

MULTI-PURPOSE PINCERS FOR WELDING UNDER PROTECTIVE GAS

The multi-purpose pincers for welding under protective gas (more commonly referred to as inert gas-shielded arc welding) are used for maintenance purposes for the welding torch of inert gas-shielded arc welding units. A description of these pincers is to be found in "Welding and Metal Fabrication", vol. 57, no. 1, February 1989, page 41 ("Welper"), for example.

Inert gas-shielded arc welding has become an indispensable tool in the metal working industries (machine building, automotive industry, shipbuilding, steel construction etc.). Even the smallest metal working or machine shop has inert gas-shielded arc welding equipment. Modern-day gas-shielded arc welding equipment is perfected and easy to use.

However, the welding torch (referred to as the welding gun below) has to be handled carefully and subjected to scheduled, thorough maintenance. Otherwise no high-quality weld seams can be produced complying with exacting quality standards.

The most important work which needs to be performed to welding guns on a daily basis is removing and cleaning the protective gas nozzle, replacing the wire guide (also referred to as the contact nozzle or contact tip), cutting off the welding rod to the optimum length and removing the wire electrode which has become welded or stuck to the wire guide (formation of a weld bead) subsequent to afterburning.

A great number of various tools must be on hand at the welding site to perform all the work indicated above. Disorder and the constant search for the right tool are bothersome, not to mention time-consuming. The tools used to date have not been specifically designed for the purpose indicated above, consequently work has not been carried out in a completely satisfactory manner.

The new multi-purpose pincers for inert gas-shielded arc welding replace all the less-than-perfect tools used for the job to date. They are specifically designed for the job at hand, consequently they permit work to be carried out easily and quickly to the complete satisfaction of the welder. Description of the enclosed illustrations:

- Fig. 1: Multi-purpose pincers for welding under protective gas (i.e. inert gas-shielded arc welding)
- Fig. 2: Removal of the welding rod which has become welded or stuck to the wire guide (weld bead)
- Fig. 3: Cleaning metal sputter from the protective gas nozzle
- Fig. 4: Cutting off the welding rod to the optimum length
- Fig. 5: Pulling off the protective gas nozzle
- Fig. 6: Unscrewing the wire guide

Owing to the characteristic features detailed in patent claims 1 and 12, the invention allows maintenance work on the welding gun of inert gas-shielded arc welding equipment to be carried out easily and quickly.

The most remarkable feature of the new multi-purpose pincers for inert gas-shielded arc welding 1 (Fig. 1) is that, for the first time, a weld bead 3 (Fig. 2) which has become welded or stuck to the wire guide 2 subsequent to afterburning can be easily removed using a single tool in a negligible amount of time.

Figure 2a shows why the weld bead 3 is difficult to remove using conventional tools: The weld bead 3 is small and thus difficult to access using normal pincers or pliers. The problem is compounded by the fact that the wire guide 2 and, as a consequence, the weld bead 3 to be removed are not readily accessible inside in the protective gas nozzle 4, which is why using needle-nose pliers or a similar tool does not produce the desired results.

Up until now, the only thing that could be done in such cases was to pull the protective gas nozzle 4 off the welding gun and grind the weld bead off using a grinding machine or file it off. In particularly troublesome cases, part of the welding rod inside the wire guide becomes welded to it. Consequently, the wire guide has to be unscrewed and removed in order to drill open the hole/passage from the back. The parts then have to be reassembled. The entire procedure is a time-consuming chore.

Afterburning combined with the formation of weld bead occurs relatively frequently, it can happen to the best of welding operators. This is due to unsuitable welding voltage or wire feed speed, for example.

The weld bead hook 5 is used to loosen/remove the weld bead 3 (Fig. 2). This weld bead hook 5 (Fig. 1, Fig. 2) consists of a lever 6 and a sharp hook 7. It looks somewhat like the bottle/can opener blade of a pocket knife. A weld bead 3 which has become frozen or stuck can be loosened with the aid of the weld bead hook 5 as follows: The multi-purpose pincers for inert gas-shielded arc welding 1 are held by the handle 10 with one hand, the weld bead hook 5 being attached to this handle. Lever 6 is slid into the annular-shaped gas outlet channel 8 (Fig. 2). It must be ensured that the sharp hook 7 is lifted over the weld bead 3, followed by lodging it between the fore-part 9 of the wire guide 2 and the welded/stuck weld bead 3. This is followed by applying lever action (comparable to using the bottle/can opener mentioned above), in the process loosening the weld bead 3 from the wire guide 2, at the same time pulling it outwards somewhat. Afterwards the wire rod 11 can pass freely through and out of the wire guide 2; after the weld bead is cut off, the welding gun is operational again.

It is obvious that, thanks to the weld bead hook 5, the weld bead 3 can be removed from the wire guide 2 easily and quickly. The special shape of the weld bead hook 2 ensures that it can be used for all standard welding guns available today.

Of course, the sharp edge of the sharp hook 7 can be provided with a notch or groove, so that the hook can grip better around or under the neck of the weld bead (i.e. the interface between the weld bead and the fore-part 9 of the wire guide 2). It would also be conceivable to provide the weld bead hook 5 with a suitable handle, to offer it as an independent tool, i.e. not in combination with the new multi-purpose pincers 1. However, the added advantages offered by the multi-purpose pincers for inert gas-shielded arc welding would have to be dispensed with.

This includes the possibility of removing metal sputter 12 from the gas outlet channel 12 (Fig. 3). Owing to so-called the arc blow effect during inert gas-shielded arc welding, small-sized metal sputter pieces may

shoot from the molten weld pool. When this metal sputter is deposited upon the protective gas nozzle 4, it hardens and remains stuck to it. In time, a large amount of metal sputter 12 (Fig. 3a) collects, thus narrowing/closing off the gas outlet channel 8. This in turn impairs the flow of gas to such an extent that the inert-gas shield no longer evenly covers the arc, as a result rendering clean welding impossible.

Up until now the only thing that could be done in such cases was to scratch away the spattered metal using screwdrivers, scribing irons, needle-point files etc. and knock the metal sputter particles out of the welding gun. Grease or special sprays can be applied to the annular gas outlet channel so that this does not have to be done too often, however this is only effective for a limited time.

Thanks to the blades 13 (Fig. 3) of the multi-purpose pincers for inert gas-shielded arc welding 1, this work can now be performed more efficiently and better: The multi-purpose pincers 1 are held by the handles 10, so that the blades 13 can be slid into the annular gas outlet channel 8. This is followed by turning the pincers about their longitudinal axis several times, if need be, all metal sputter 12 is knocked or scraped off by the non-cutting edge 16 of the blades 13. Only the loose metal sputter pieces now have to be knocked out of the nozzle and the welding gun is operational again.

The pressure spring 15 (Fig. 3) secured between the lobes 14 facilitates handling of the new multi-purpose pincers 1 considerably, as the blades are automatically opened by the spring. It stands to reason that, as a result, the user's hand does not cramp up and thus he is prevented from tiring. In addition, the blades 13 are shaped in such a manner that, when in working position, their non-cutting edge 16 is aligned parallel to the tapered inner wall of the protective gas nozzle. Consequently, it is not necessary to specially align the multi-purpose pincers or exercise special care when using them. Transverse dogs 18 have been provided in order to prevent the blades 13 from opening more than to an angle of ca. 15°. The transverse dogs are permitted to move freely only along the path defined by the grooves 19. It should be mentioned that the handles 10 are fitted with plastic grips 29 designed in keeping with latest findings of ergonomic science. At least one of the grips incorporates a loop 17. This

makes it possible to hang or secure the multi-purpose pincers 1 on/to a hook or nail.

Cutting off the welding rod 11 to the optimum length poses no problem for the new multi-purpose pincers 1 for inert gas-shielded arc welding. When measured from the front edge 20 of the protective gas nozzle 4, the welding rod must protrude exactly 6 millimeters. This distance 21 (Fig. 4) is necessary so that the welding rod 11 is clearly visible for positioning the welding gun and so that the welding gun is tilted at the right angle. The right angle of tilt ensures that the arc blow effect supports the welding of the workpiece. Incidentally, when the welding rod protrudes too far, welding is rendered altogether impossible.

Up until now, the welding rod was transported sufficiently via the automatic wire feed until it protruded as needed and cut off using a standard side cutter. Owing to the blade shape of these side cutters, however, it is impossible to adhere to the required distance of 6 millimeters, as it can only be estimated where the knife edges are located. In many cases, worn or unsuitable side cutters are used which pinch off the welding rod instead of cutting it off in a clean manner.

The new multi-purpose pincers are provided with special cutters 22 (Fig. 4) specifically for this purpose which are incorporated on the inner side at the base of the blades 13. The cutters 22 are pared (shaved) or ground in such a manner that the welding rod 11 is cut off in a clean manner. In addition, owing to the spacer cheeks 23 located on either side, the welding rod 11 can easily be cut off at the optimum length of 6 millimeters. The spacer cheeks 23 are precisely thick enough so that the cut edge 24 is located exactly 6 millimeters from the front edge 20 of the protective gas nozzle 4 when it is positioned against one of the spacer cheeks 23 as shown in Figure 4. This happens as a matter of course when the multi-purpose pincers 1 are slid over the welding rod to be cut off up to the furthestmost position with the blades open. By virtue of the fact that spacer cheeks 23 are located on both sides, it is of no consequence from which side the multi-purpose pincers 1 are slid over the welding rod. The blades 13 and thus also the cutters 22 are made of hardened steel in order to ensure long serviceable life.

The new multi-purpose pincers for inert gas-shielded arc welding also allow the protective gas nozzle 4 to be removed in a safe manner. Subsequent to welding, the protective gas nozzle is extremely hot. Consequently, it cannot be touched with the hand when it is to be pulled off.

Up until now, protective gas nozzles have been removed using a pipe wrench or universal pliers. Universal pliers, however, are not sufficiently large to properly encompass or grip around the protective gas nozzle, consequently they slip off easily.

Thanks to the new multi-purpose pincers, these less-than-perfect tools for the job can now be dispensed with. The new pincers feature so-called external recesses 25 on the inner side of the two pincer legs 26 (Fig. 5). The external recesses 25 are dimensioned in such a manner that all protective gas nozzles commonly in use today can be securely gripped and unscrewed. The plastic grip 29 features a bridge 27 to ensure that the user's hand does not slip.

The new multi-purpose pincers for inert gas-shielded arc welding 1 are also excellent for removing or mounting the wire guide 2. Wire guides wear down from time to time or have to be replaced by others featuring another hole diameter when a welding rod 11 with another diameter is required. The welding rod 11 also serves as the welding electrode. It is also of paramount importance that the right wire guide 2 be used for a particular welding rod diameter in order to ensure unimpeded current flow from the wire guide 2 to the welding rod 11.

Up until now, a special tool has had to be kept on hand for replacing or exchanging the wire guide 2. For the most part, fork wrenches, monkey wrenches or flat-nose pliers have been used. Using flat-nose pliers in particular results in damage to the wire guide, as they squeeze the bearing surface edges of the relatively soft wire guide. A wire guide damaged in this manner can no longer be easily screw-mounted or unscrewed.

Thanks to the specially shaped, dimensioned V-shaped notches 28 (Fig. 6) on the inner sides of the legs 26 of the multi-purpose pincers, the pincers can be used to screw-mount and unscrew all the wire guides

commonly in use today, irrespective of their cross section, without damaging them.

The new multi-purpose pincers for welding under protective gas (more commonly referred to as inert gas-shielded arc welding) replace all the less-than-perfect tools used for the job to date at the work site of an inert gas-shielded arc welding unit. The special feature of the weld bead caused by afterburning and welded/stuck to the wire guide being easily removed makes the new multi-purpose pincers an indispensable tool for the welder.

Amended Claims



[Received by the International Office on 20 January 1992, the original Claims 1 - 14 being replaced by the amended Claims 1 - 12 (2 pages)]

1. Pincers (1) for the maintenance of equipment used for welding under protective gas, featuring a protective gas nozzle (4), a gas outlet channel (8) and a wire guide (2), said pincers consisting of two pincer legs (26) connected to one another via a joint like pliers, said legs featuring metal blades (13) at their front ends, said blades being shaped to match the shape of the gas outlet channel (8) of the protective gas nozzle (4), the pincer legs (26) being maintained in an open position by virtue of the pressure action exerted by a pressure spring (15), each of the non-cutting edges (16) of the blades (13) being positioned against the inner wall of the protective gas nozzle (4) when the pincers are in said open position, said pincers characterized in that one of the pincer legs (26) features a weld bead hook (5) at its lower end, said weld bead hook being similar to the bottle/can opener blade of a pocket knife, said weld bead hook consisting of a lever (6) which projects inside the gas outlet channel (8) and grips around the wire guide (2), and of a sharp hook (7') for gripping behind the weld bead (3) stuck to the fore-part (9) of the wire guide (2).
2. Pincers as claimed in Claim 1 wherein the open position of the blades (13) is limited to ca. 15° by virtue of transverse dogs (18) which engage in grooves (19).
3. Pincers as claimed in Claim 1 or 2 wherein the edges of the non-cutting edges (16) of both blades (13) are rounded in such a manner that the pincers can be rotated in an unimpeded manner for the purpose of removing metal sputter (12) on the inner wall of the protective gas nozzle (4).
4. Pincers as claimed in one of the Claims 1 to 3 wherein the blades (13) incorporate cutters (22) on their opposing inner sides for the purpose of cutting off the welding rod (11) at the proper length.



5. Pincers as claimed in Claim 4 wherein the pincer legs (26) feature a spacer cheek (23) on at least one side in the vicinity of the cutters (22), when positioned against the front edge (20) of the protective gas nozzle (4) establishing a specific distance (21) between the front edge (20) and the cut edge (24) of the cutters (22).
6. Pincers as claimed in Claim 5 wherein the distance (21) amounts to between ca. 4 and 8 mm.
7. Pincers as claimed in one of the Claims 1 to 6 wherein an external recess (25) is provided between the pincer legs (26), said recess being shaped to fit the outer shape of a protective gas nozzle (4) for the purpose of gripping the same.
8. Pincers as claimed in Claim 7 wherein the external recess (25) is corrugated.
9. Pincers as claimed in one of the Claims 1 to 8 wherein notches (28) are provided between the pincer legs (26), said notches being shaped to fit the outer shape of a wire guide (2) for the purpose of gripping the same.
10. Pincers as claimed in Claim 9 wherein the notches (28) are V-shaped.
11. Pincers as claimed in one of the Claims 1 to 10 wherein the pincer legs (16) are provided with plastic grips (29), said grips not impeding or covering the external recess (25) or the notches (28).
12. Pincers as claimed in one of the Claims 1 to 11 wherein the sharp hook (7') -- when viewed from the front -- features a V-shaped notch or groove in its sharp edge.