Development Of Cam Mechanism For Notch Cutting By Using Electrode Arc

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Abstract— In some Cases,where cylindrical objects are used, some places require a proper notch so that welding at that place is perfectly done.To get a perfect notch different machines are used,in some machines, operations are done by using plasma,but here we have tried to reduce the cost of plasma cutting by using an electrode arc for the cutting/notching. Vee notches in tube, particularly square tube, may be cut so deep as to cut almost through the tube: three sides of a square tube. This then allows torner, usually finished by welding.

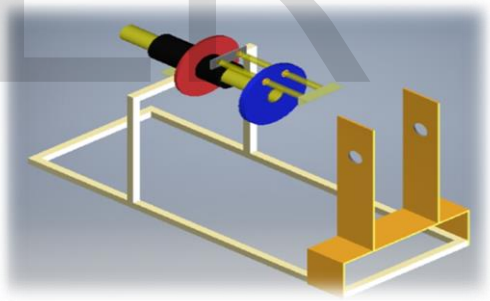
Index Terms— Cam mechanism;Cylindrical Objects;Electrode Arc;Notch Cutting

Introduction

Notching is a low-cost process, particularly for its low tooling costs with a small range of standard punches.The speed of notching is usually limited by manual handling when loading the workpieces into the press. Pieces some feet long may be manually loaded into a single-stroke press. Smaller pieces are still generally hand-fed, limiting speeds to perhaps 100 strokes / minute. It is an operation of removing a small part of metal sheet of desired shape from edge of metal sheet.

Mechanism

Depending upon the diameter of tube of pipe on which profilehas to be generated,the cam is designed.In cam the designed angle of notch & depth is been taken into account.If the diameter of the pipe changes a 90 degree,an adjustable arm depends on the changes in diameter.The roller follower traces the path of cam & develops the required profile.The roller is designed in such a way that it adjusts itself on the edges. There is a spring attached in the adjustable arm so that it gets a forward & backward motion .This mechanism basically works on the profilic design, so as we design the profile for cam, the cam will follow that part & cut that desired notch.Notch cutting for some materials take a dig as some materials have different cutting properties as Hardness,Toughness etc. Notch wear at the cut line is also a serious problem during the matching of high-austenitic stainless steels.We always take care for the cutting process as the wear condition doesnt just eradicate but surely is reduced with increased efficiency. The critical point where the finished notch seems to be related to factors such as transverse stress & temperature distribution & chemical interaction.Thus the progress of notch has often been the localised shear region of the chip & the exposed binder phase of the tool.



Motor &Pulley

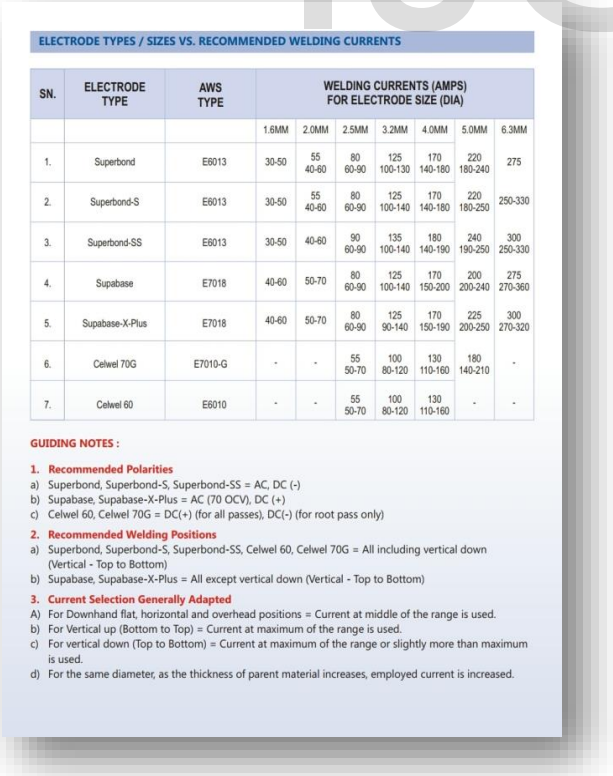
Initially,we tested using a motor from car wipers but after some test we preferred an AC motor from car wipers having the potential of moving both on right & on left.Then we connected the motor with a potentiometer to regulate the speed of its rotation & with a switch that chooses the rotation of the direction as well as the activation of the motor.So as the motor is ON the perforated shaft rotates on the direction we want & as the speed we wish. After we have achieved our goal uptill this,we put an aluminium flange lined with linear bearing at the front side of the perforated shaft.The linear bearing is used for ensuring a forward & backward move in our machine.

Operation

In our setup as the motor is started,due to rotation of the shaft the flange attached to the holder rotates & it rotates according to cam profile required for the notch.There are also linear bearing which helps in forward & backward movement,using these bearings, we managed to make a basis for the electrode arc cutter.In specific, our system is known as a 'pantograph'.So thus the electrode arc cutter is spinning around the tube following the pantograph and removing the material that should be removed.It should be noted that without the pantograph, our machine cuts in a straight line and if it is needed to cut in an angle, the inclination for cutting is chosen according to the direction of clamp's rotation.

Cutting electrode

For this setup we have used electrode arc as a cutting tool.In arc cutting the electrode is the most important parameter.Here we have used non consumable electrode for cutting.So using this our cutting cost has been reduced. This below table shows the electrode type with weiding or cutting currents.



ELECTRODE TYPES / SIZES VS. RECOMMENDED WELDING CURRENTS

SN.	ELECTRODE TYPE	AWS TYPE	WELDING CURRENTS (AMPS) FOR ELECTRODE SIZE (DIA)						
			1.6MM	2.0MM	2.5MM	3.2MM	4.0MM	5.0MM	6.3MM
1.	Superbond	E6013	30-50	55 40-60	80 60-90	125 100-130	170 140-180	220 180-240	275
2.	Superbond-S	E6013	30-50	55 40-60	80 60-90	125 100-140	170 140-180	220 180-250	250-330
3.	Superbond-SS	E6013	30-50	40-60	90 60-90	135 100-140	180 140-190	240 190-250	300 250-330
4.	Supabase	E7018	40-60	50-70	80 60-90	125 100-140	170 150-200	200 200-240	275 270-360
5.	Supabase-X-Plus	E7018	40-60	50-70	80 60-90	125 90-140	170 150-190	225 200-250	300 270-320
6.	Celwel 70G	E7010-G	-	-	55 50-70	100 80-120	130 110-160	180 140-210	-
7.	Celwel 60	E6010	-	-	55 50-70	100 80-120	130 110-160	-	-

GUIDING NOTES :

1. **Recommended Polarities**
a) Superbond, Superbond-S, Superbond-SS = AC, DC (-)
b) Supabase, Supabase-X-Plus = AC (70 OCV), DC (+)
c) Celwel 60, Celwel 70G = DC(+) (for all passes), DC(-) (for root pass only)

2. **Recommended Welding Positions**
a) Superbond, Superbond-S, Superbond-SS, Celwel 60, Celwel 70G = All including vertical down (Vertical - Top to Bottom)
b) Supabase, Supabase-X-Plus = All except vertical down (Vertical - Top to Bottom)

3. **Current Selection Generally Adapted**
A) For Downhand flat, horizontal and overhead positions = Current at middle of the range is used.
b) For Vertical up (Bottom to Top) = Current at maximum of the range is used.
c) For vertical down (Top to Bottom) = Current at maximum of the range or slightly more than maximum is used.
d) For the same diameter, as the thickness of parent material increases, employed current is increased.

Future plans

We can make changes where errors are found.We can change the pantograph with a new & desired design & due to this we can get different notches.We are also looking for more rpm motor due to that the notchning process will progress faster,increasing the cutting speed.

Conclusion

The advantages of our construction are multiple.For example it can cut tubes of a large diameter compared to other kinds of machines that are not capable of that.It can also cut straight angles & various shapes according to the guiding ring of the pantograph.It is portable & light in weight.Its major advantage is its cost as it is much less comparing to other machines like CNC. It is also capable to cut round flanges & also different notches by using different clamps**.**

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