Field of the invention:

The invention relates to an improvement in sheet metal hand tools.

Background of the invention:

In industry today, many manufacturing and processing plant use piping that is insulated to reduce heat loss or gain to the surroundings. This insulation is often made from expanded foam or fiberglass, and requires a protective outer sheath to guard against abrasion, compression, or other actions that may be detrimental to the life and performance of the insulation.

Typically, this sheathing is an outer layer of aluminum or stainless steel, formed from straight sections for straight piping, and formed corners that correspond to bends in the pipe for going around corners, such that the entirety of the pipe is insulated. Once installed, the insulation sheathing is retained in place on the pipe by means of metal strapping that has an integral clamp formed within it. Typically, once the sheathing is installed, workers retain it in place by the use of this special strapping and clamps, which requires several tools. Tin snips are required to cut off excess banding length, and a hammer and screwdriver are needed to bend over the locking tabs on the clamp

to retain the band around the sheathing. This requires the worker to change tools several times in the process of securing a band to the pipe, and it is cumbersome to carry a plurality of tools on a job site.

In addition, pipe typically does not have any flat sections upon which to place the tools when they are not needed, so if they are placed on the ground the worker is required to always bend to retrieve his tools, which may become muddy from the ground, and accelerates wear and rust on the tools. In some locations the pipe racks that carry the pipe to be clad are high above the ground and it is not practical for a worker to continuously exchange tools from the ground Alternatively, to avoid the process of changing tools, workers will often dispense with the separate tools, and use the tin snips to perform all functions. While this can function, it often damages the pipe sheathing when the sides of the snips are used as a hammer, and results in a substandard fastening of the band clamps.

Therefore, there is a need in the art for a clamp fastening device suitable for use piping systems that mitigates the difficulties of the prior art.

Brief description of the Drawings:

The invention will now be described by way of exemplary embodiments with reference to the accompanying simplified, diagrammatic, not-to-scale drawings. In the drawings:

Figure 1 shows a top view of the invention
Figure 2 shows a detailed view of the hammer end
Figure 3 shows a detailed view of the band clamp closed by the present invention.
Figure 4 shows a cross section through a fastened band clamp.

Detailed description of the drawings:

The present invention provides for a band clamp closing apparatus, suitable for use in the construction industry. When describing the present invention, all terms not defined herein have their common art-recognized meanings.

As shown in figure 1, a tin snip 10 includes a protrusion 12. The protrusion 12 has a leading edge 14 that is rounded, and a trailing edge 16 that is square. The leading rounded edge 14 is used to ensure that when the snips are used in the normal sheet metal cutting mode that they will slide along a table, worksurface or other sheet metal smoothly, rather than having a sharp edge that may mar the surface that is underneath the material being cut. Since the trailing edge 16 is held at a higher angle that the leading edge, the possibility that the trailing edge will come in contact with another piece of material is remote, therefore it does not need to be rounded.

The protrusion 12 is approximately the same thickness as that of the arm 20 of the snip, such that the protrusion does not interfere with the normal operation of cutting sheet metal. During experimental development, thicker protrusions were tested, and found to bind in the kerf of the sheet metal that was being cut. Although a thinner protrusion 12 slightly reduces the effectiveness of the protrusion as a hammer, it does not impair the sheet metal cutting function of the snips. The leading edge 14 of the protrusion 12 is placed approximately ⅛" behind the pivot point 18 of the snips. This assures that the protrusion is far enough back so as to not impair the sheet metal cutting function by requiring the user to raise the handles to an uncomfortable angle to have the protrusion 12 clear a worksurface if the snips are being used to cut material on a table or the like. However, the protrusions are not so far back as to upset the weight distribution of the snip such that it would be uncomfortable or dangerous to use the snip as a hammer.

The protrusion 12 is also placed such that it aids cutting of sheet metal. During cutting of sheet metal, the protrusion rides in the cut made by the snips and serves to separate the halves of the cut, and thus preventing the cut portions of the sheet metal from binding on the snips. During testing, the width and placement of the protrusion 12 was found to be critical to the performance of the improvement of the snips cutting

performance. If the protrusion was too wide, it tended to bind, and the snips could not advance through the sheet easily. If the protrusion was too narrow, the improvement was negligible, but then the clip closing function of the protrusion was compromised. During testing in the workshop, the addition of the protrusion 12 was found to reduce the effort required to cut a piece of sheet metal, as compared to an otherwise identical set of snips lacking the protrusion 12. This was attributed the function of the protrusion to keep the cut from closing and therefore binding on the snips as they move through the metal, and it also functions as a rudder to help keep the cut from wandering, and produces straighter cuts.

The protrusion may be a piece of steel that has been welded or fastened by some other suitable process to the arm of a pair of preexisting snips, or as will be more likely in a production run, the protrusion and arm will be a single forging or casting. In the current embodiment, only a single protrusion is shown, but two could be used, one on each arm. In a preferred embodiment, the arm and protrusion will be forged as one piece.

In figure 3 a typical band clamp is shown in the closed and finished position. In normal use, the clamp circumscribes a metal sheathing on an insulated pipe, and the clamp retains the sheathing and insulation in place on the pipe. In order to install a band and clamp assembly on a pipe, first a fold 34 is made on one end of the band 32, and the clamp 30 is slid along the bad 32 until it engages the fold 34 at the leading edge 36 of the clamp. The band and clamp is then wrapped around the pipe that is to have its sheathing retained, and a tool called a tightener grasps both ends of the band 32 and tensions them to ensure that the band grasps the sheathed pipe securely.

Once tensioned, the opposite, distal end of the band 38 is slid through the clamp on top of the opposite end that previously engaged the clamp. The band end 38 is then cut to length using the snips, and then folded over the top portion 40 using the protrusion 12 to bend the band end 38 through 180 degrees. Once the band is bent, it is further bent downward to be approximately parallel with the portion of the band that entered the clamp. Once bent downward, the arms 42 are bent over to retain the distal end 38 of the

band. The protrusion 12 on the snip is also used to bend the arms to secure the distal end of the band. Once the arms 42 have secured the band, the tightener is removed and the band joint is complete.

A pair of snips incorporating the present invention also offer advantages in worker safety over the prior art. In prior practice, the snips must be carried in addition to a hammer and screwdriver in order to effectively secure the clamp 30. Often workers are installing these clamps on pipes in elevated positions, and it is cumbersome to be constantly switching tools. It is inevitable, that a tool will be accidentally dropped, which poses a safety hazard for workers below, plus much lost time as the worker has to descend the scaffolding to retrieve his tool. The present invention allows the worker to dispense with carrying a screwdriver and hammer, and have the modified snip perform all the necessary functions of securing the clips.

The protrusion 12 can be used to bend both the banding 38, and to fold over the arms 42, and to cut the band 38 to the required length. The planar surface of the face of the protrusion 12 allows these functions to be performed easily, whereas they could be performed with a standard pair of snips, since the edges of the standard snip are rounded and slip off the workpiece. Owing to the flat face of the protrusion, field-testing has found that the snip of the present invention required less force to secure a clamp that the prior technique of using a hammer and screwdriver. This resulted in less worker fatigue and a higher productivity. At the present time, field-testing has encompassed securing over 50,000 clamps, and improved productivity has been noted, along with an improvement in the finished quality of the insulated pipe.

The specific methods of using the closure tool described herein are not intended to limit the claimed invention unless specifically claimed in that manner below. As will be apparent to those skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the scope of the invention claimed herein.