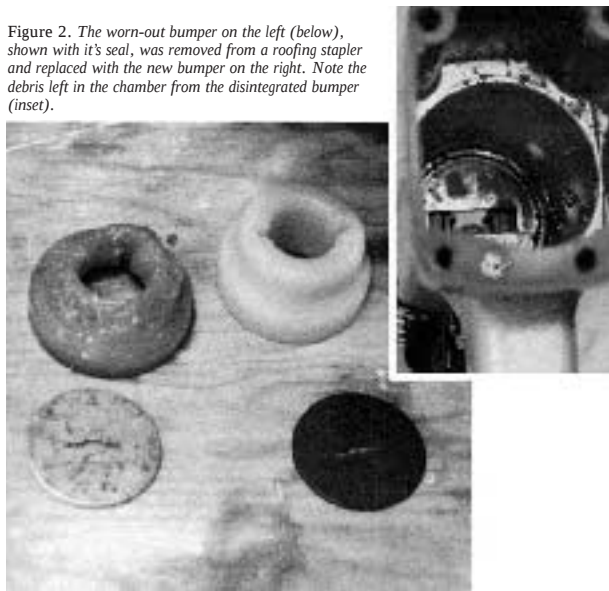


Figure 3. O-rings, such as the main-cylinder seals pointed out in the photo, fit tightly in tracks to seal the chambers inside an air gun. Handle O-rings with care since any debris in the track or on the ring will ruin the seal.

AIR TOOL TROUBLE SHOOTING	
Problem	Possible Cause
Piston does not return.	Piston O-ring or sleeve O-rings worn or broken.
Air leaks at exhaust.	Main valve malfunctioning, or valve O-rings worn or broken.
Air leaks at trigger.	O-rings in trigger valve worn or broken.
Gun misfires, fastener overdrives without increase in air pressure, bits of rubber expelled with fastener or through exhaust, or a fine, black powder gathers near exhaust port.	Bumper worn.
Nails don't set all the way at full pressure or nail bends when driven.	Driver blade worn.



Figure 4. To keep pneumatic fasteners in good repair you need to replace key parts regularly. The most often replaced parts, which you should keep on hand, are labeled in the photo above of a disassembled roofing stapler.

part in hand first (see Figure 4). And even if you're taking a tool apart just to clean it, you'll want some spare parts around. Too often, a worn O-ring will dissolve in your hands, and you're left holding a useless pile of parts.

Internal parts are rarely interchangeable between two different makes or models, so you have to go to the manufacturer for spare parts. Senco and Bostitch make this very easy. Both companies provide rebuild kits that are readily available in individual boxes through distributors. Each kit costs between \$10 and \$15 and includes gaskets and a little tube of lubricant.

Hilti and Duofast not only sell parts to the operator, but they send out service reps in vans to do the repairs as a matter of course. Hilti's field reps work directly for the company and have a reputation like UPS drivers for being prompt. Even if you don't run Hilti and Duofast guns, these companies are an assured source of accessories like oil, in-line oilers, regulators, and hose splicing kits.

But while not all the manufacturers of pneumatic tools put parts on a card or bring them to your door, *all* of the manufacturers can provide you with spare parts (see customer service numbers below). If you can't buy a kit, you have

to buy each part separately. The distributor can usually tell you all the parts you will need for a particular gun or you can figure it out from the schematic. You don't always need all the parts, however. In general, you need a driver blade, a bumper, and the O-rings in the main valve, the sleeve assembly, and the trigger valve. Gaskets can be cut out of a sheet of standard gasket material from an auto supply house and installed with Permatex. Occasionally the spring that feeds the nails through the magazine will break, so it's nice to have one of these on hand in the truck.

Most of the manufacturers are set up to provide parts and information to their distributors first. The service manuals are set up to train distributors to service the tools. But the manufacturers also encourage the operator to service his own tools and the information made for distributors is often available to the user. Try to get a service manual for each gun you own. The service manuals are often very clear and detailed; they will be much clearer to read than the exploded view schematic provided in most owner's manuals. ■

Clayton DeKorne is an associate editor of The Journal of Light Construction.

Customer Service

Here is a list of the customer service addresses and phone numbers.

Bostitch:

Stanley-Bostitch
Biggs Drive
East Greenwich, RI 02818
401/885-0700, in R.I.; 800/556-6696

Duofast:

Duo-Fast Corporation
3702 River Road
Franklin Park, IL 60131
708/678-0100

Halstead:

Halstead Enterprises
P.O. Box 788
Rancho Cucamonga, CA 91729-0788
714/987-4511

Haubold:

Haubold of America
P.O. Box 538
Morristown, TN 37815-0538
615/587-3913

Hilti:

Hilti
P.O. Box 21148
Tulsa, OK 74121
800/879-8000

Hitachi: (East and Midwest)

Sivaco Fastening Systems
615 Falmouth St.
Warrenton, VA 22186
800/874-8226

Hitachi (West) and Holz-Her

Air Nail Co.
5335 Reisner Way
South Gate, CA 90280
213/563-0233

Paslode: (East)

Paslode/ITW
Two Marriott Drive
Lincolnshire, IL 60069
800/222-6990

Paslode (West)

Paslode/ITW
3480 S. Willow
Fresno, CA 93725
800/852-8820

Senco Products, Inc.

P.O. Box 2116
Millford, OH 45150
800/543-4596

Spotnails:

Spotnails, Inc.
1100 Hicks Road
Rolling Meadows, IL 60008
800/621-6098 or 708/259-1620 (in Ill.)

Tech:

Tech Forge Industries
1555 Ave. S., #107
Grand Prairie, TX
800/634-5318