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Fabrication of Multi - Diameter Hole Attachment for Upvc Routing Machine

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ABSTRACT- Routing is the process to making **handle holes** in one height of each panel to fit handles in it. most of the routing machine consist of y and z direction adjustment for restricting head moment in order to make rectangular hole in profile, while following this process for routing it initially takes around 20min for adjustment of restriction bar according to required hole size, also in case of any other hole apart from **rectanglehole** is not possible with restriction used. When circular **multi-diameter holes** needed, in that case we have to mark the hole shape on profile and make hole free hand, resulting in poor finish and waste of material. Hence we introduced a **stepped bar** which we welded on the moving tool head and
added a required hole shape **guideplate** so the we can push the welded bar attached to moving tool head in the guide plate hole and the moving tool head will copy same shape resulting accurate hole on profile including circular **multi-diameter hole** with **greater finish** and eliminating the setting/adjusting time needed for routing process.

Keywords: Routing, Handle Holes, Rectangle Hole, Multi-Diameter Holes, Stepped Bar, Guide Plate,Greater Finish.

1. INTRODUCTION

Routing is the process to making handle holes in one height of each panel to fit handles in it.

this process is carried out on a single head pneumatically operated routing machine which has a fixed bed on which workpiece is clamped and moving tool head capable of sliding on provided rail in x-axis, y-axis, and z- axis. it consists of two operating handles one on each right and left end of machine. the left handle controls moment of head in y-axis or vertical moment of tool head while the handle on right controls the moment of headin both x-axis and z-axis direction or horizontal moment and also has a press button to actuate the motor in orderto rotate the drill bit for cutting.the workpiece needs to be routed is placed on the bed aligning centre of profile to centre of bed and then clamped by pressing foot pedal which forces the workpiece against the height welded perpendicular to bed.

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the slot needs to be drilled is marked using a marker pen on profile with gig / template aligning its centre withprofile.

without actuating the start button, the tool head is slide towards left at max positioning of hole and the momentof head is restricted with the help of restrictor provided.

similarly, the moment of head is then restricted in right followed by adjusting restriction in forward and reversedirection / z-axis.

after adjustment, the test slot is made in sample profile and handle is fitted in same slot in-order-to check the proper fit of handle. the tolerance of slot is 1mm so if the hole exceeds the required tolerance the profile is then counted as wastage and will be reused only when the new order comes with same profile requirement and smaller size than it.

this makes the head adjustment process the most time consuming in fabrication of UPVC and requires a highlyskilled and experienced worker to complete the job with accuracy still having the chances of wastage is much higher than any other process.

2. WORKING

Working of machine with stepped-bar assembly and guide plate.

1) For making slots of casement handle the stepped bar is placed on top of centre hole of guide plate using operating handles and press button of handle is pushed down and hence moving the ball of ball bearing to 1st 3mm slot of stepped bar so that the first step of 5mm diameter will trace the location of hole.

2) After making the big centre hole push button of handle is pulled up and stepped bar is placed above left hole on guide plate using operating handles and then pushed down twice in-order-to move the ball to 2nd 3mm slot ofstepped bar so that second step of stepped bar is diameter 8mm will trace the hole and will make comparatively smaller hole than previous.

3) Same step is repeated for making right small diameter hole.

4) In case of making slot for popup handle we just need to push the handle push button in the popup slot in guide plate with first step of stepped bar and make a slot by following its path using operating handles.

5) For adjustment, the set screw is rotated clockwise in-order-to move the head towards the set screw and hencethe centre of slot.

and the set screw is rotated counter clockwise in order to move the head away from the set screw and hence thecentre.

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Working of stepped-bar assembly.

1) The stepped bar assembly has 3 different diameter steps at bottom of bar and 3 inside taper steps ofactuate the different step at the bottom of bar.
2) A small bearing ball is introduced and pressed in the upper side of stepped bar with 3 inside taper stepswith help of spring and bolt forcing it in to engage one step a time.
3) In-order-to engage 2nd step of step bar, the stepped bar is pressed below resulting in moving back of bearing ball due to tapered inside step and compressing action of spring on other hand and finally entering 2nd hole of upper side of stepped bar with 3 inside taper steps.
4) This result engaging the 2nd step and for 3rd step same process is followed again, while retracting the stepped bar upwards in order to again actuate the 1st and 2nd step whenever needed.

3. ADVANTAGES

1.Reduction in adjustment time.

2.Reduction in overall time.

3.Greater finish in final product

4.Semiskilled worker can operate the machine.

5.Can easily adapt any change in hole diameter.

6.Can use multi diameter drill without change of drill bit.

7.Negligable wastage of raw material,i.e. profile.

COST REDUCTION ANALYSIS IN TERMS OF WASTAGE

NOTE: Material rate and size of panels varies from time to time.

1) An average UPVC windows profile costs varies from about 300rs/m to 500rs/m according to the current rates.
2) For a month UPVC fabricators fabricate about 20-30 windows/doors for which they will have to fabricate minimum of 40-60 holes in total.
3) The ratio of material wastage with old method without attachment was 2 in 10 or2/10 while machineoperated by professional.
4) Also an average height of any windows/door varies from 0.7m to 2.1m, hence for calculations purposeconsidering it to be 1.7m.
5) In that case considering wastage 2/10, average height 1.7m, average rate 300rs/m-500rs/m and

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monthlyaverage holes need to be made 40-60 nos.

6) The **monthly** wastage will be around **4080rs** on low(8x1.7mx300rs/m) and **10200rs** on high(12x1.7mx500rs/m) and if calculated on **yearly basis** its **48,960rs to 1,22,400rs.**

4. CONCLUSION

In-order-to overcome this consequence of wastage of capital due to profile wastage, wastage of time due to marking of slot on each height of a panel, initial adjustment, changing the drill bit for two different holes on same profile in case of casement handles, and need of highly skilled labour to perform this job with a bit higheraccuracy and with minimum time consumption,

we fabricated the attachment which can make multi diameter hole with same drill bit for casement handle slot and reused the gig / template initially used to mark holes on profile as guide plate to trace the shape of slot during cutting moment of moving head which reduces the time consumption of adjusting to negligible as compared to previous process and with higher accuracy which a semi-skilled labour can also perform with ease.

5. REFERENCE

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