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Abstract—In small industry cutting a sheet using plasma arc machine for various shapes precisely at low cost it have been observed a challenging job since they have been found following a manual marking and cutting using plasma arc machining, to cut a sheet precisely at low cost even without wasting of time here we used a manual operated fixture that is used in conjunction with a plasma cutting torch for cutting the sheet in different shapes. This fixture involves magnetic assembly to make position stable, and a tracing mechanism for tracing the profile and replicate profile on sheet, linear scales and a protector are provided to make sure the distance travelled and movement of torch at required degree respectively for required shapes using particular configuration.

Index Terms—fixture, Plasma arc machine, magnetic assembly, ferrous sheet and specific configuration

I. INTRODUCTION

In this work we target the problem of small industries which use plasma arc cutting for the machining process and for them it has long been recognized that it is extremely difficult even for a skilled operator to accurately cut an accurate shape of sheet work pieces by simply free hand movement of the cutting tip relative to the work piece. Though dimension can be achieved close to tolerance but it would take lot of minutes since it demand a marking process before and here in our work we are suggesting a fixture which is able to achieve accuracy without even wasting time in marking.

This fixture can guide the plasma cutting torch for cutting ferrous sheet in the shape, it may be a circular, square, arc type and profile type. This device has two columns and upper parts of it can rotate on its axis; column’s upper part’s rotation can be block by using a clamping screw. Both column mount on the sheet; they remain stick to the sheet due to the mounting arrangement at the lower’s part of column’s base, which make their position stable. There are two elongated rigid rod (first and second) both has graduated engraved linear scale and primary rod is placed through the hole in upper part of the primary column, this rod has graduated engraved linear scale which ensures the distance and this rod can be fixed in hole by clamping.

II. BACKGROUND OF FIXTURE FOR CUTTING OF FERROUS SHEETS

A. Background and Prior Art

It has long been recognized that it is extremely difficult even for a skilled operator to accurately cut an accurate shape of sheet work pieces by simply free hand movement of the cutting tip relative to the work piece and it is also hard to get dimension close to the tolerance.

Following is the brief view of attachment been made to simplify this work:

A device which may be releasable attached to a hand operated oxy-acetylene or similar type torch to facilitate cutting of arcs or circles in a work piece by providing a pivot point about which the cutting tip may be moved [1]. The invention comprises an attachment for a straight cutting torch that permits the cutting torch to accurately cut circular shaped holes in tubing or other metal objects [2]. There is a definite need for a mechanical circle-cutter today, particularly in view of the advent of plasma cutters and the need for efficiency in making such cuts, as in the commercial manufacture of metal discs. The conventional method in prevalent use today is to utilize a template to aid in inscribing the desired circle upon the work piece which is frequently of sheet steel [3]. A guide bolt is mounted on the main circular ring and is attached to the Work piece and forms the center of a circular hole that will be cut with the plasma torch [4]. Feature of the cutting torch attachment of the present invention is that when clamped to the tubes of a cutting torch, the attachment functions as a guide for cutting accurate circles or circular arcs and the center locating member is placed in a center punch mark located at the center of the desired circle on a work piece and the torch is rotated about the center locating member to cut the circle or arc [5]. The present invention generally relates to attachments for cutting torches and, more particularly, is concerned with an torch attachment for cutting holes and circles with such cutting torches [6].

But none of above prior art’s attachment appear to be an adequate solution to cut and mark the all kind of shape on a sheet with single attachment, they all suffer from the following limitation.
There is no arrangement to get stable centering and to make sure the distance to be cut and to monitoring for degree during arc cutting.

None of them can cut all circular, arc, rectangle and profile shape with single attachment with particular configuration.

Their accuracy is limited.

Proposed fixture is able to cut a sheet without wasting time in marking and cutting a sheet in various shapes with specific configuration.

B. Principal Object of Attachment

It is the main object of the proposed attachment to provide a device to cut a sheet in various shape precisely without wasting the time in marking and making device able for circular cutting, arc shaped cutting, square shape cutting and profile cutting by single attachment with different -different configuration.

III. SPECIAL FEATURE OF PROPOSED FIXTURE

This attachment has special features given below

- This attachment has particular configuration for cutting in particular shape.
- Coin shaped magnets are used for mounting arrangement shown in fig. 2
- Measuring scales are provided which help to eliminate marking.

III. EXPERIMENTAL SETUP FOR VARIOUS SHAPE CUTTING

The fixture shown are capable of manually controlling the movements of a plasma torch for cutting a ferrous sheet in the form of various shapes, use specific configuration for each and these are described depending upon required shape as below:

A. Configuration for Cutting a Sheet in Circular Shape

For cutting a circular disc attachment configuration is shown in Fig.1 includes a column, first elongated rod, torch holder and torch. Where column consist of an upper part which rotate in lower part having a thrust bearing between

Fig. 2. Magnetic assembly
upper part and a lower part which provide frictionless rotation between lower part and upper part during circular cutting. First rod placed into the hole in upper part and first rod is clamped by the clamping screw. This first rod has an engraved linear scale which helps to assure required radius. A torch holder mounts on the end of first elongated rigid rod, torch holder consist of a square block which mount on the end of first elongated rod and clamp by clamping screw, an adjustable rod hold in the block by clamping screw which can be adjusted up and down, a ring is welded on the bottom end of adjustable rod which has a sleeve inside which holds the torch, use of sleeve depends upon the diameter of the torch to be hold. For cutting the disc from a ferrous sheet column mount on the sheet and centering is done by coinciding the with the marked at the center. Magnets provided for mounting arrangement. Radius of Required disc can be adjusted by clamping the first elongated rod by, taking the required distance on engraved scale and then get start the torch and by rotating the torch with respect the cylindrical block hence object can be cut.

B. Configuration for Cutting a Sheet in Arc Shape

For an arc shape cutting, attachment configuration is shown in Fig.3 includes a column, first elongated rod, torch holder and torch. where column consist of an upper part which rotate in lower part having a thrust bearing between them which provide frictionless rotation between lower part and upper part during arc cutting and required arc angle can be assured using an engraved degree measuring scale and rotation of upper part can be fixed at any degree by clamping screw. A first elongated rod placed into the hole in upper part and first elongated rod clamped by the clamping screw. This first elongated rod has an engraved linear scale which confirms the linear movement of torch. A torch holder mount on the end of first elongated rod, torch holder consist of a block which mount on the end of first elongated rod and clamped by clamping screw another rigid rod hold in the block by clamping screw which can be adjusted up and down, a ring is welded on one end of the adjusted rod which has a sleeve inside which holds the torch, sleeve depends upon the diameter of the torch to behold. For cutting the disc from a ferrous sheet a column placed on ferrous sheet and centering...
is done by coinciding the with the marked center. Magnets provide mounting arrangement. For cutting the required shape from the ferrous sheet can be done by coinciding the required degree on scale with an engraved line and then rotation movement of upper part prevented by the clamping screw and then first elongated rod can be push or draw up to required distance which ensured by the scale engraved on first elongated rod.

C. Configuration for Cutting a Sheet in Rectangle/Square Shape

For rectangular/square shape cutting, attachment configuration shown in Fig.4 it includes two columns and, first elongated rod, movable guiding column, second elongated rod, torch holder and torch for cutting a rectangular piece from the ferrous sheet, first elongated rod work as a guiding beam which placed into the hole in upper part and clamped by and another end is fixed in secondary column which is same in construction as column both columns and are placed on ferrous sheet during cutting and both column and stick to the sheet due to the action of magnets and provided for mounting arrangement, a movable guiding column slides over the first elongated rod which can be fixed on first elongated rod in case of need by clamping screw when second elongated rod slides freely through the hole in lower part of guiding block which movement become smooth using the wheel which mounted on a circular bar and hold by a pin, torch holder mounted on the end of second elongated rod and torch height adjust by adjustable rod moving up and down in block and clamped by clamping screw and torch can be hold in sleeve. Second elongated rod will be stationary by clamping screw when movable guiding/sliding column move over the first elongated rod, during the cutting both engraved scale and in a slot and make sure the movement of torch for required distance.

D. Configuration for Cutting a Sheet in Profile Shape

For profile cutting attachments configuration shown in Fig.5 it includes column and, first elongated rod, second elongated rod, and movable guiding column, tracing pointer, torch holder and torch, for cutting a profile from ferrous sheet by tracing. The first rod clamped in upper part by clamping screw and another end is fixed in secondary column which is same in construction as both columns and are placed on the sheet, during cutting both column, stick to the sheet by the magnets and, a movable guiding column slides over the first elongated rod, second elongated rod slides through the hole in lower part. A torch holder mounted on the end of second elongated rod and torch height adjust by adjustable rod moving up and down in block and clamped by clamping screw and torch can be hold in sleeve. Second elongated rod, movable guiding column move over the first elongated rod during the tracing the profile. During the cutting we also make the lower part of movable guiding column free to swivel by losing the clamping screw, a thrust bearing placed between lower part of guiding column and upper part of guiding column which help to free swivel movement of lower part of guiding column.

IV. CONCLUSION

In this paper this is found very useful since small industry face some sort of problems during a ferrous sheet cutting using plasma arc cutting machine regarding cost, reliability, accuracy and precision in such cases this fixture is useful and this is able to cut various shapes of sheet using specific configuration depending upon required shape of sheet, this fixture also facilitate measurement for distance and angle to eliminate waste of time.

REFERENCES


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