

SECTION 3

WELDING AND TOOLS

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1. SPOT WELDING

1-1. GENERAL DESCRIPTION

Spot welding is also known as resistance spot welding and it is the most suitable method of welding for automobiles. It has three main features: the welding can be performed instantaneously, it exercises very little effect on the mother material, and it reduces the generation of distortion to the absolute minimum. However, please remember to remove all paint and other impurities from the surface of the material you intend to weld for reliable results.

1-2. WELDING CONDITIONS

When performing spot welding, make absolutely sure that you conform to the conditions governed by the current, conductivity time, welding pressure, holding time, and shutdown time recommended for the spot welder. Please bear in mind the following points when welding :

- Plate thickness and minimum welding pitch

Note : When the welding intervals are too small, this leads to branching, making it impossible to maintain the desired soldering state.

Plate thickness	0.6mm	0.9mm	1.2mm	1.6mm
Minimum intervals	11mm	16mm	20mm	24mm

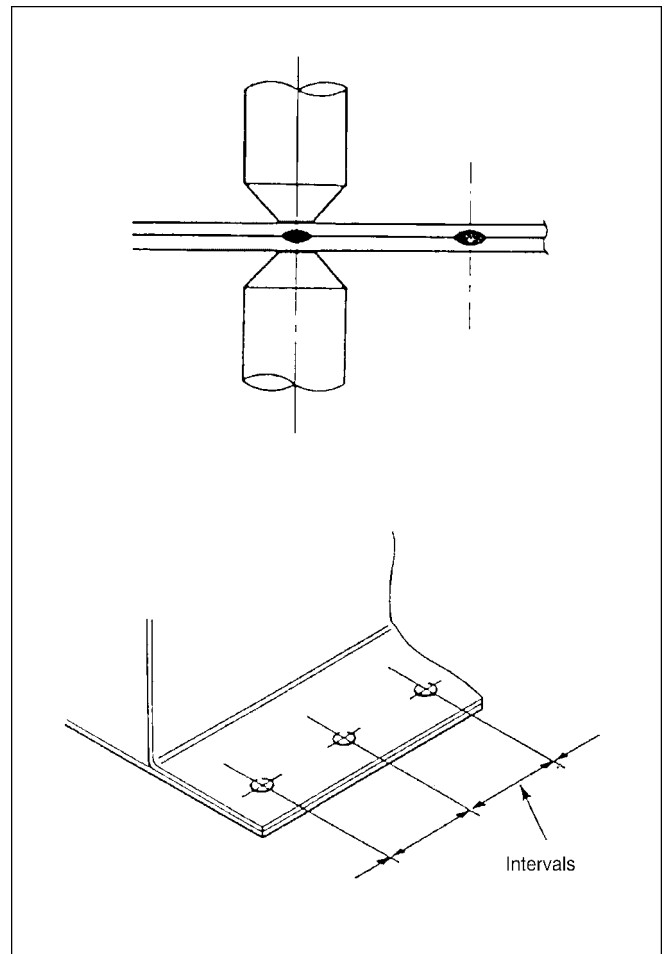


Fig. 2

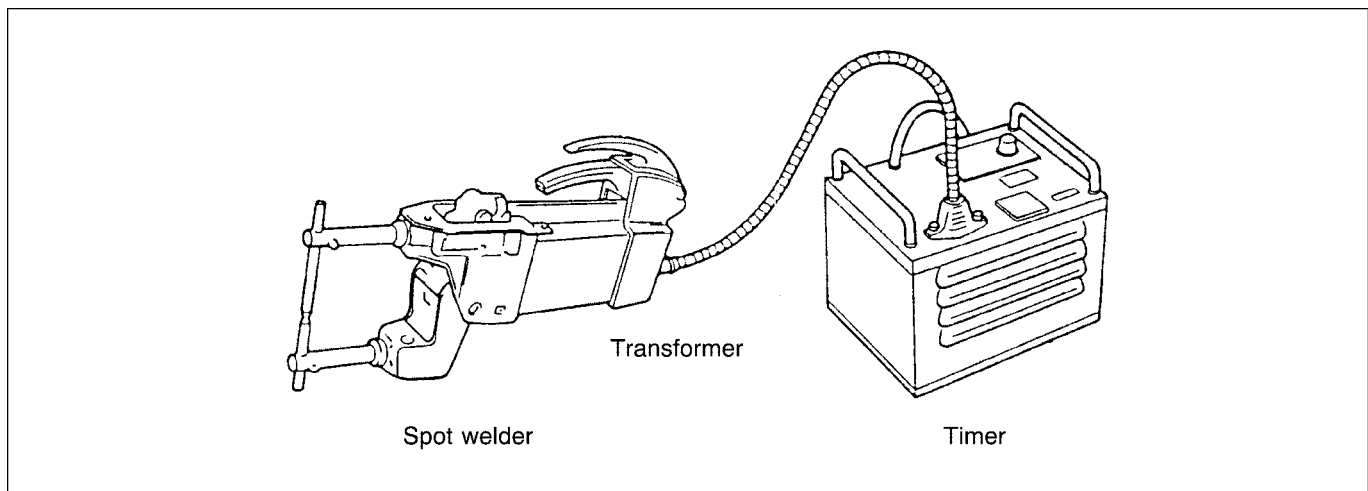


Fig. 1 Welders

- Plate thickness and tip diameter

Plate thickness	0.6mm	0.9mm	1.2mm	1.6mm
Minimum intervals	4.5Ø	5.0Ø	5.5Ø	6.0Ø

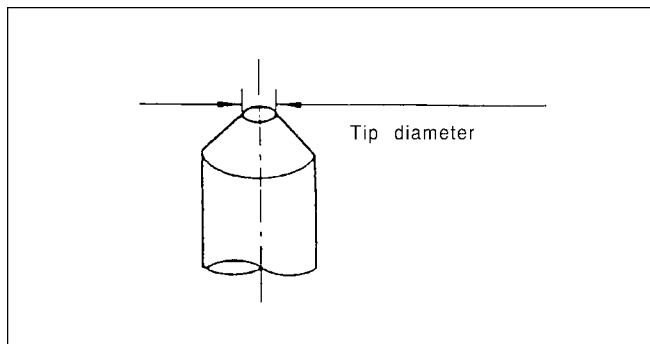


Fig. 3

Even if you perform the welding in accordance with the conditions, the strength of the welded sections may fluctuate widely with drops in the voltage and other factors. The quality of the welding cannot be evaluated unless the welded sections are destroyed.

Provide yourself with a steel plate of the same thickness and conduct a destruction test.

- If holes appear in the steel plates, this means that the welding is standard strength.
- Drive a wedge between two panels near the nugget. If the welded parts do not come apart and the diameter of the nugget appears more than 3 mm, the welding should be satisfactory.

1-3. WELDING STRENGTH TEST

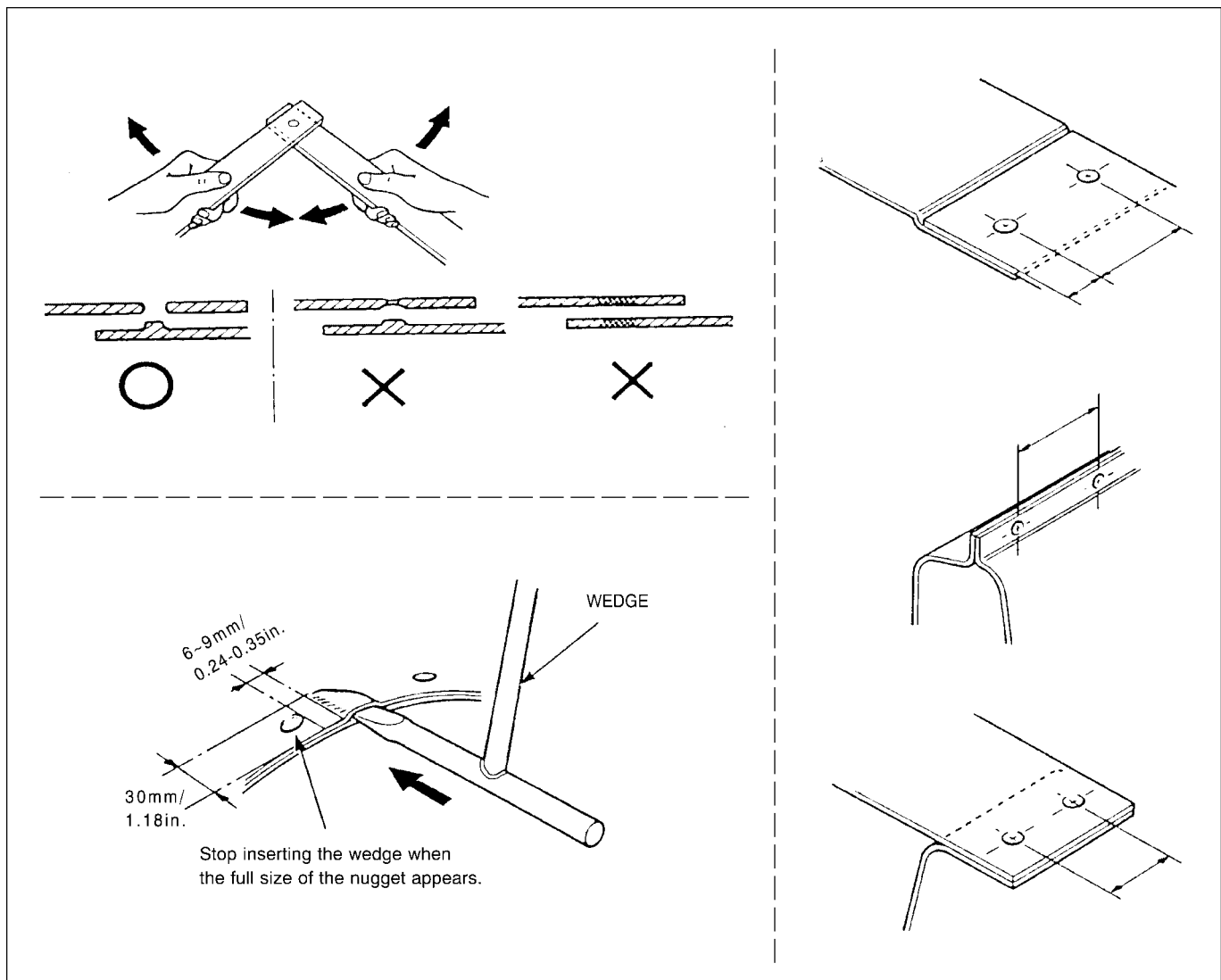


Fig. 4

Note : It is difficult to perform spot welding in the following circumstances.

- When it is not possible to remove any rust or paint attached to the welding surfaces.
- When the tip of the spot welder cannot be inserted into the welding section.
- When the welding surfaces can be seen from the outside and welding will impair the exterior appearance.

In all these cases, it is recommended that the gas welding method be employed. However, if it is not possible to perform spot welding because of space restrictions, plug welding based on the arc welding method may be performed instead. Here the welding sections must be close together.

2. GAS WELDING

Gas welding is indispensable for body repair because of the broad range of its applications from joining the body panels, cutting the materials that construct the body and applying heat to reform panels, and also because it is easy to get hold of the tools. However, this method requires experience.

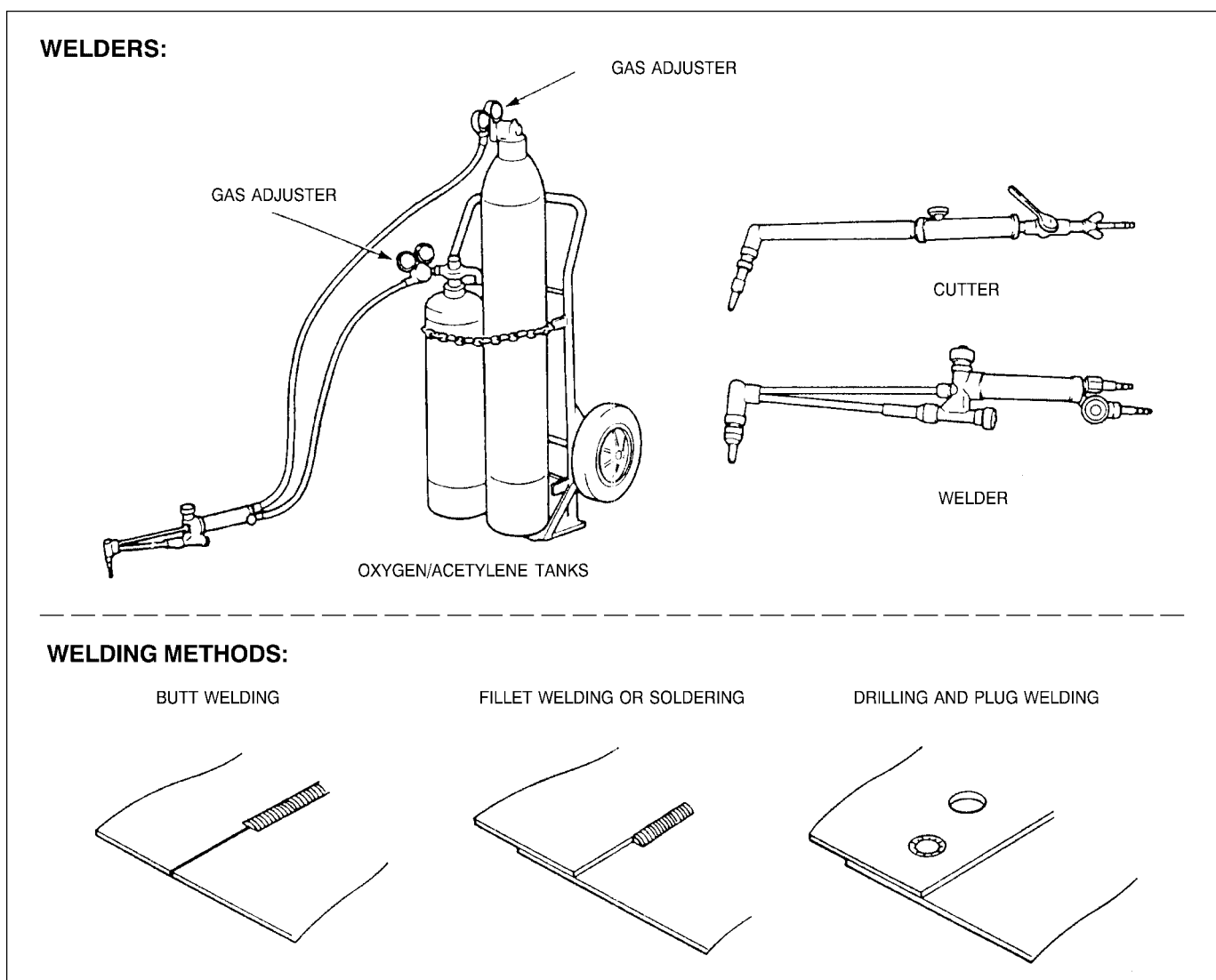


Fig. 5

Note : Below is an example of how not to perform gas welding, avoid operations like this.

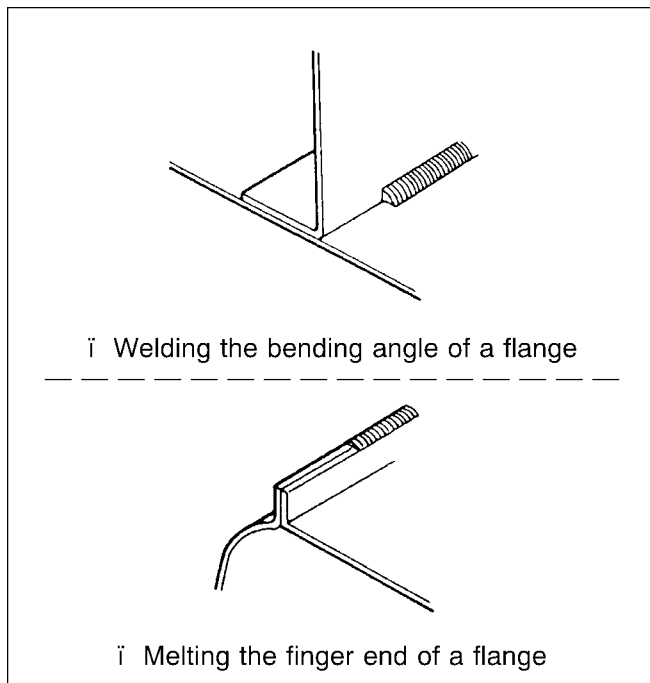
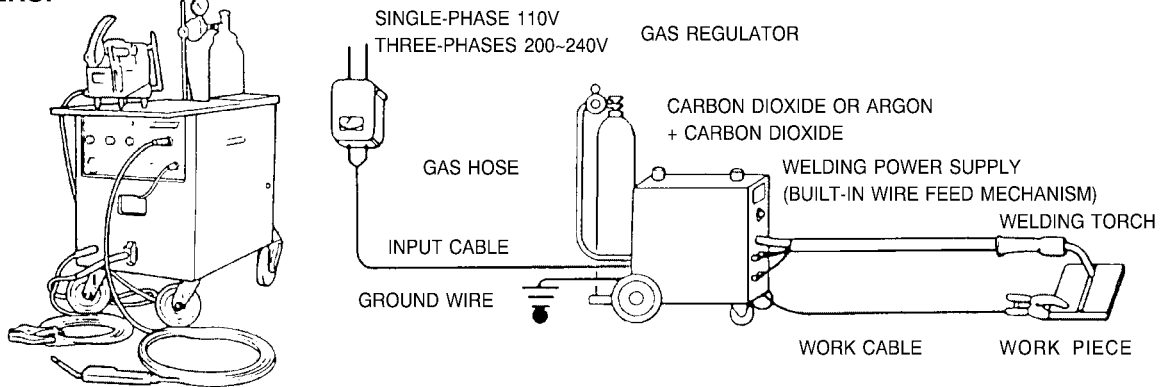


Fig. 6

3. CARBON DIOXIDE ARC WELDER(MIG ARC WELDING)

This welding process uses inexpensive carbon dioxide instead of expensive inert gases as a shielding means. Consumable metal electrodes are employed. It has a wide range of applications, including butt welding of thin plate, fillet welding, plug welding, and MIG spot welding. In terms of the weld strength, it is also highly stable.

WELDERS:



WELDING METHODS:

BUTT WELD

FILLET WELD

SPOT WELD

PLUG WELD

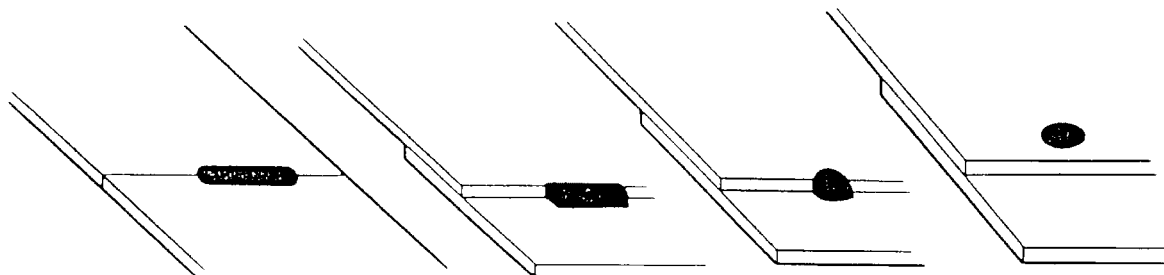
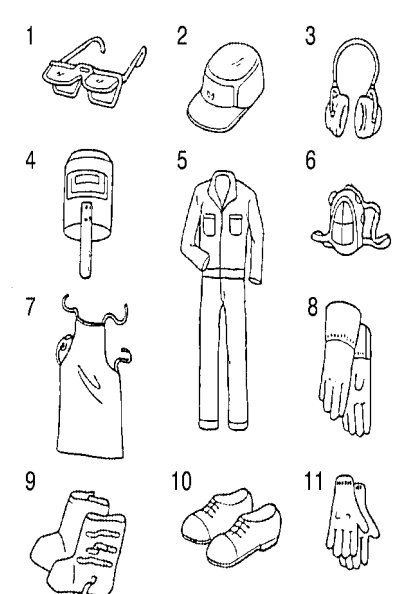
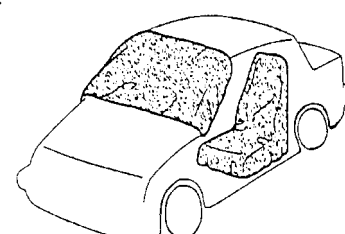
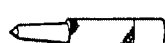
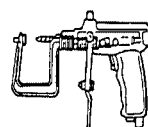
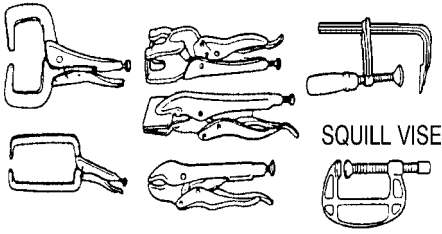
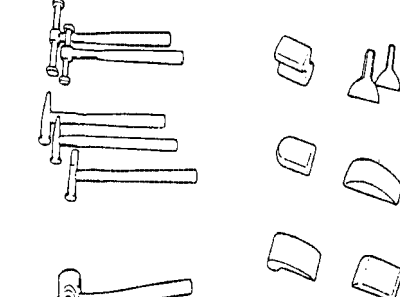
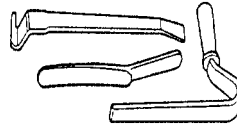
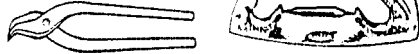
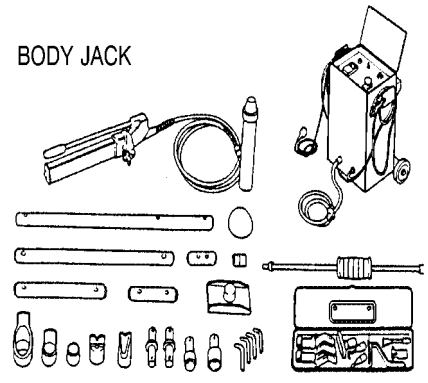
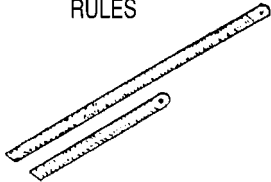
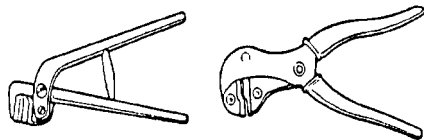
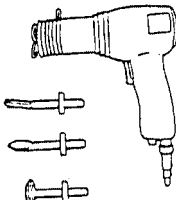
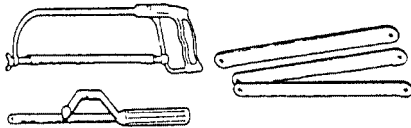


Fig. 7

4. REPAIR TOOLS

Item	Work	Tools. equipment used
Protective tools	Operator	1. Protective goggles 2. Cap 3. Ear plug 4. Shield for eyes 5. Overalls with long sleeves 6. Dust-proof mask 7. Protective apron 8. Welding gloves 9. Foot protectors 10. Safety shoes 11. Work gloves 12. Spattering guard 
	Vehicle body	12 Heat-resistant protective cover 
Processing tools	Plug hole drilling	DRILLING BLADE, DRILL, SPOT CUTTER  PUNCH  PRESSURE DRILL 

Item	Work	Tools. equipment used
Fixing tools	Base metal fixing	VICE GRIPS SCREW CLAMP  SQUILL VISE
Shaping tools	Skin panel shaping	HAMMERS DOLLIES  SPOONS  FILE/FILE HOLDER  SNIPS/SHEARS 
	Body, frame shaping	WELDER BODY JACK  SLIDER HAMMER 
Measuring tools	Measuring	RULES  CONVEX RULES

Item	Work	Tools. equipment used
Flange tools	Edge preparation	
Cutting tools		AIR JIGSAW  AIR IMPACT CUTTER  HAND NIBBLER  HANDSAW  CHISEL 
Sanding tools	Cleaning	DISC SANDER Air type: Electric type: BELT SANDER 