

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Seaming Tools for Seaming Sheet Metal and/or methods of using same

We ALUMINIUM DISTRIBUTORS LIMITED, a company incorporated under the laws of New Zealand, of 21-25 Ghuznee Street, Wellington, New Zealand, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to seaming tools for seaming sheet metal and/or methods of using same, such tools having been designed particularly though not solely for use in seaming roofing strips constructed according to our prior British Patent Specification No. 31936/59. Serial No. 866156).

In that specification roofing strips are provided having a first upstanding edge on one side at or near to a right angle to the plane of the sheet and a second upstanding edge on the other side at or near to a right angle to the plane of the sheet, this second edge having an outwardly turned flange lying in a plane substantially parallel to the plane of the sheet. To seam such strips, the flange of the second edge of one strip is folded over the first edge of a second strip and the upper parts of the three thicknesses of metal again folded over through about 180° to provide a substantially weather proof seam. By hand methods such a continuous seam is tedious and time consuming to effect and therefore expensive.

It is an object of the present invention to provide a seaming tool and/or a method of operating same which will enable adjacent sheets such as the foregoing to be seamed rapidly yet effectively.

Accordingly in one aspect the invention consists in a seaming tool for use in seaming sheet metal comprising a frame adapted in use to surmount a pair of prepared edges of sheets of metal to be seamed which edges are longer than said frame working members adapted to engage parts of the edges to be seamed and

folding means operable to cause one of said working members to engage and to fold at least one of said prepared edges so that part of a seam is made by such folding.

In a further aspect the invention consists in a method of seaming sheet metal, said method comprising the steps of forming a first upstanding edge at or near a right angle to the plane of a sheet of metal on one side and forming a second upstanding edge at or near to a right angle to the plane of a further sheet on the other side, said second edge having an outwardly turned flange lying in a plane substantially parallel to the plane of the sheet, placing said sheets side by side with said flange overlying said first edge, nipping said flange over said first edge by a series of nipping movements using a nipping tool, applying the aforementioned seaming tool to the partially formed seam and folding the upper part of the partially formed seam over until it lies substantially at right angles to the upstanding part of the seam, moving the seaming tool along in sections so that a continuous seam may be made even though a comparatively short seaming tool is being used, and crimping the further partially made seam by turning the folded over part of the seam downwardly substantially parallel to the upstanding part of the seam.

By the foregoing method it can be seen that a lengthy seam can be quickly yet effectively made by the use of simple hand operated tools the resultant seam being substantially water-proof.

One preferred form of the invention and modifications thereof will now be described with reference to the accompanying drawings in which

Figure 1 is a plan view of the seaming tool according to the invention, ready to be applied to a pair of prepared edges of metal to be seamed,

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Figure 2 is a sectional elevation through A—A on the plan and

5 Figure 3 is a sectional view through A—A on the plan but with the seaming tool in the operated position.

The preferred form of the invention has been devised for seaming joints between adjacent roofing sheets constructed according to British patent specification No. 31936/59. (Serial No. 866156).

In the preferred form of the invention a frame 1 is provided comprising side members 2 supported parallel to one another on a forward base plate 3 and a rearward base plate 4 at a distance apart of for example eighteen inches. In the allochiral side members 2 are semi-circular openings 5, so positioned that the frame 1 surmounts a pair of prepared edges on sheets of metal to be seamed, as will be described later, thereby enabling any length of seaming to be catered for. An annular groove 6 is provided on the inner surface of the side members 2 around the periphery of the semi-circular opening 5 by an inner bar 7 and an outer bar 8, the latter being approximately half an inch away from the former and the space there between thus providing the groove 6.

30 The forward base plate 3 is attached to the under surface of the side members 2 by fixing means 9 passing through the side bars 10, the bars 10 for example comprising half inch square mild steel. The plate 3 extends from the forward end 2a of the side members 2 and terminates with an upturned lip 11, the leading edge of which is positioned centrally in the semi-circular hole 5. Attached to the under surface of the base plate 3 either extending the full width or in strips forming part of the width is a soft material 12 thereby obviating or minimising the roofing material from being damaged or scratched while the machine is in operation jointing the seams as will be described fully later. The turned up lip 11 forms one side of the clamping means and extends through the semi-circular openings 5 until it is flush with the outer face of the side bars 10.

50 The rearward base plate 4 which supports the rear ends of the side members 2 fixing them parallel to one another, extends from the rearward end 2b of the side members 2 for a distance of approximately two inches and is fixed to the side members by an convenient means, for example, by screwing through the sides of the side members 2. A soft material 13, for example pinex, is attached to the under surface of the rearward base plate 4 performing a similar purpose to that described with reference to the front plate 3.

60 A working means comprising the opposite portion of the clamping means is movably adjustable by an operable means as will be further described later thus providing effective

clamping by a clamping member 14 fastening the prepared edges of the aforementioned sheets between the leading face of the clamping member 14 and the upturned lip 11. The clamping member 14 is fastened for example by welding to a frame 19 which has a rearward projecting lug 20 extending from either end. The width of the whole assembly is limited to allow substantial clearance on either side between the ends of the frame 19 and the side plates 2. Fixed to the upper surface of the rearward projecting lug 20 on either side is a base plate 15 which moves in a longitudinal groove 16. The longitudinal groove 16 extends from the rearward end of the annular groove 6 and is formed by lower guide rail 17 and upper guide rail 18, with the upper guide rail 18 spaced approximately $\frac{3}{8}$ inch from the bottom or lower guide rail 17, which is mounted flush with the bottom edge of the side members 2.

The operating means provided to movably adjust the clamping member 14 comprise a shaft 21 mounted between the side members 2 to which an operating handle 22 is attached. A pair of eccentric shafts 23 are symmetrically provided on the ends of the shaft 21 and rotate in bearing blocks 24 provided on the side members 2 fitted about the main periphery of the shaft 21 and adjacent to the ends thereof are movable bearing blocks 25 slidably engaged between guides 26 extending from the slidable base plate 15. The movable bearing blocks 25 have grooves 27 positioned down either side in which the vertical guides 26 act and these grooves are of a sufficient size and tolerance to enable the easy movement of the bearing blocks 25 during rotation about the eccentric shafts 23 on the operation of the operating handle 22. The bearing or end portions of the shaft 21 are for example $1\frac{1}{2}$ inches in diameter but intermediate portions may be reduced in section if so desired. The handle 22 is for example a $\frac{3}{4}$ inch solid rod welded to the operating shaft and extends outwardly for example about eight inches. The small eccentric shafts 23 may be for example $\frac{3}{8}$ inch in diameter and are positioned adjacent to the circumference in the ends of the main shaft 21. Operating clearance is provided between the end of the main shaft 21 and the bearing means 24 in which the eccentric shafts revolve.

A folding means is adapted to rotate in the annular grooves 6 thus enabling movement through approximately ninety degrees. The folding means comprise a channel section 29, two inches in width with the outer leg 30 one inch in length, while the inner leg 31 rests on the top of the upturned lip 11 of the base plate 3 and is only $\frac{3}{8}$ inch in length. At each end of the channel 29 is attached the quadrant plate 28 with the semi circular bar adapted to move in the annular groove 6 attached to the outer surface thereof. Situated off centre on the leg 130



30 is a $\frac{3}{4}$ inch handle 32 which extends perpendicularly out therefrom for a length approximately sixteen inches.

5 The use of the foregoing construction in seaming a joint is as follows.

As is described in British patent specification No. 31936/59 (Serial No. 866156), the adjacent edges of sheets to be jointed comprise an upstanding edge on one sheet and the edge of the adjoining sheet has an upwardly turned lip portion with an outwardly turned flange portion lying in a plain parallel with the plane of the sheet itself but standing a short distance thereabove. To prepare the sheets in a preliminary way the outwardly directed flange is bent over to grip the upstanding edge of the other sheet. A simple wooden forming tool comprising a pair of hinged jaw members operable by handle members may be used to turn this flange downwardly parallel to the upstanding edge to which the flange is attached and folding over the edge of the adjacent sheet. When this is completed the seaming tool as aforesaid is placed over the seam and the operating handle 22 is moved thereby rotating the shaft 21 about the eccentrics 23 held in the bearing blocks 24. This rotary action about the eccentrics 23 causes the movably bearing blocks 25 to move and by transference of movement through the vertical guides 26, causing the base plate 15 the rearward projecting lug 20 and the frame 19 to which the clamping member 14 is attached to close upon the seam, thus gripping the seam between the upturned lip 11 and the forward surface of the clamping member 14. The movement about the eccentric shafts 23 has the effect of lifting and dropping the eccentric blocks 24 in the vertical guides 17. The working parts of the clamping means when this operation is complete adopt a position as shown in Figure 3.

The folding means is now operated by means of raising the handle 32 to an approximately vertical position with the quadrant plates 28 and attached semi circular bars rotating about the annular grooves 6. Thus the top portion of the seams protruding above the lip 11 is folded over at right angles by the inside leg 31 of the channel section 29 and is bent substantially parallel to the main plane over which the sheets are extended.

The folding means is then returned to its unoperated position and the working parts comprising the operable and clamping means are also released. The seaming tool may now be moved along the surface of the sheets until it is in position to repeat a similar folding action on the adjacent unfolded portion of the seam. The seam extending on either side of the folding tool passes through the semi circular holes 5, thus any length of seaming in the same joint may be effected.

As a result of the operation of the seaming tool the seam has had the upper portion bent

substantially at right angles, and preferably a little more than right angles, to the remaining portion of the upstanding joint. To complete the joint this substantially right angled portion is folded downwardly to a juxtaposition with the remaining upstanding portion of the seam. This operation is completed by a tool having a pair of hinged jaw members and a pair of operating handles as previously described and the effect produced thereby is a seam with all edges completely covered or turned inwardly.

WHAT WE CLAIM IS:—

1. A seaming tool for use in seaming sheet metal comprising a frame adapted in use to surmount a pair of prepared edges of sheets of metal to be seamed, working members adapted to engage parts of the edges to be seamed and folding means operable to cause one of the said working members to engage and to fold at least one of the said prepared edges so that part of a seam is made by such folding.

2. A seaming tool as claimed in Claim 1, wherein clamping means are provided to clamp said edges to each other during folding.

3. A seaming tool as claimed in Claim 2, wherein said clamping means comprise a clamping member movable to clamp the prepared edges of sheets between said clamping member and a fixed one of said working members and operating means manually operable to move said clamping member.

4. A seaming tool as claimed in Claim 3, wherein said clamping member is slidably movable.

5. A seaming tool as claimed in Claim 4, wherein said operating means comprise a shaft mounted in said frame and having an operating handle, a pair of eccentrics on said shaft, a pair of eccentric blocks engaging said eccentrics and also slidably engaging guide members on said clamping member so that rotation of said shaft by said handle causes said eccentrics to slide said clamping member.

6. A seaming tool as claimed in any one of the preceding claims, wherein said folding means comprises a folding bar carried in annular bearing means in a manner such that the axis on which said folding means turns lies along the seam being made while yet the edges being seamed are longer than the frame or working members of said tool.

7. A seaming tool as claimed in Claim 6, wherein said annular bearing means comprise a semi-circular annular groove on each side of said frame and shaped slides on said folding member adapted to slide in said grooves.

8. A seaming tool as claimed in Claim 7, wherein said folding member is carried in bearing means constructed and arranged substantially as described with reference to the accompanying drawings.

9. A seaming tool as claimed in any one of the preceding claims, wherein the undersurface thereof is covered with a soft material such as chip board.

30 is a $\frac{3}{4}$ inch handle 32 which extends perpendicularly out therefrom for a length approximately sixteen inches.

The use of the foregoing construction in seaming a joint is as follows.

As is described in British patent specification No. 31936/59 (Serial No. 866156), the adjacent edges of sheets to be jointed comprise an upstanding edge on one sheet and the edge of the adjoining sheet has an upwardly turned lip portion with an outwardly turned flange portion lying in a plain parallel with the plane of the sheet itself but standing a short distance thereabove. To prepare the sheets in a preliminary way the outwardly directed flange is bent over to grip the upstanding edge of the other sheet. A simple wooden forming tool comprising a pair of hinged jaw members operable by handle members may be used to turn this flange downwardly parallel to the upstanding edge to which the flange is attached and folding over the edge of the adjacent sheet. When this is completed the seaming tool as aforesaid is placed over the seam and the operating handle 22 is moved thereby rotating the shaft 21 about the eccentrics 23 held in the bearing blocks 24. This rotary action about the eccentrics 23 causes the movably bearing blocks 25 to move and by transference of movement through the vertical guides 26, causing the base plate 15 the rearward projecting lug 20 and the frame 19 to which the clamping member 14 is attached to close upon the seam, thus gripping the seam between the upturned lip 11 and the forward surface of the clamping member 14. The movement about the eccentric shafts 23 has the effect of lifting and dropping the eccentric blocks 24 in the vertical guides 17. The working parts of the clamping means when this operation is complete adopt a position as shown in Figure 3.

The folding means is now operated by means of raising the handle 32 to an approximately vertical position with the quadrant plates 28 and attached semi circular bars rotating about the annular grooves 6. Thus the top portion of the seams protruding above the lip 11 is folded over at right angles by the inside leg 31 of the channel section 29 and is bent substantially parallel to the main plane over which the sheets are extended.

The folding means is then returned to its unoperated position and the working parts comprising the operable and clamping means are also released. The seaming tool may now be moved along the surface of the sheets until it is in position to repeat a similar folding action on the adjacent unfolded portion of the seam. The seam extending on either side of the folding tool passes through the semi circular holes 5, thus any length of seaming in the same joint may be effected.

As a result of the operation of the seaming tool the seam has had the upper portion bent

substantially at right angles, and preferably a little more than right angles, to the remaining portion of the upstanding joint. To complete the joint this substantially right angled portion is folded downwardly to a juxtaposition with the remaining upstanding portion of the seam. This operation is completed by a tool having a pair of hinged jaw members and a pair of operating handles as previously described and the effect produced thereby is a seam with all edges completely covered or turned inwardly.

WHAT WE CLAIM IS:—

1. A seaming tool for use in seaming sheet metal comprising a frame adapted in use to surmount a pair of prepared edges of sheets of metal to be seamed, working members adapted to engage parts of the edges to be seamed and folding means operable to cause one of the said working members to engage and to fold at least one of the said prepared edges so that part of a seam is made by such folding.
2. A seaming tool as claimed in Claim 1, wherein clamping means are provided to clamp said edges to each other during folding.
3. A seaming tool as claimed in Claim 2, wherein said clamping means comprise a clamping member movable to clamp the prepared edges of sheets between said clamping member and a fixed one of said working members and operating means manually operable to move said clamping member.
4. A seaming tool as claimed in Claim 3, wherein said clamping member is slidably movable.
5. A seaming tool as claimed in Claim 4, wherein said operating means comprise a shaft mounted in said frame and having an operating handle, a pair of eccentrics on said shaft, a pair of eccentric blocks engaging said eccentrics and also slidably engaging guide members on said clamping member so that rotation of said shaft by said handle causes said eccentrics to slide said clamping member.
6. A seaming tool as claimed in any one of the preceding claims, wherein said folding means comprises a folding bar carried in annular bearing means in a manner such that the axis on which said folding means turns lies along the seam being made while yet the edges being seamed are longer than the frame or working members of said tool.
7. A seaming tool as claimed in Claim 6, wherein said annular bearing means comprise a semi-circular annular groove on each side of said frame and shaped slides on said folding member adapted to slide in said grooves.
8. A seaming tool as claimed in Claim 7, wherein said folding member is carried in bearing means constructed and arranged substantially as described with reference to the accompanying drawings.
9. A seaming tool as claimed in any one of the preceding claims, wherein the undersurface thereof is covered with a soft material such as chip board.



10. A seaming tool when constructed, arranged and operable substantially as described with reference to the accompanying drawings.
- 5 11. A method of seaming sheet metal, said method comprising the steps of forming a first upstanding edge at or near a right angle to the plane of a sheet of metal on one side and forming a second upstanding edge at or near to a right angle to the plane of a further sheet on the other side, said second edge having an outwardly turned flange lying in a plane substantially parallel to the plane of the sheet, placing said sheets side by side with said flange overlying said first edge, nipping said flange over said first edge by a series of nipping movements using a nipping tool, applying a seaming tool constructed according to any one of the preceding claims to the partially formed seam
- and folding the upper part of the partially formed seam over until it lies substantially at right angles to the upstanding part of the seam, moving the seaming tool along in sections so that a continuous seam may be made even though a comparatively short seaming tool is being used, and crimping the further partially made seam by turning the folded over part of the seam downwardly substantially parallel to the upstanding part of the seam.
12. A method of seaming sheet metal when effected substantially as described with reference to the accompanying drawings.
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