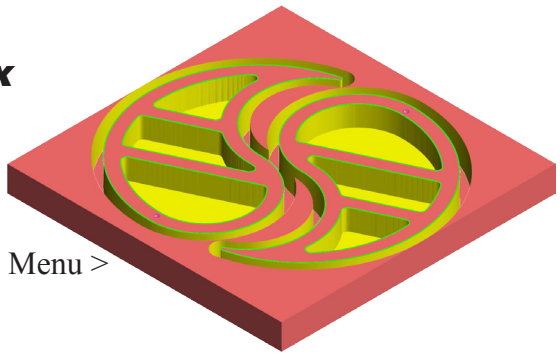
Jewelry Box
Tray



A. Sketch Tray Circle.

Step 1. If necessary start a new Mastercam file, click FILE Menu > New .

Step 2. Click CREATE Menu > Arc > Circle Center Point.

Step 3. Key-in **6.5 for diameter** in ribbon bar, **Fig. 1**.

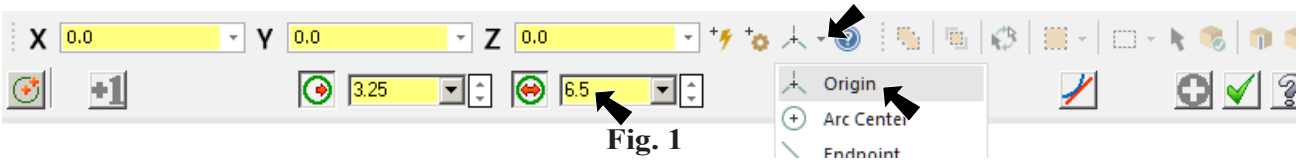


Fig. 1

Step 4. Click the down arrow in Auto Cursor ribbon bar and click Origin to place rectangle, **Fig. 1**.

Step 5. Click OK in ribbon bar to fix circle and close ribbon bar, **Fig. 1**.

Step 6. Fit (**Alt-F1**) and use **F9** to toggle Origin/Axis display on and off to confirm Origin, **Fig. 2**.

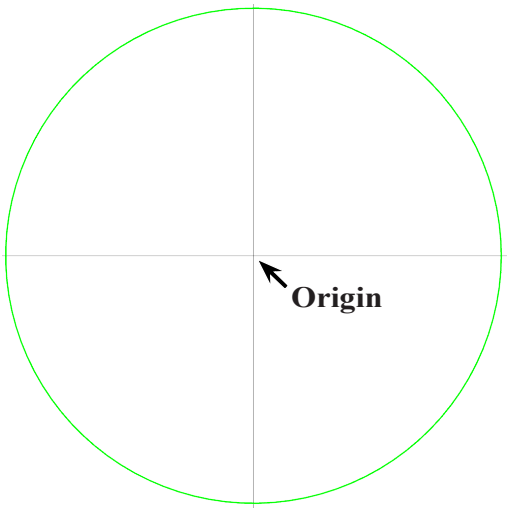


Fig. 2

B. Twin Edge Point Circles.

Step 1. Click CREATE Menu > Arc > Circle Edge Points.

Step 2. Use the **upper quadrant and Origin** as the two points to draw circle and draw second circle using **lower quadrant and Origin**, **Fig. 3**.

Step 4. Click OK in ribbon bar to fix circle and close ribbon bar.

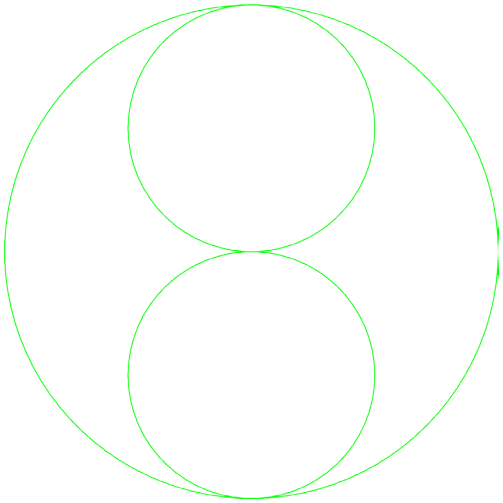


Fig. 4

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C. Save As "TRAY"

Step 1. Click FILE Menu > Save As.

Fig. 4

Step 2. Key-in **TRAY** for the filename and press ENTER.

D. Trim Divide.

Step 1 Click EDIT Menu > Trim/Break > Trim/ Break/Extend.

Step 2. Click **Divide** (**D**) in ribbon bar, **Fig. 4**.

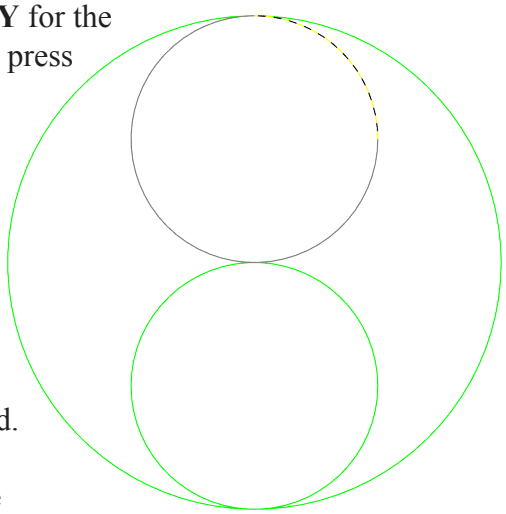

Fig. 5

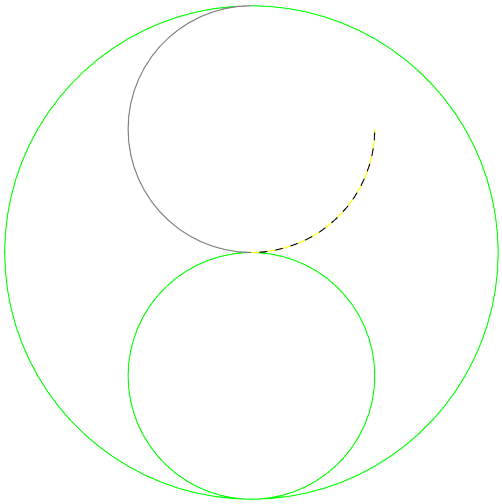

Fig. 6

Step 3. Trim arcs, **Fig. 5-8**. Click OK to close ribbon bar when done.

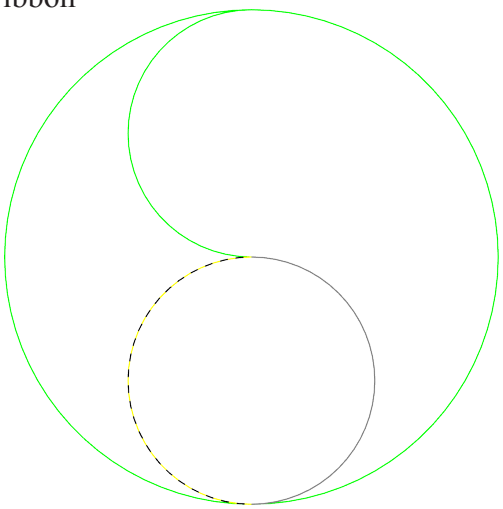

Fig. 7

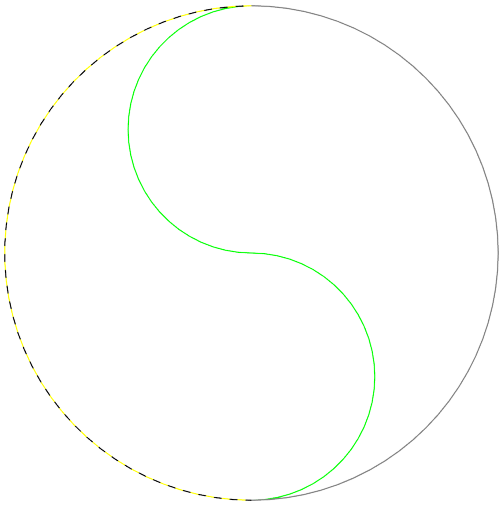

Fig. 8

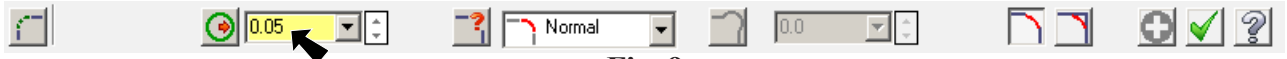

Fig. 9

E. Fillet Tip.

Step 1. Click CREATE Menu > Fillet > Entities.

Step 2. Key-in **.05 for Radius** in Fillet ribbon bar, **Fig. 9**.

Step 3. Click **both arcs at sharp tip**, **Fig. 10**.

Step 4. Click OK in ribbon bar to fix and close.

Step 5. Save (**Alt-F S**).

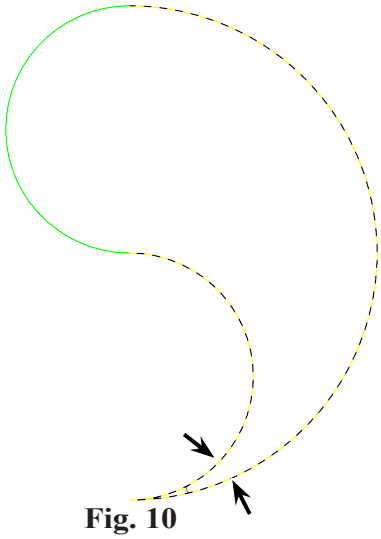

Fig. 10

F. Extrude Solid.

Step 1. Change to Isometric View (**Alt-7**).

Step 2. Click SOLIDS Menu > Extrude.

Step 3. Click Chain in Chaining dialog box.

Step 4. Click **any geometry**, **Fig. 11**.

Step 5. Click OK in Chaining dialog box.

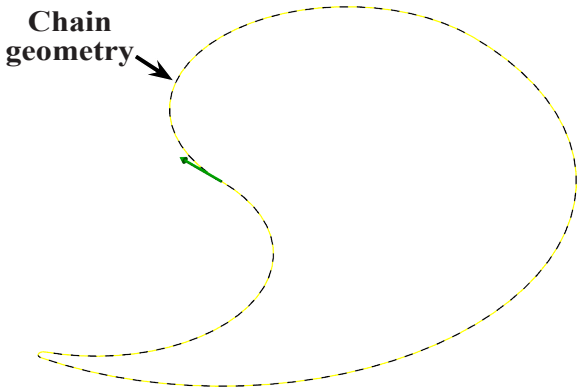

Fig. 11

Step 6. In Extrude Chain dialog box:

Select **Create Body**, **Fig. 12**

Set **Distance .75**

The direction arrow on chain points in the direction of extrude, **Fig. 13**. The direction arrow should **point down**, if arrow points in opposite direction check **Reverse direction** , **Fig. 12**.

Click OK .

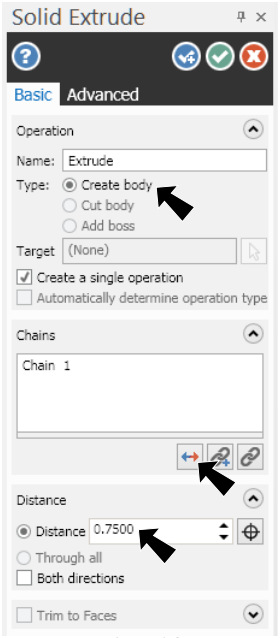

Fig. 12

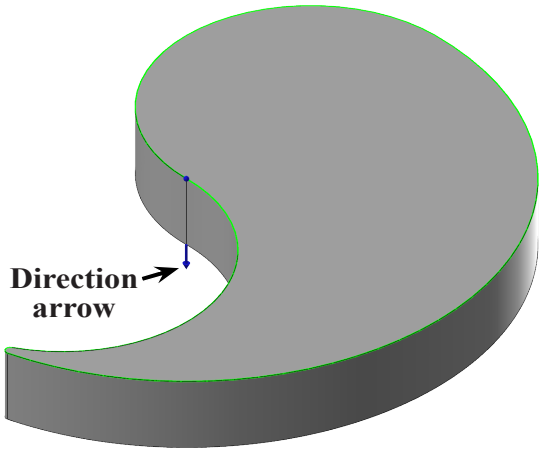

Fig. 13

G. Offset Contour.

Step 1. Change to Top View (**Alt-1**).

Step 2. Click Xform Menu > Offset Contour.

Step 3. Click Chain in Chaining dialog box.

Step 4. Click **any arc**, **Fig. 14**.

Step 5. Click OK in Chaining dialog box.

Step 6. In Offset Contour dialog box set:

Select **Copy** **Fig. 15**

Set **Distance .35** and press Tab key, **Fig. 32**.

The **purple offset should be inside** the red original, **Fig. 16**. If it is not, click **Direction** in Offset Contour dialog box, **Fig. 15**.

Click OK in Offset Contour dialog box.

Step 7. **Right click** graphics area and click Clear Colors (**Alt-R C**).

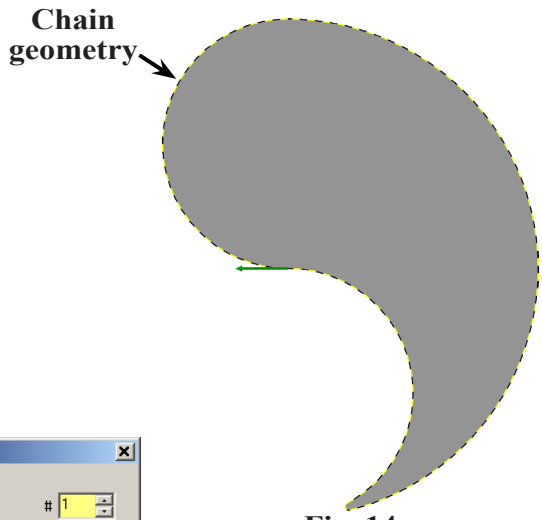

Fig. 14

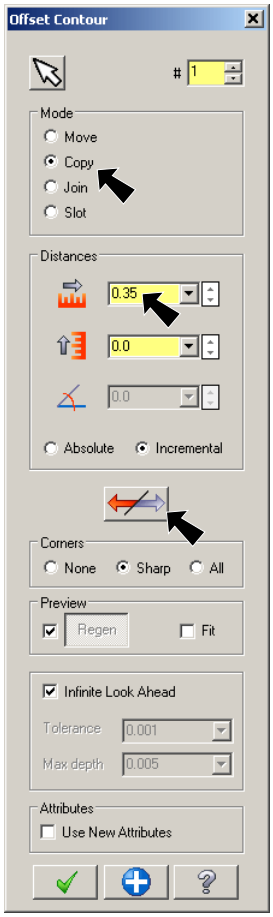

Fig. 15

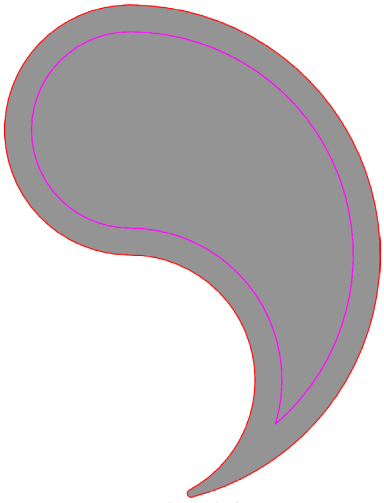

Fig. 16

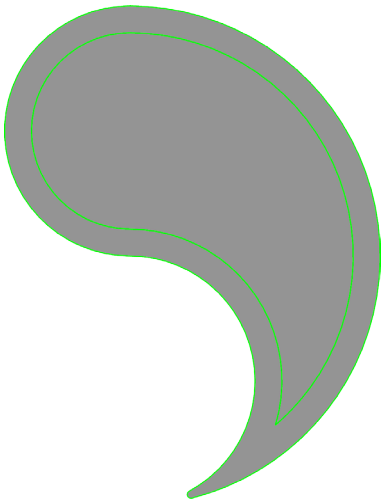

Fig. 17

H. Create Line.

Step 1. Click CREATE Menu > Line > Endpoint or click Line Tool in toolbar.

Fig. 18

Step 2. Key-in **25 for angle** in ribbon bar and click Angle to **lock**, **Fig. 18**. The field turns red when locked.

Step 3. Create **line from Origin up to right out past offset arc**, **Fig. 19**.

Step 4. Click OK in ribbon bar to fix line and close.

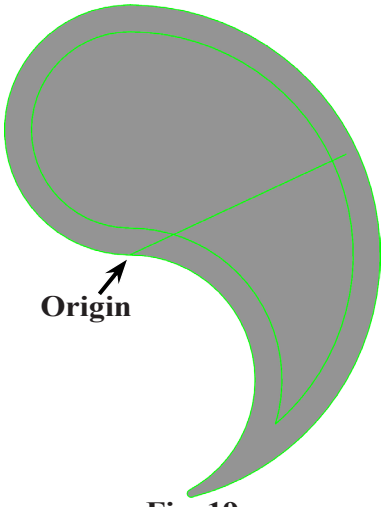

Fig. 19

I. Offset Lines.

Step 1. Click XFORM Menu > Offset.

Step 2. In Offset dialog box: **Fig. 20**

Copy

Distance **.8**

Click line, then click **above**, **Fig. 21**.

Click **Apply** .

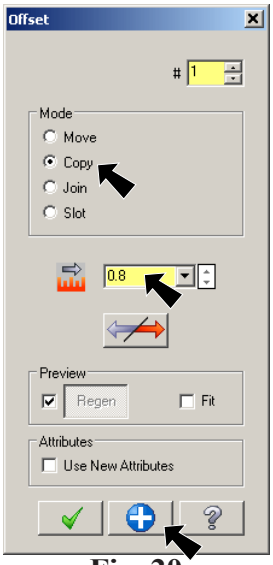

Fig. 20

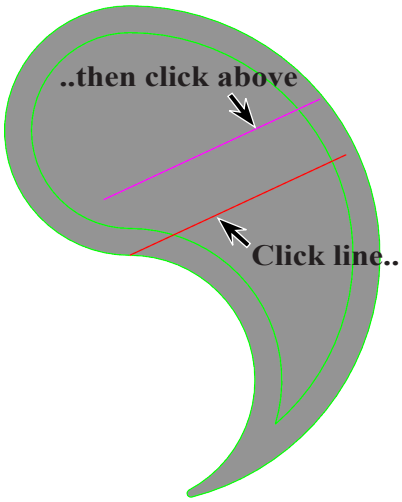

Fig. 21

Step 3. In Offset dialog box: **Fig. 22**

Distance .7
Click angled line again, then click **below**, **Fig. 23**.

Click **Apply** .

Step 4. In Offset dialog box: **Fig. 24**

Distance .175
Click offset .8 line, then click **above**, **Fig. 25**.

Click **Direction** until (twice) bi-directional lines appear, **Fig. 25**.

Click **Apply** .

Step 5. In Offset dialog box:
Click offset .7 line, then click **above**, **Fig. 26**.

Click **Direction** until bi-directional lines appear, **Fig. 26**.

Click OK .

Step 6. **Right click** drawing area and click Clear Colors (**Alt-R C**).

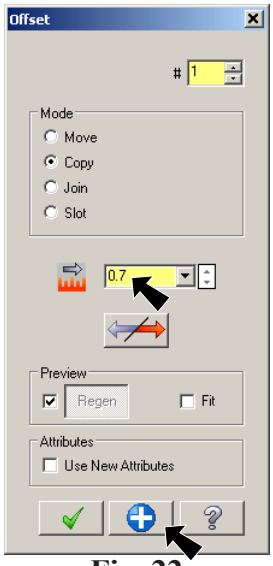

Fig. 22

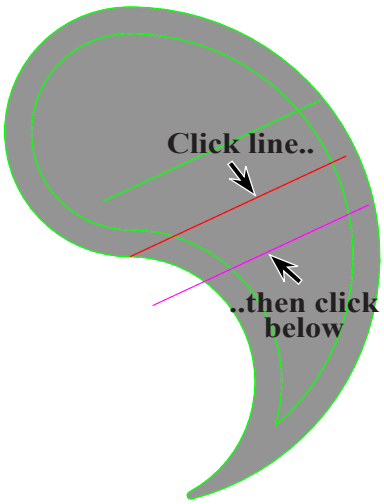

Fig. 23

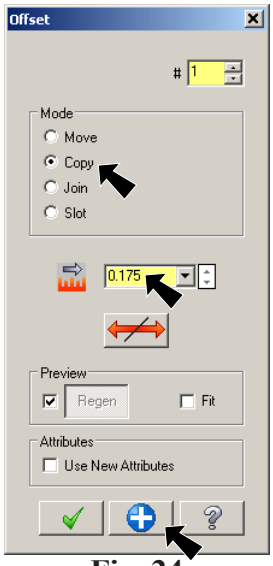

Fig. 24

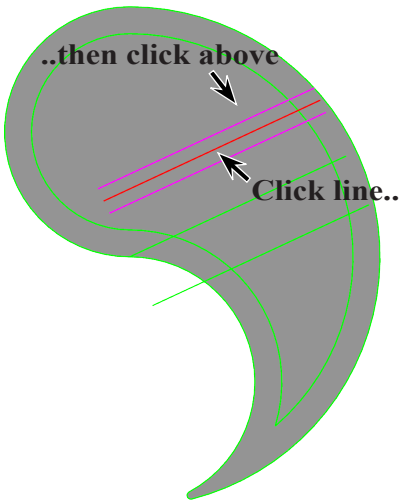

Fig. 25

Step 7. **Delete the three centerlines**. To delete, click and press Delete key, **Fig. 27** and **Fig. 28**.

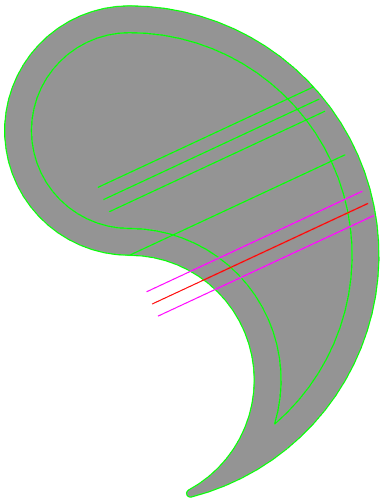
Fig. 26

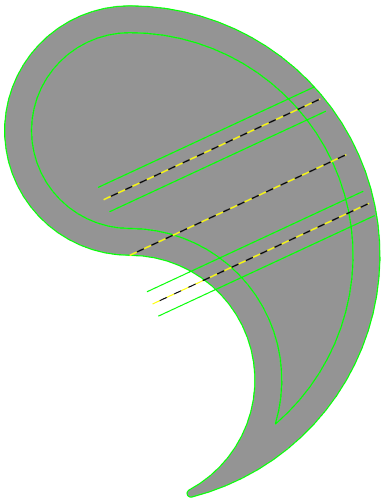
Fig. 27

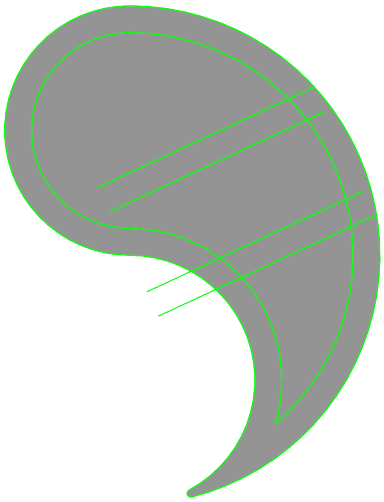
Fig. 28

J. Trim Divide and Trim 1 Entity.

Step 1 Click EDIT Menu > Trim/Break > Trim/Break/Extend.

Fig. 29

Step 2. Click **Trim 1 Entity** in ribbon bar, **Fig. 29**.

Step 3. Trim line arcs, **Fig. 30**. To trim, click line on side you want to keep then arc.

Step 4. Click **Divide** **(D)** in ribbon bar, **Fig. 32**.

Step 5. Trim all segments between lines and arcs. To trim, click the segment between the line or arc, **Fig. 33**.

Click OK to close ribbon bar when done.

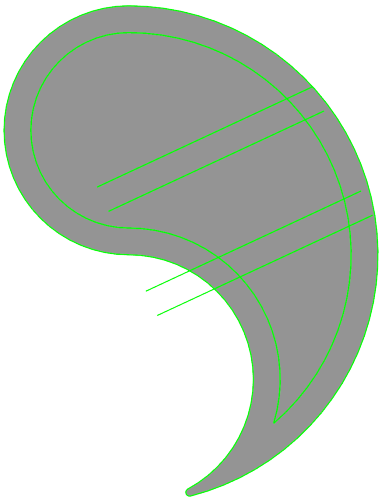

Fig. 30

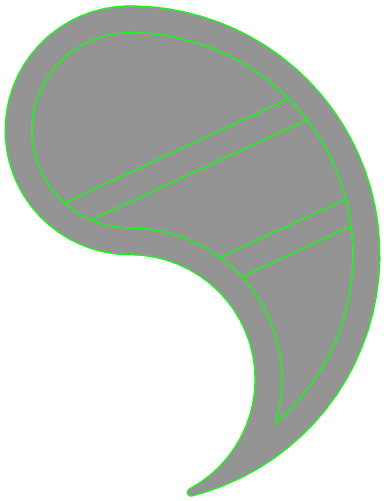

Fig. 31

Fig. 32

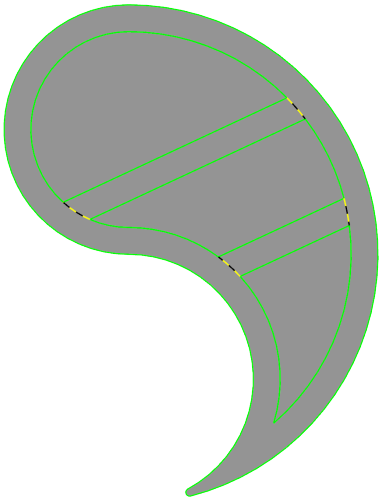

Fig. 33

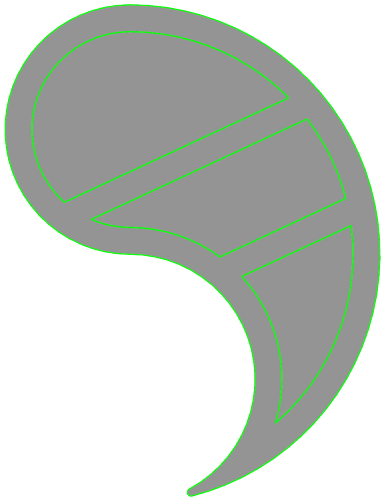

Fig. 34

K. Fillet Chains.

Step 1. Click CREATE Menu > Fillet > Chains.

Step 2. Click Chain in Chaining dialog box.

Step 3. Click to chain geometry of each pocket, **Fig. 35**.

Step 4. Click OK in Chaining dialog box.

Step 5. Key-in **.125 for Radius** in Fillet ribbon bar, **Fig. 36**.

Step 6. Click OK in ribbon bar to fix and close.

Step 7. Save (**Alt-F S**).

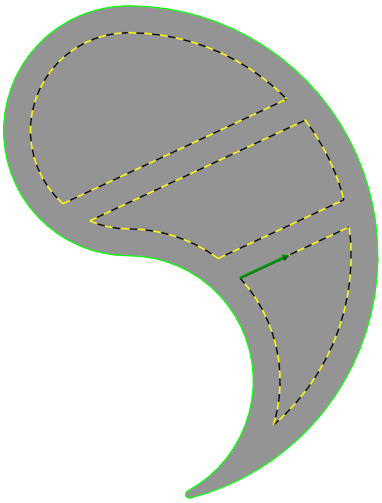

Fig. 35

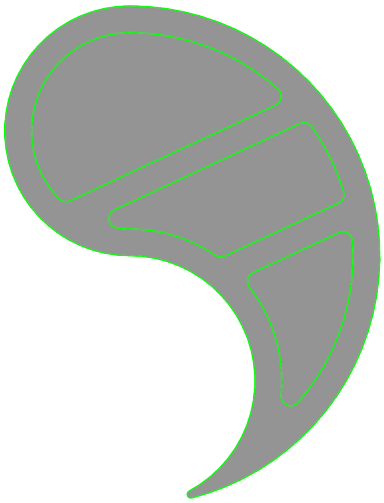

Fig. 37

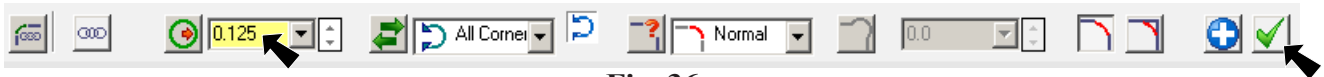

Fig. 36

L. Pin Hole Circle.

Step 1. Click Wireframe color in Status Bar. Key-in **13 for magenta** color number and press ENTER.

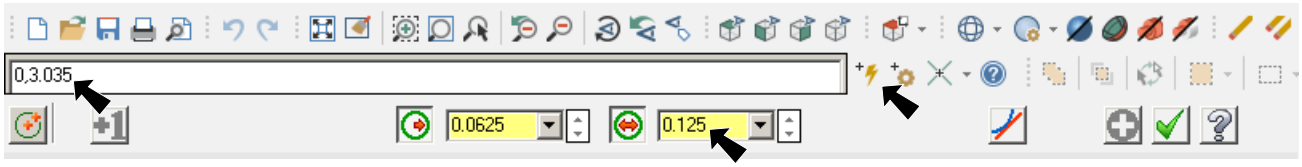

Fig. 38

Step 2. Click CREATE Menu > Arc > Circle Center Point.

Step 3. Key-in **.125 for diameter** , **Fig. 38**.

Step 4. Click Fast Point (**spacebar**) to the right of the X, Y, and Z fields in Auto Cursor ribbon bar, **Fig. 38**.

Step 5. Key-in the X, Y coordinates into the Fast Point long field and press ENTER, **Fig. 38**

0, 3.035

Click OK in ribbon bar to fix circle and close ribbon bar.

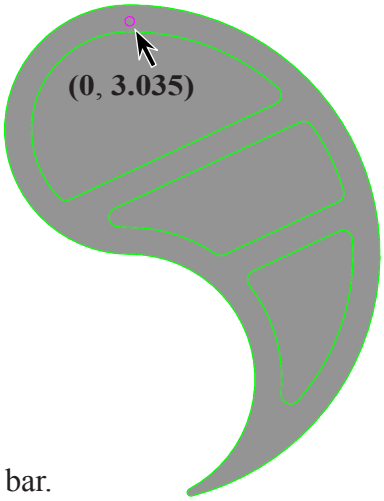

Fig. 39

M. Cut Pockets.

Step 1. Change to Isometric View (**Alt-7**).

Step 2. Click SOLIDS Menu > Extrude.

Step 3. Click Chain in Chaining dialog box.

Step 4. Click **any geometry of each pocket**, **Fig. 41**.

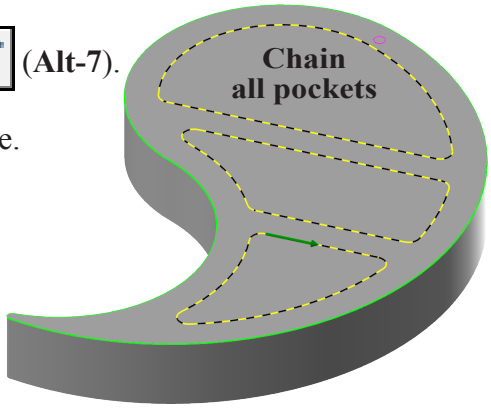

Fig. 41

Step 5. Click OK in Chaining dialog box.

Step 6. In Extrude dialog box, **Fig. 40**
Select **Cut Body**
Select **Distance**
Set **Distance .65**

The direction arrow should **point down**, **Fig. 42**.
Click **OK and Create New Operation**.

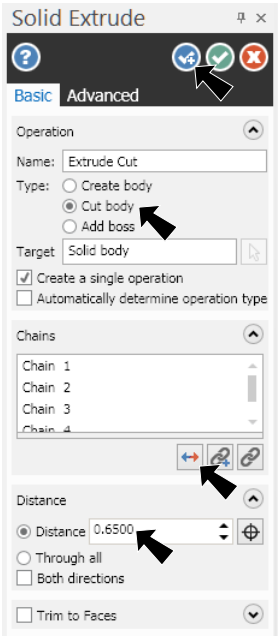

Fig. 40

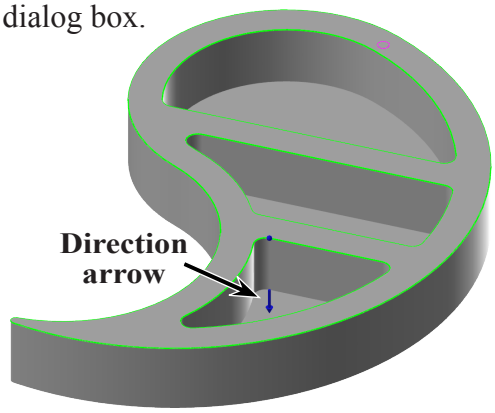

Fig. 42

N. Cut Pin Hole.

Step 1. Click Chain in Chaining dialog box.

Step 2. Click **Pin hole circle**, **Fig. 44**.

Step 3. Click OK in Chaining dialog box.

Step 4. In Extrude dialog box, **Fig. 43**
Select **Cut Body**
Select **Through All**

The direction arrow should **point down**, **Fig. 45**.
Click OK.

Step 5. Save (**Alt-F S**).

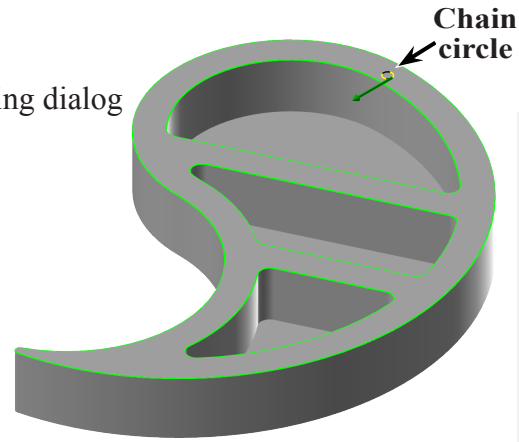

Fig. 44

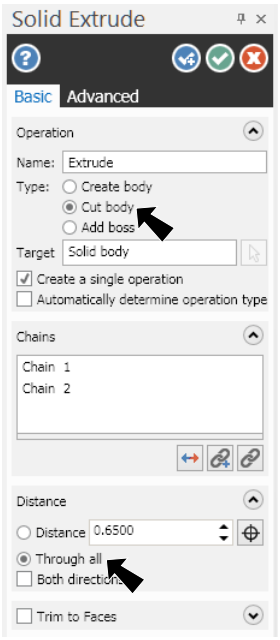

Fig. 43

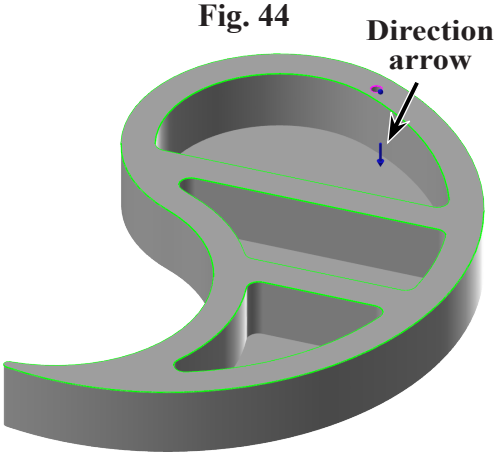

Fig. 45

O. Translate Solid.

Step 1. Change to Top View (**Alt-1**).

Step 2. Use **F9** to toggle Origin/Axis display on.

Step 3. Click XFORM Menu > Translate.

Step 4. Click the **solid body** to select it and click **End Selection** (**ENTER**) in ribbon bar, **Fig. 46**.

Step 5. In Translate dialog box set:

Select **Move** **Fig. 47**

ΔX **.5**

ΔY **.1**

Click OK .

Click Yes to move defining wire-frame entities, **Fig. 49**.

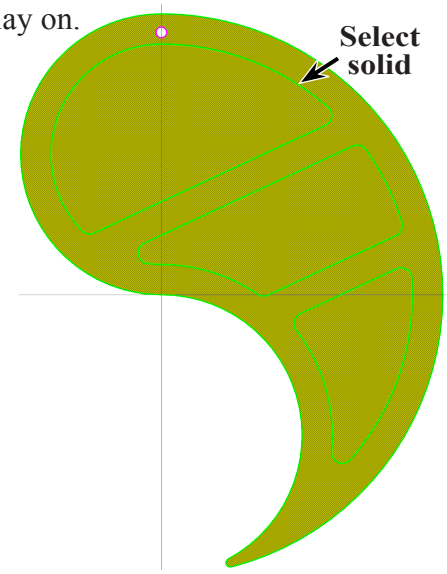

Fig. 46

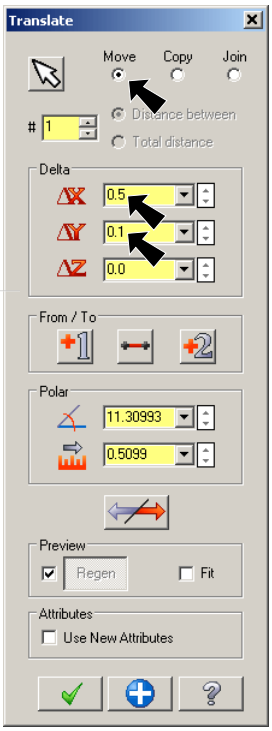

Fig. 47

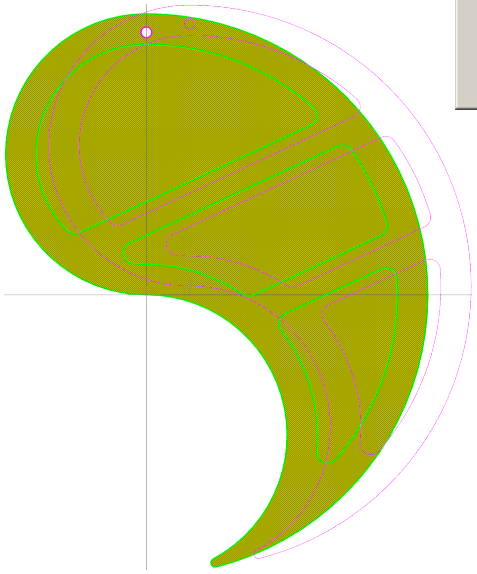

Fig. 48

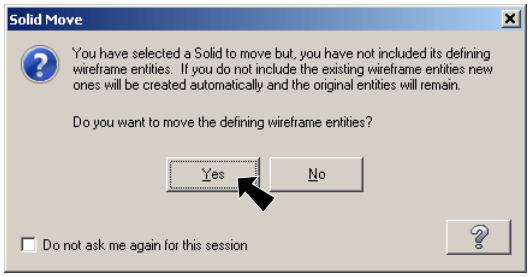

Fig. 49

P. Rotate Solid.

Step 1. Click XFORM Menu > Rotate.

Step 2. Drag a window selection around all to select all and click **End Selection** (**ENTER**) in ribbon bar, **Fig. 50**.

Step 3. In Rotate dialog box set:

Copy **Fig. 51**

Number of Steps **1**

Rotation Angle **180**

Click OK.

Step 4. **Right click** graphics area and click Clear Colors (**Alt-R C**).

Step 5. Save (**Alt-F S**).

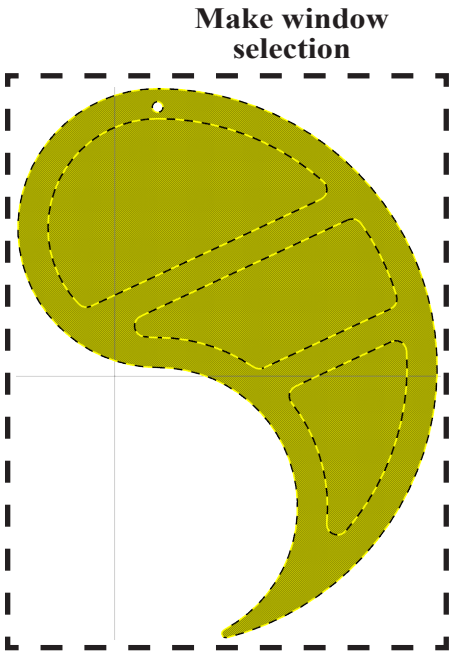

Fig. 50

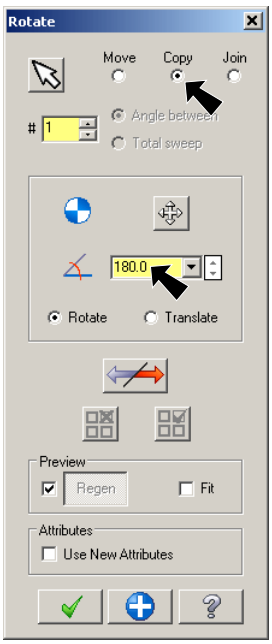

Fig. 51

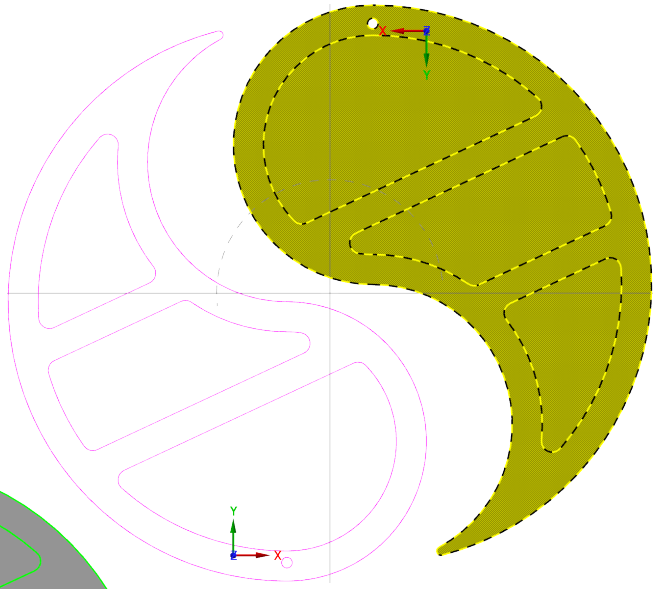

Fig. 52

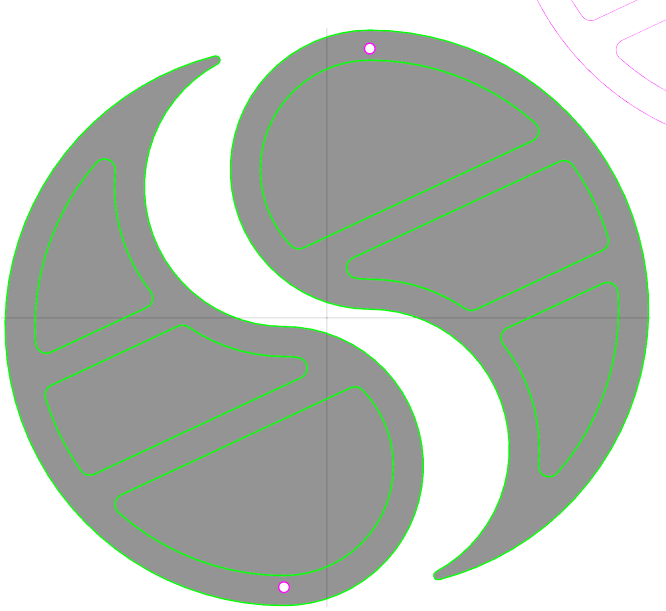

Fig. 53

Q. Machine Type and Stock Setup.

Step 1. Change to Isometric View (**Alt-7**).

Step 2. If necessary, display Toolpaths Manager. Use **Alt-O**.

Step 3. If Machine Group is **not** displayed in the Operations Manager, **Fig. 54**, click MACHINE TYPE Menu > Mill > Default.

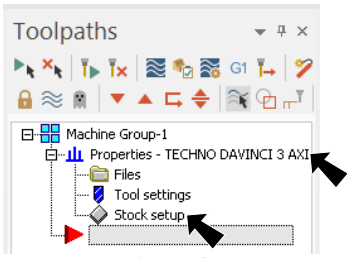

Fig. 54

Step 4. Expand **Properties** in the Toolpaths Manager and click **Stock Setup**, **Fig. 42**.

Step 5. Confirm Stock Plane is **Top**, **Fig. 55**.

Step 6. Confirm **Display** is checked.

Step 7. Key-in for X, Y and Z stock dimensions:

X 8
Y 8
Z .75

Step 8. Confirm Stock Origin coordinates:

X 0
Y 0
Z 0

Step 9. Click OK in the Machine Group Properties.

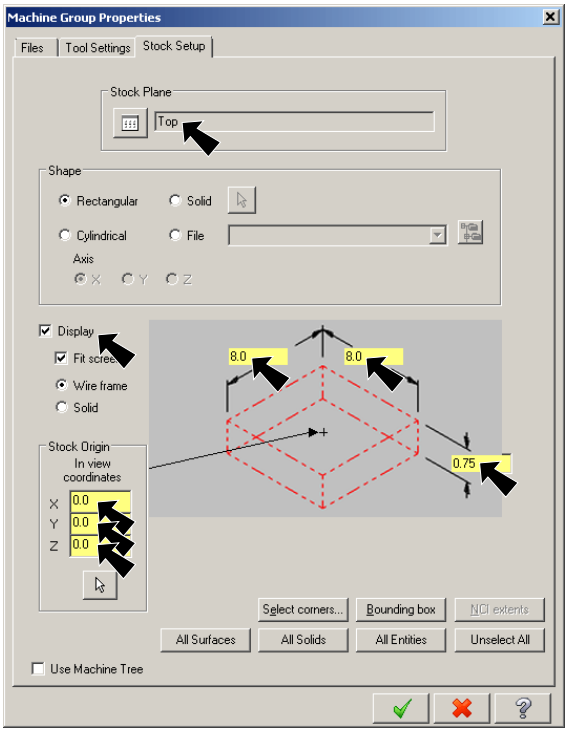

Fig. 55

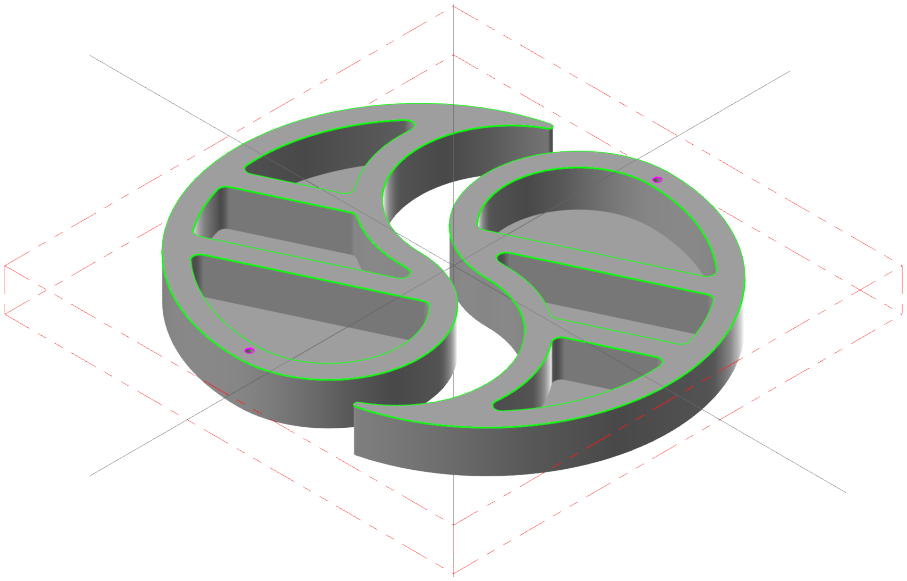

Fig. 56

R. OptiRough Toolpath.

Step 1. Click TOOLPATHS Menu > Surface High Speed > **Dynamic OptiRough**.

Step 2. Click OK in the NC name dialog, **Fig. 57**.

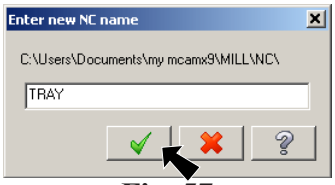

Fig. 57

Step 3. Click **both solid bodies** to select as Drive Surfaces, **Fig. 58**.

Step 4. Click **End Selection** (**ENTER**) in ribbon bar to accept solid as drive surfaces.

Step 5. Click **Containment boundary Select** button in the Toolpath/surface selection dialog box, **Fig. 59**.

Step 6. Click **Chain** (**C**) in Chaining dialog box, **Fig. 60**.

Step 7. Click **any geometry of each pocket**, **Fig. 61**.

Step 8. Click OK in Chaining dialog box, **Fig. 60**.

Step 9. Click OK in Toolpath/surface selection dialog box, **Fig. 59**.

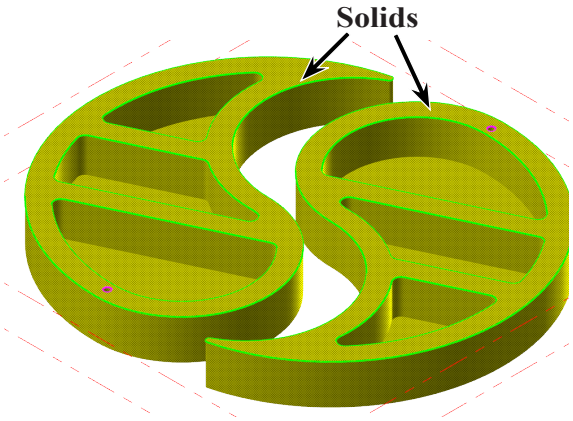

Fig. 58

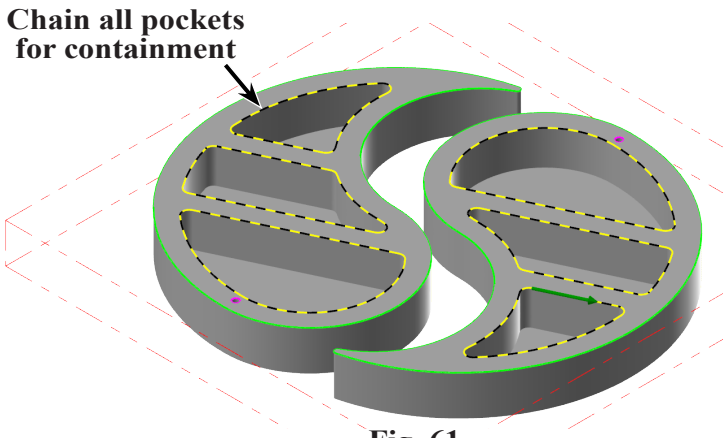

Fig. 61

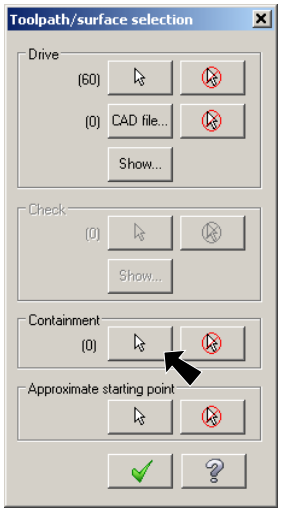

Fig. 59

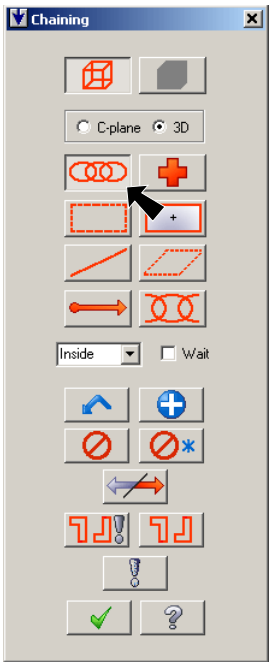

Fig. 60

Step 10. Select **Toolpath Type** from the tree control and confirm: **Dynamic OptiRough toolpath Drive surfaces Containment boundary Fig. 62**.

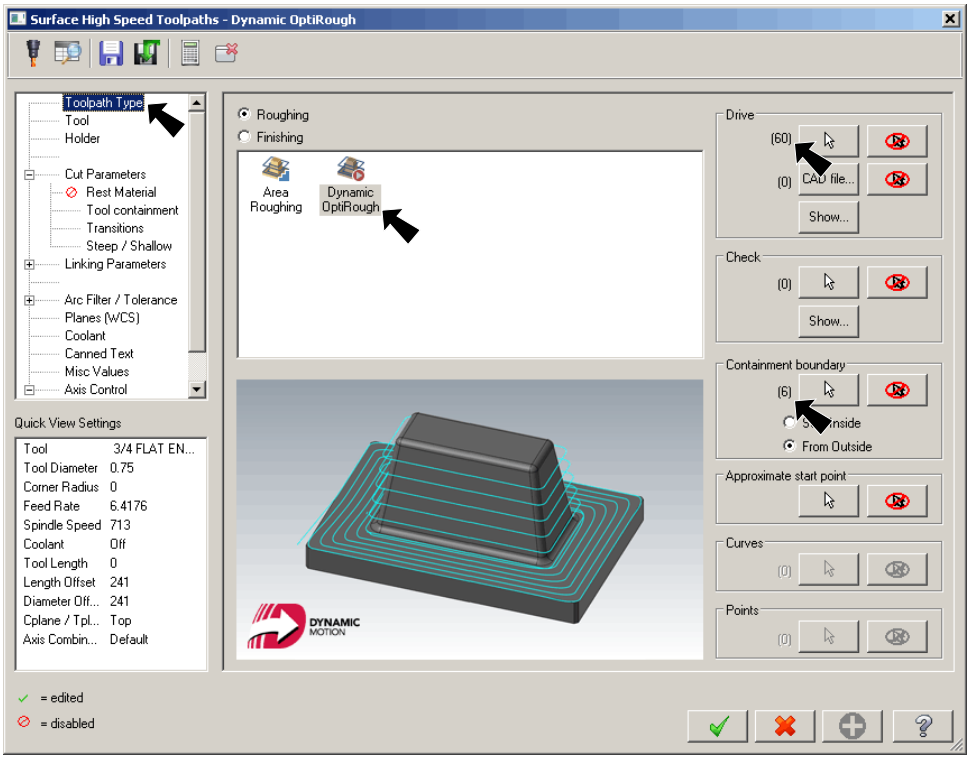

Fig. 62

Step 11. Select **Tool** from the tree control and:

click **Select library tool** button, **Fig. 63**.

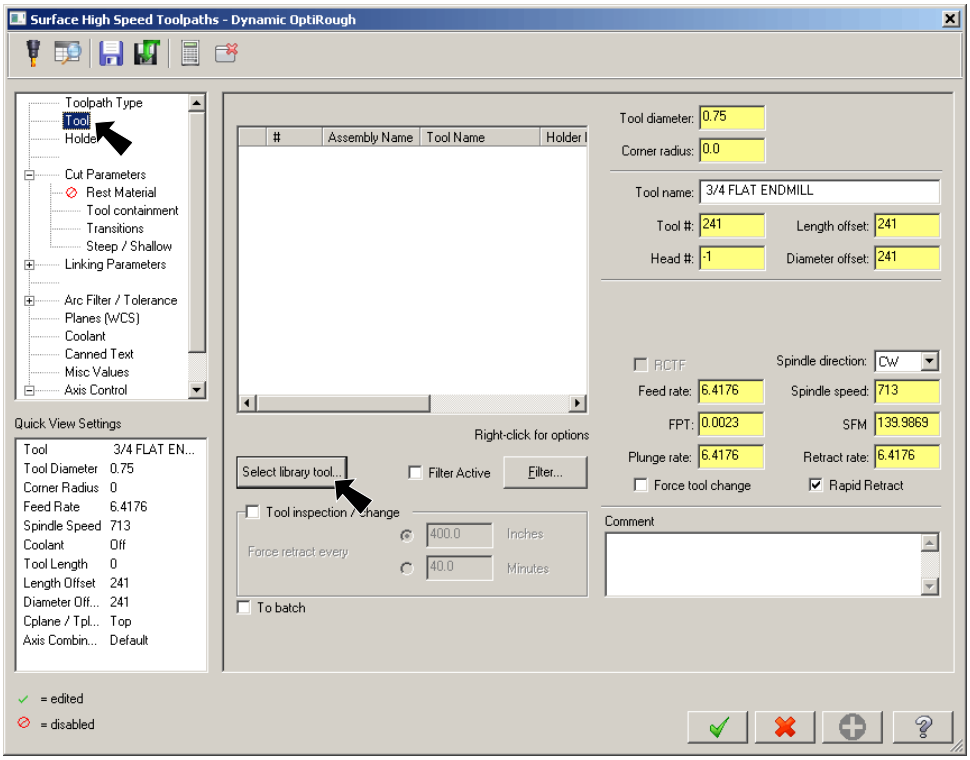

Fig. 63

Step 12. Click **285 1/4 FLAT ENDMILL** and click OK, **Fig. 64**.

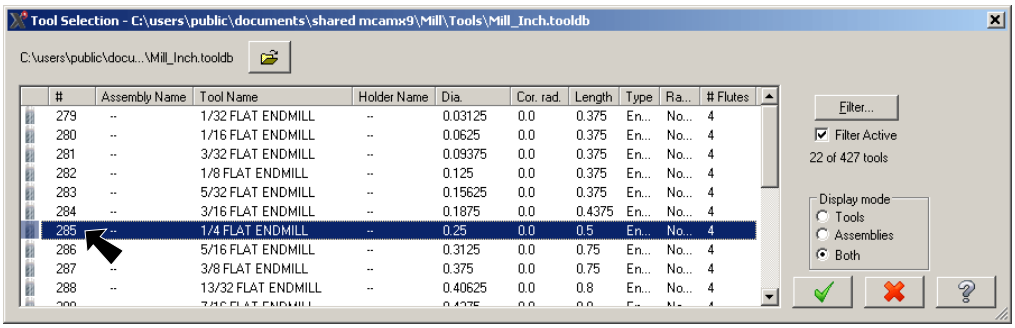

Fig. 64

Step 13. Back in **Tool** page set:
Feed rate 40

Plunge rate 20
Fig. 65.

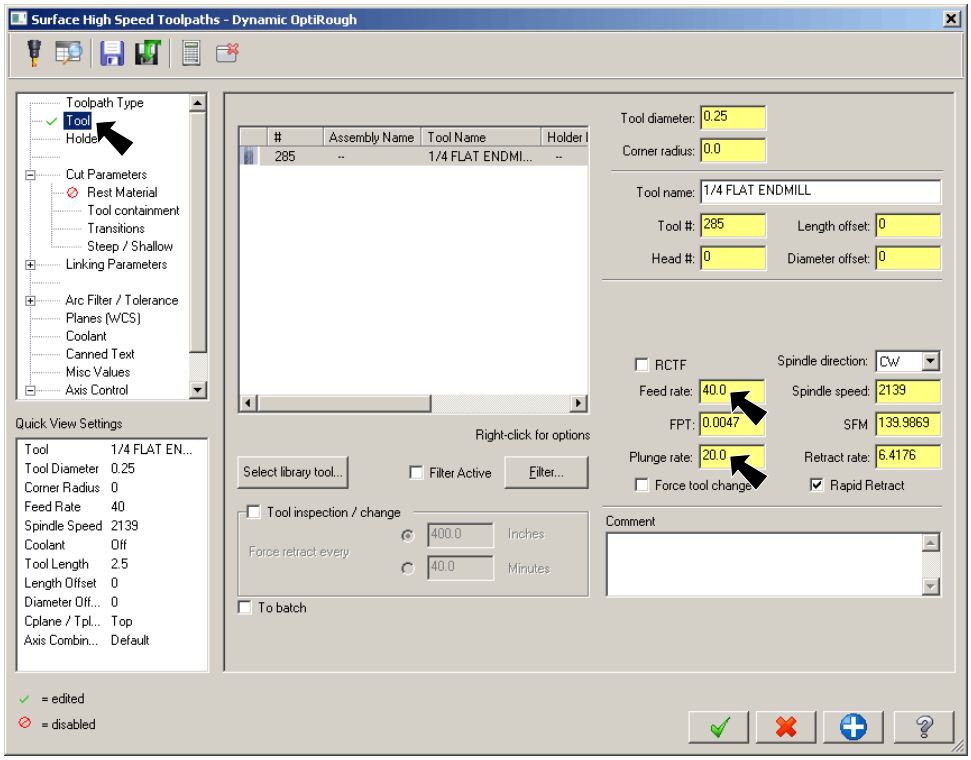

Fig. 65

Step 14. Select **Cut Parameters** from tree control and set:

Stepdown 60

Minimum toolpath radius 2.5

Stock to leave on Walls and Floors 0
Fig. 66.

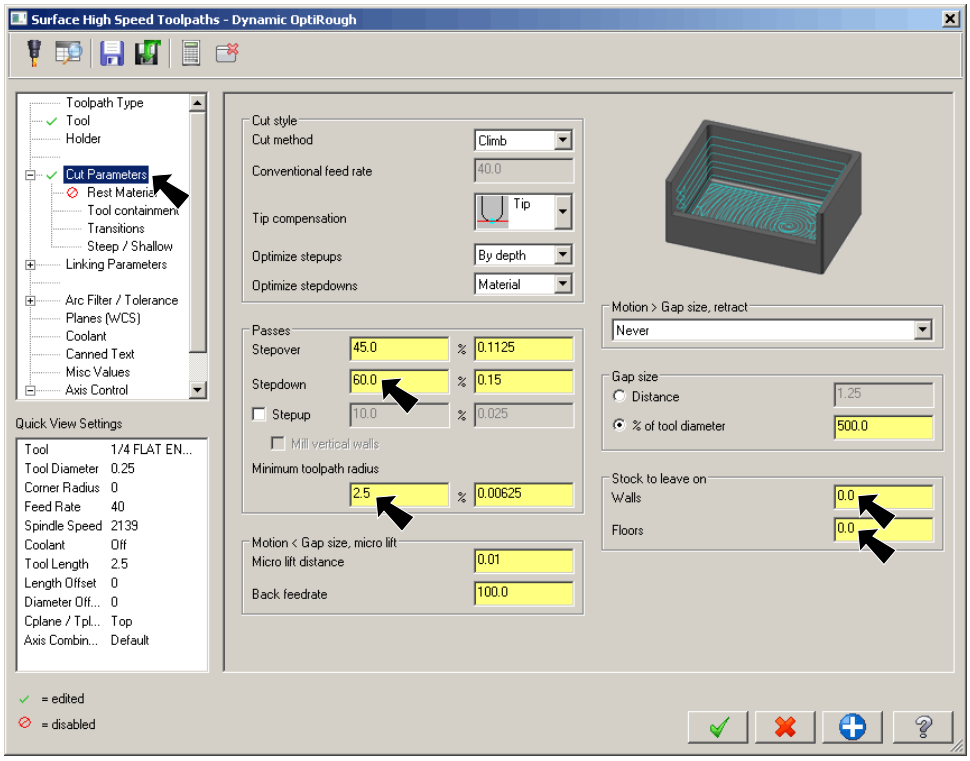

Fig. 66

Step 15. Select **Transitions** from tree control and set:

Plunge angle 10
Fig. 67.

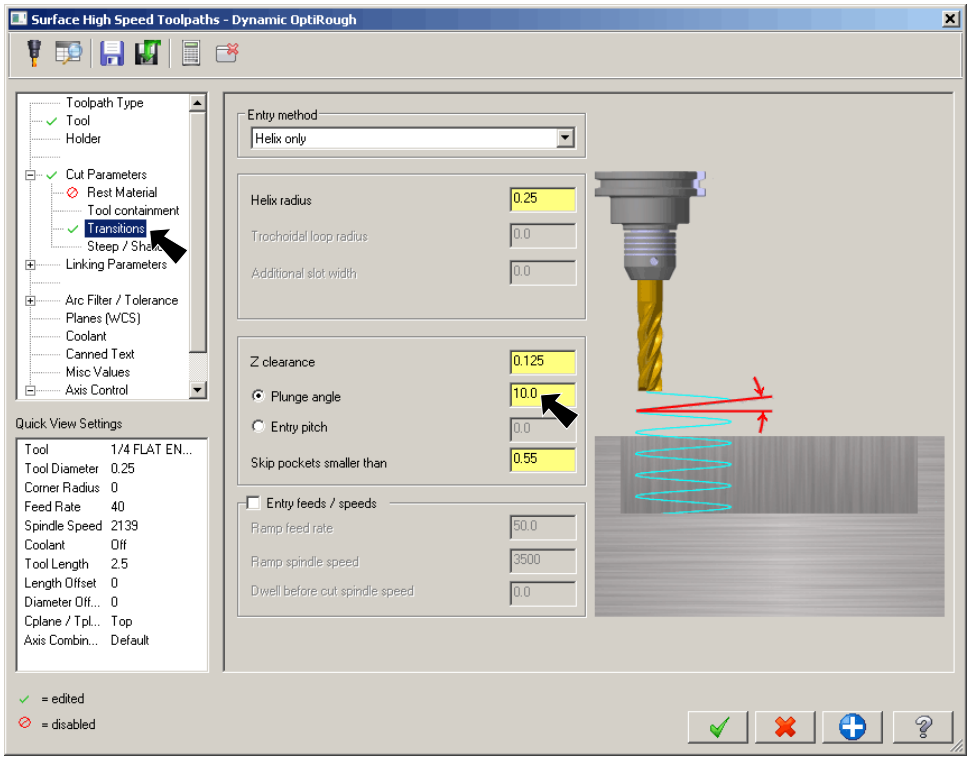

Fig. 67

Step 16. Select **Linking Parameters** from tree control and set:

Clearance plane 1

All leads 0
Fig. 68.

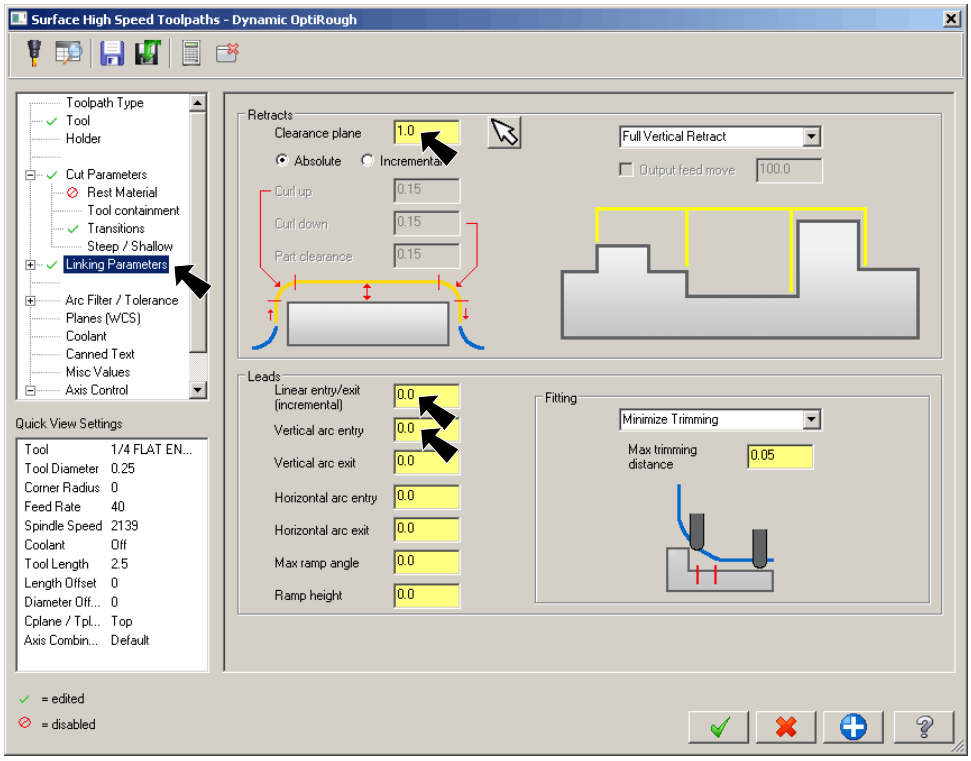

Fig. 68

Step 17. Click OK in Dynamic OptiRough dialog box.

Step 18. Allow Mastercam to calculate toolpath and Save (**Alt-F S**).

S. Contour Toolpath.

Step 1. Use **Alt-T** to turn off toolpath display.

Step 2. Click TOOLPATHS Menu > **Contour**.

Step 3. Click **Chain** (**C**) in Chaining dialog box, **Fig. 69**.

Step 4. Click **both outside edge geometry** to chain both, **Fig. 70**. The chain arrow should point **clockwise** around **each** chain. If a chaining directions arrow is pointing in the opposite direction - click Reverse , **Fig. 69**.

Step 5. Click OK in Chaining dialog box.

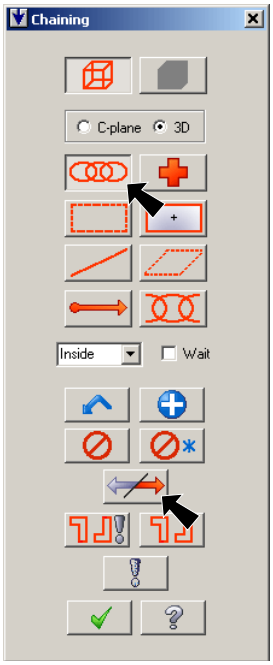

Fig. 69

Confirm chains!
Direction of chain determines which side of chain bit cuts!

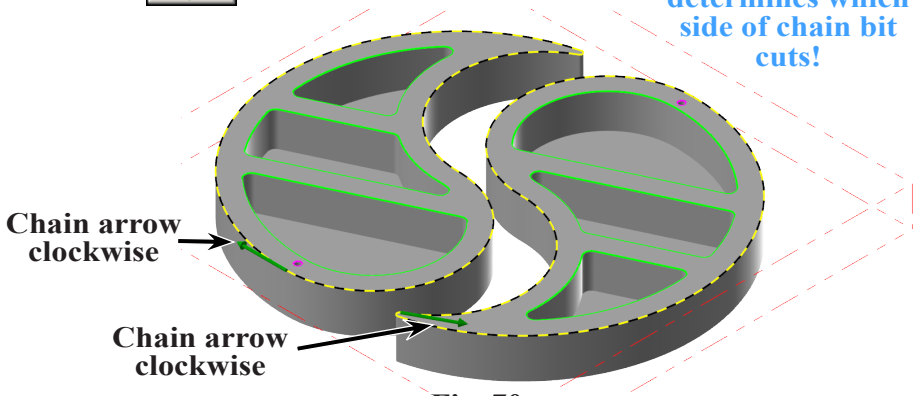

Fig. 70

Step 6. In the 2D Toolpaths Contour dialog box confirm **2 Chain** is selected **Fig. 71**.

Step 7. Select **Tool** from the tree control and: Confirm **285 1/4 FLAT ENDMILL**

Feed rate 40

Plunge rate 20 Fig. 72.

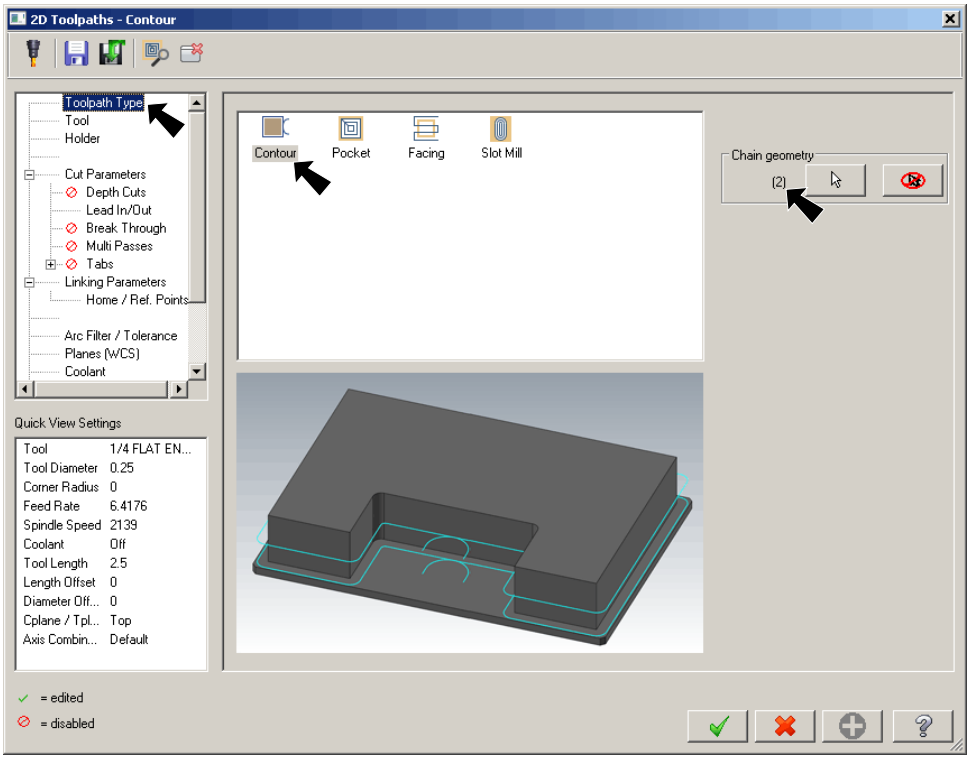

Fig. 71

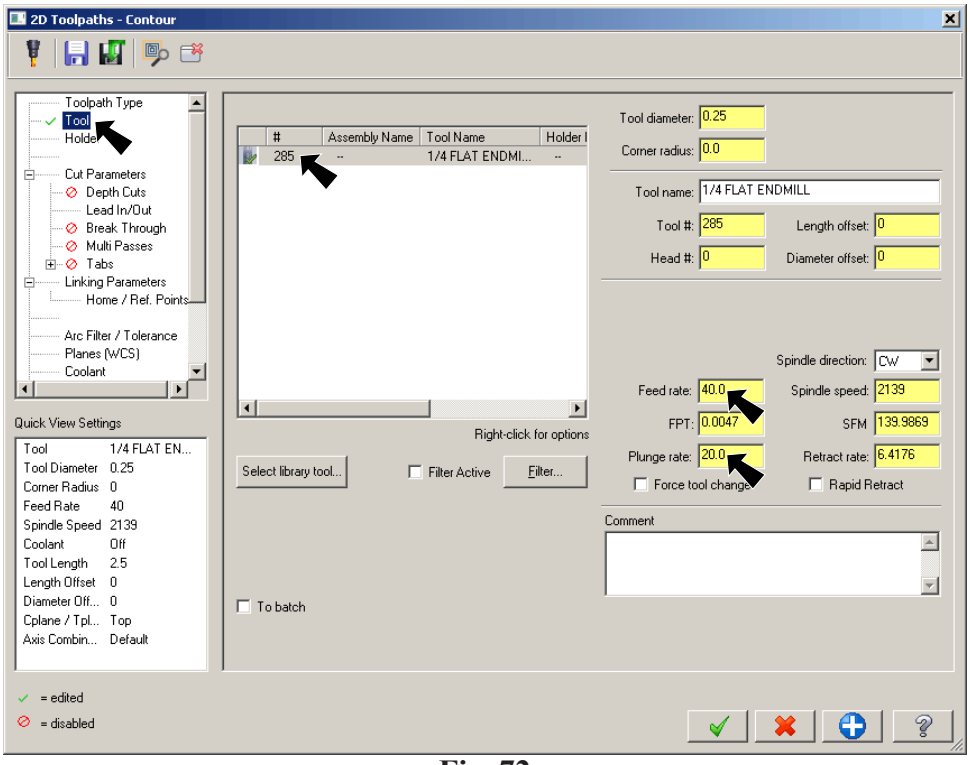

Fig. 72

Step 8. Select **Cut Parameters** from tree control and set:

Compensation type Wear

Compensation direction Left

Tip comp: Tip

Stock to leave on walls and floors 0
Fig. 73.

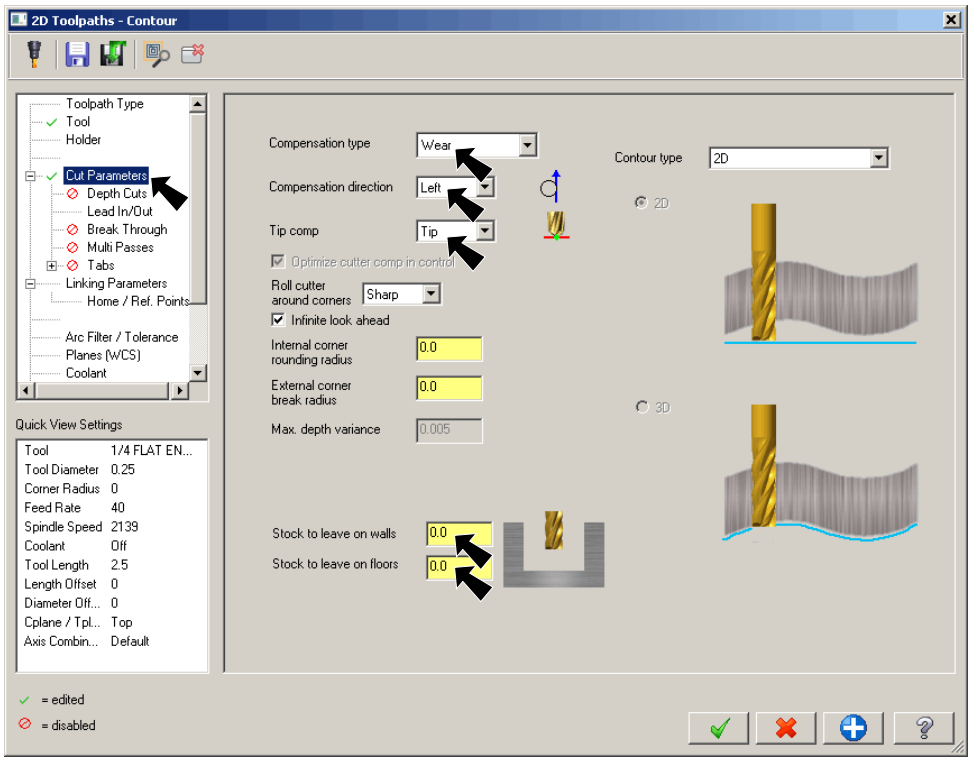

Fig. 73

Step 9. Select **Depth Cuts** from tree control and set:

Check **Depth cuts**

Max rough step .2

Check **Keep tool down**
Fig. 74.

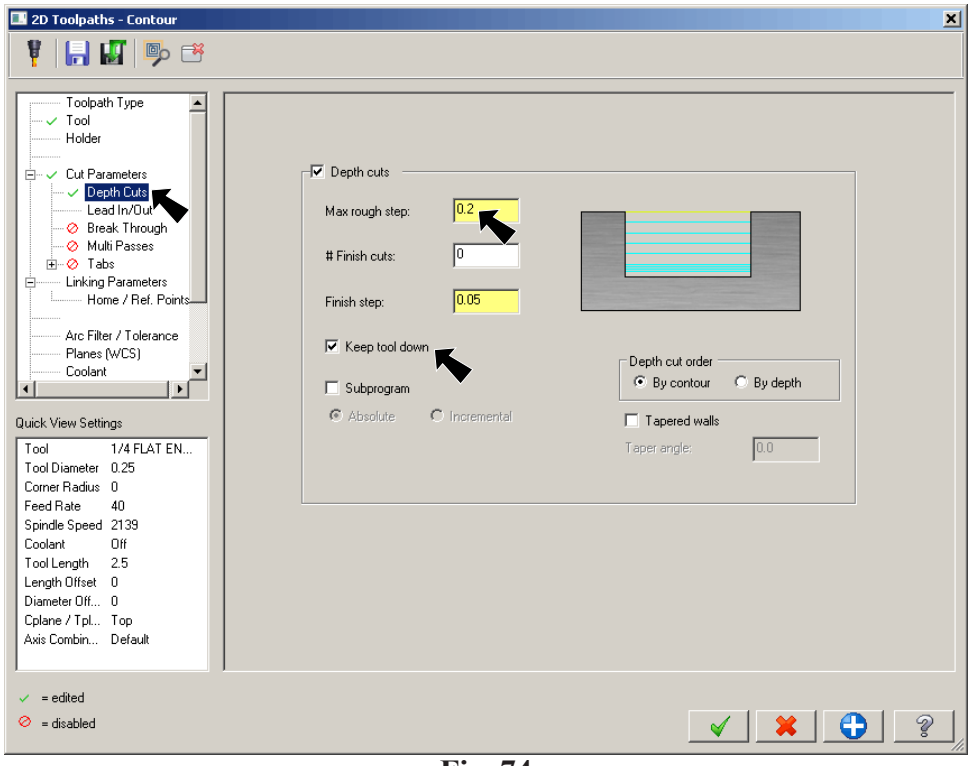

Fig. 74

Step 10. Select **Lead In/Out** from tree control and set:

Uncheck **Lead In/Out**
Fig. 75.

Step 11. Select **Break Through** from tree control and set:

Check **Break through**

Break through amount .01
Fig. 76.

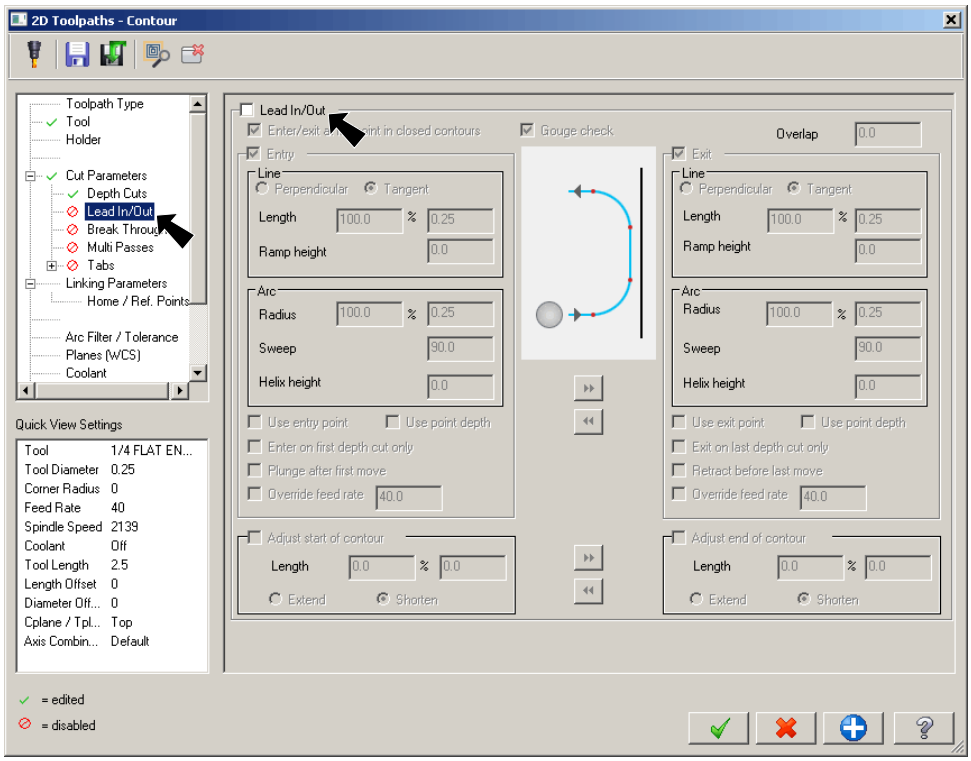

Fig. 75

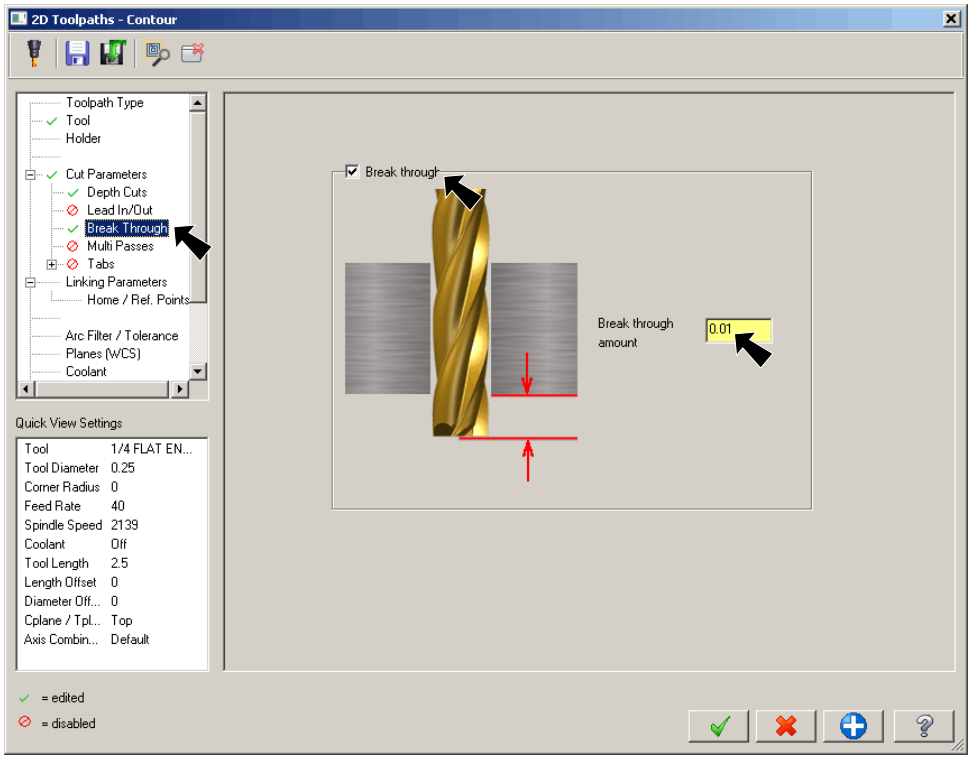

Fig. 76

Step 12. Select **Linking Parameters** from tree control and set:

Depth -.75
Fig. 77.

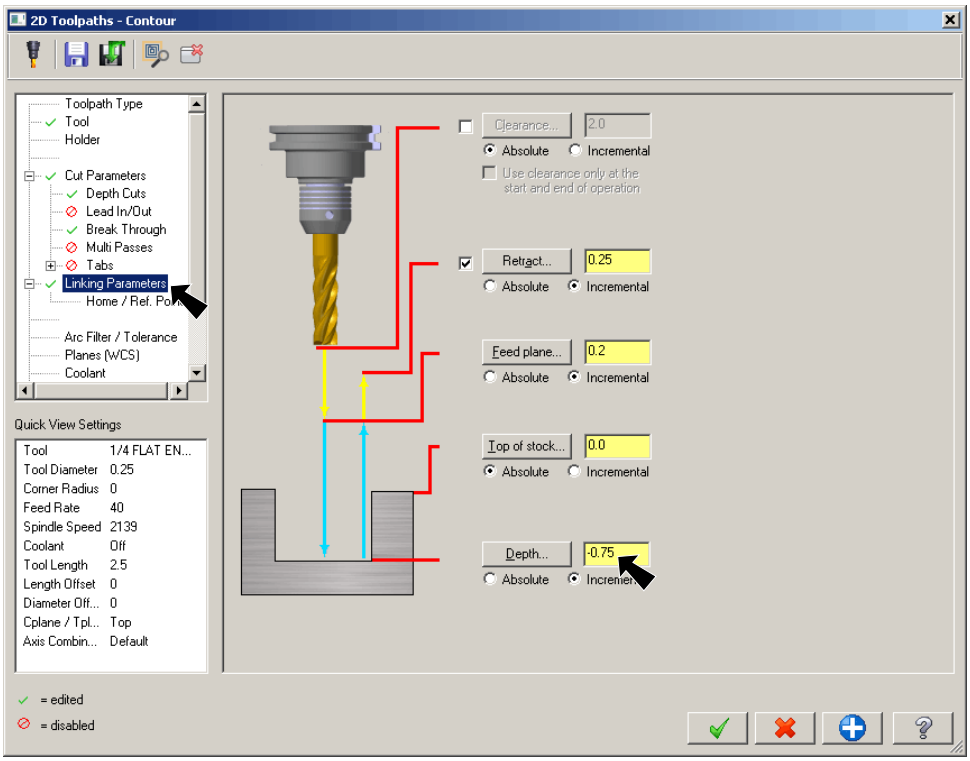

Fig. 77

Step 13. Click OK .

Step 14. Save (**Alt-F S**).

T. Verify Toolpath.

Step 1. Click **Toolpath Group-1** in the Toolpaths Manager to select **OptiRough and Contour** toolpaths, **Fig. 78**.

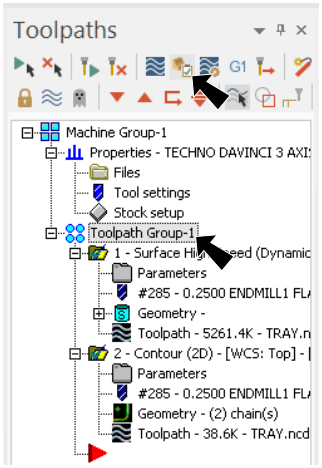

Fig. 78

Step 2. Click **Verify** in the Toolpaths Manager, **Fig. 78**.

Step 3. Click **Play** (**R**) in VCR bar.

Step 4. Note **Total Time** to run program under Toolpath Info in the Move List panel (**roughly 28 minutes**), **Fig. 79**.

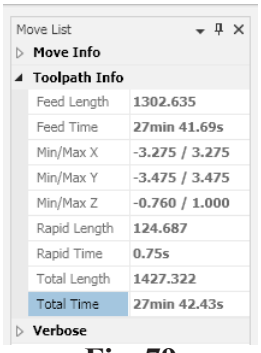

Fig. 79

Step 5. Switch back to Mastercam (**Alt-Tab**).

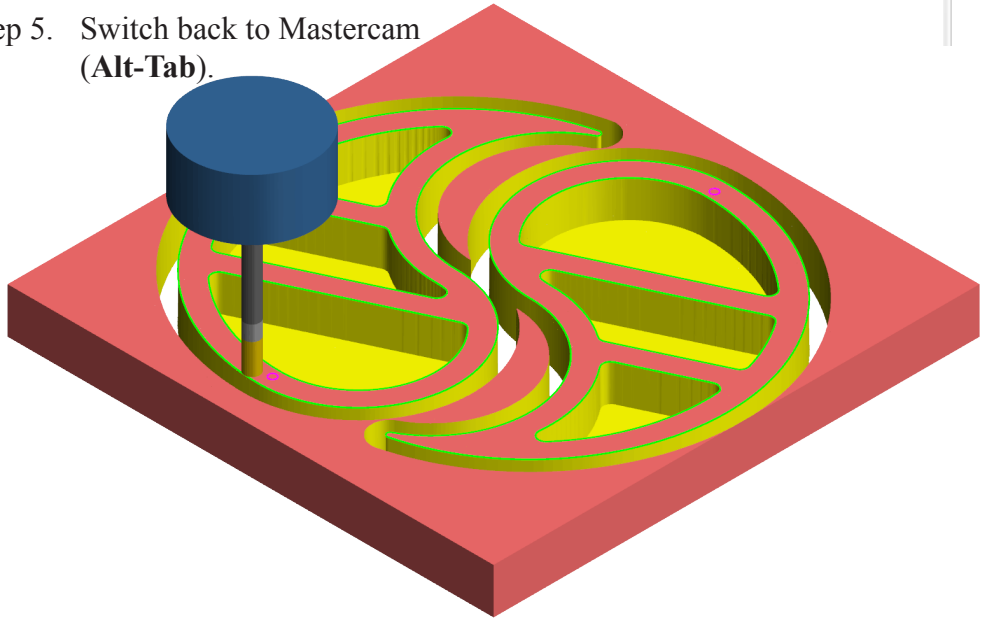

Fig. 80

U. FBM Drill Toolpath Right Tray.

Step 1. Click TOOLPATHS Menu > **FBM Drill**.

Step 2. Click the **right Tray solid**, **Fig. 81**.

Step 3. Select **Hole Detection** from the tree control and set:

Confirm **Limit search to plane Top Fig. 82**.

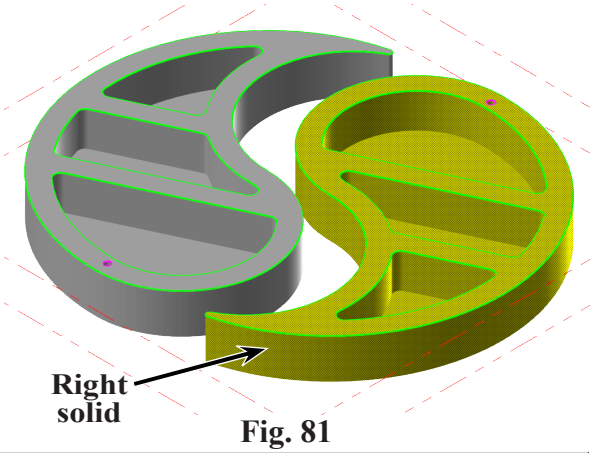

Fig. 81

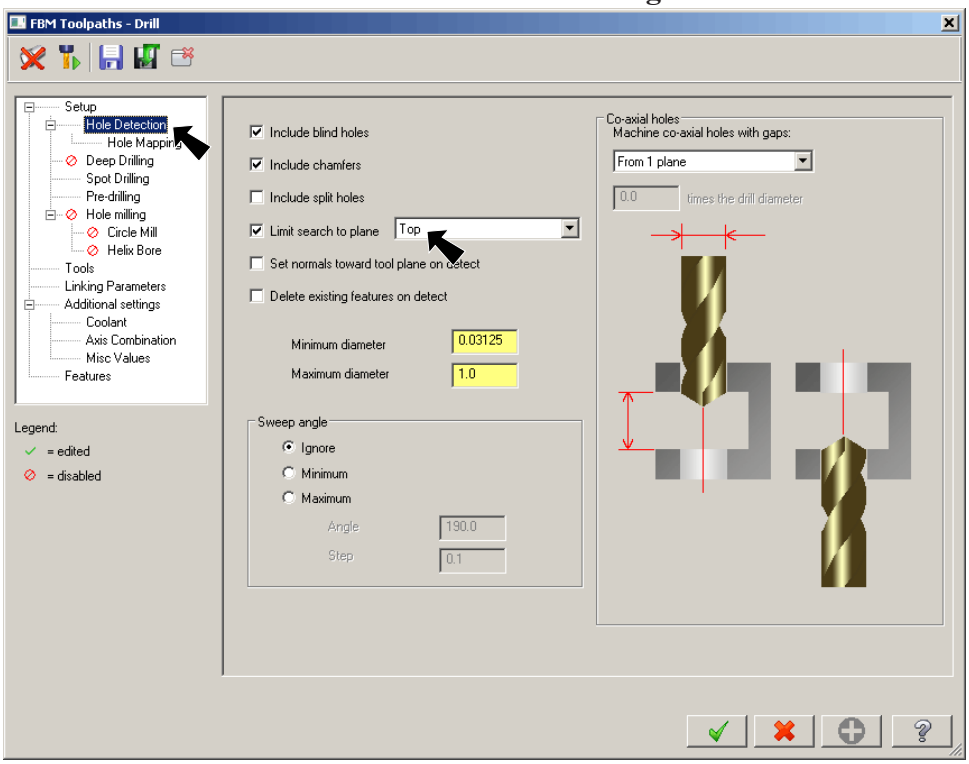

Fig. 82

Step 4. Select **Spot Drilling** from the tree control and uncheck **Spot Drilling** check box, **Fig. 83**.

Step 5. Select **Pre-drilling** from the tree control and uncheck **Pre-drilling** check box, **Fig. 84**.

Step 6. Click **Detect** button at the top of the dialog box to find the holes, **Fig. 84**.

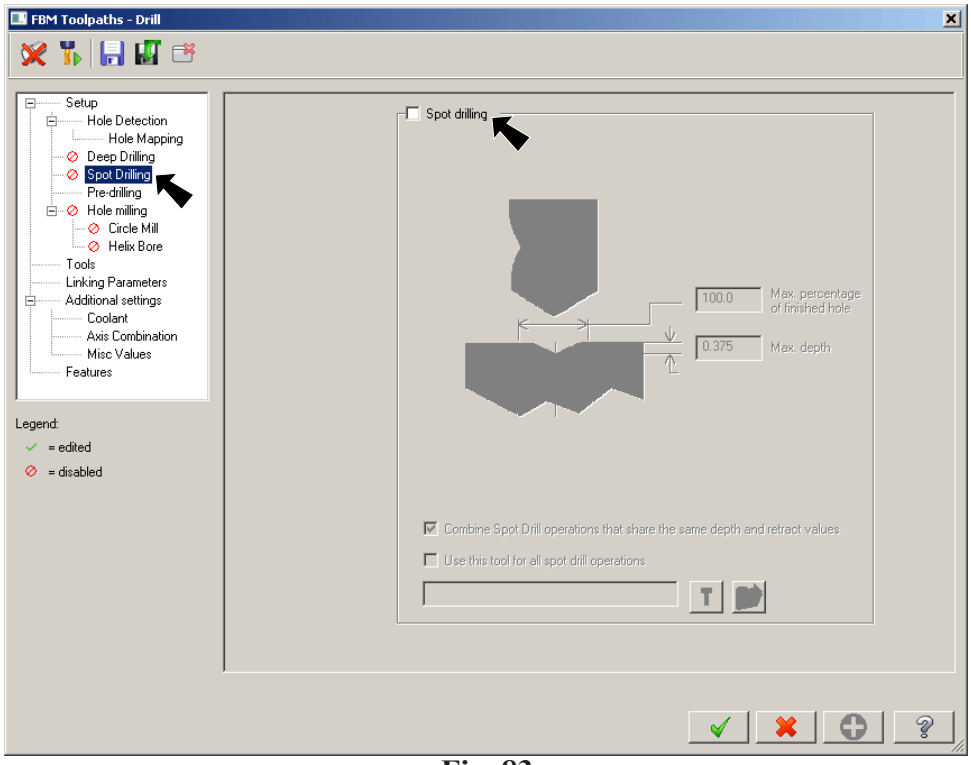

Fig. 83

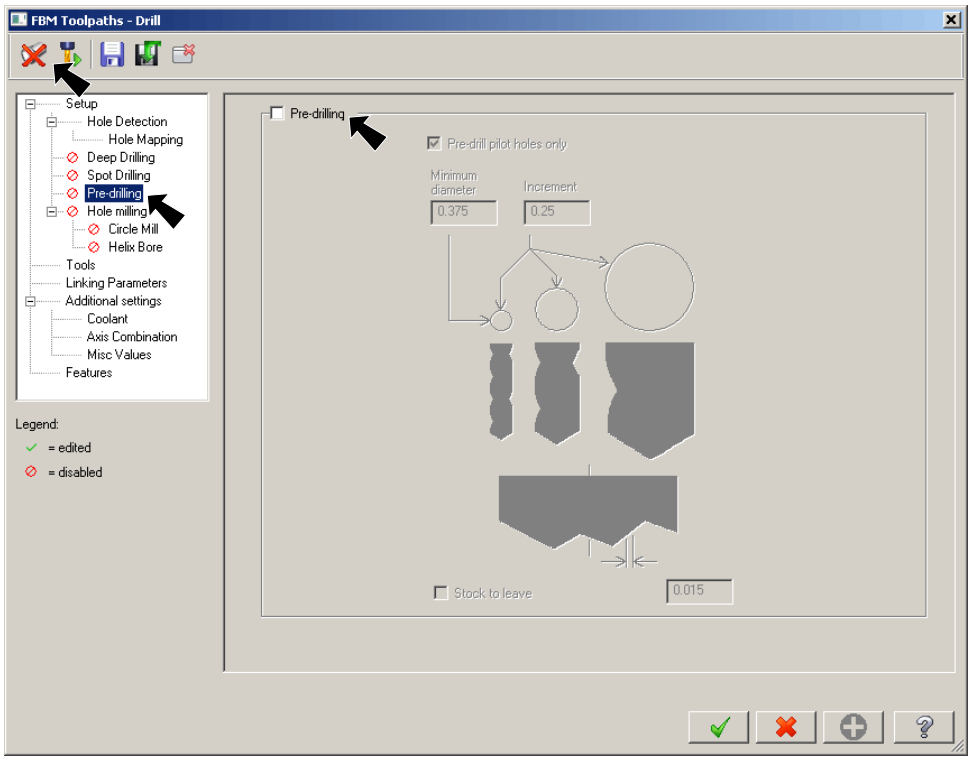

Fig. 84

Step 7. Confirm **1 hole depth .75** is listed and click OK , **Fig. 85**.

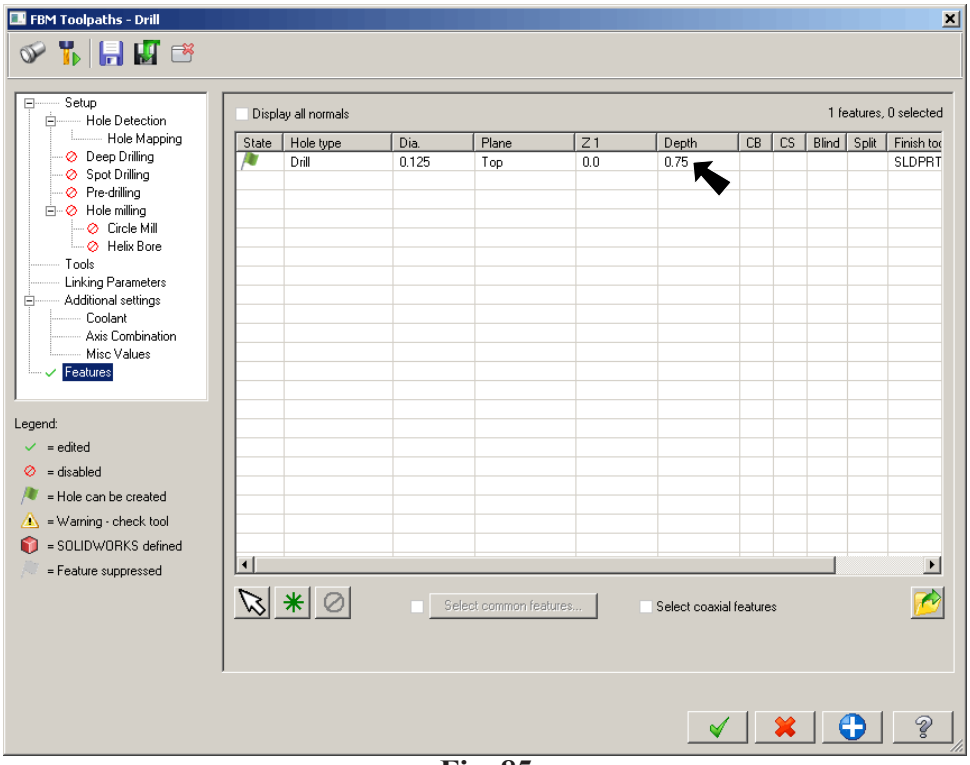

Fig. 85

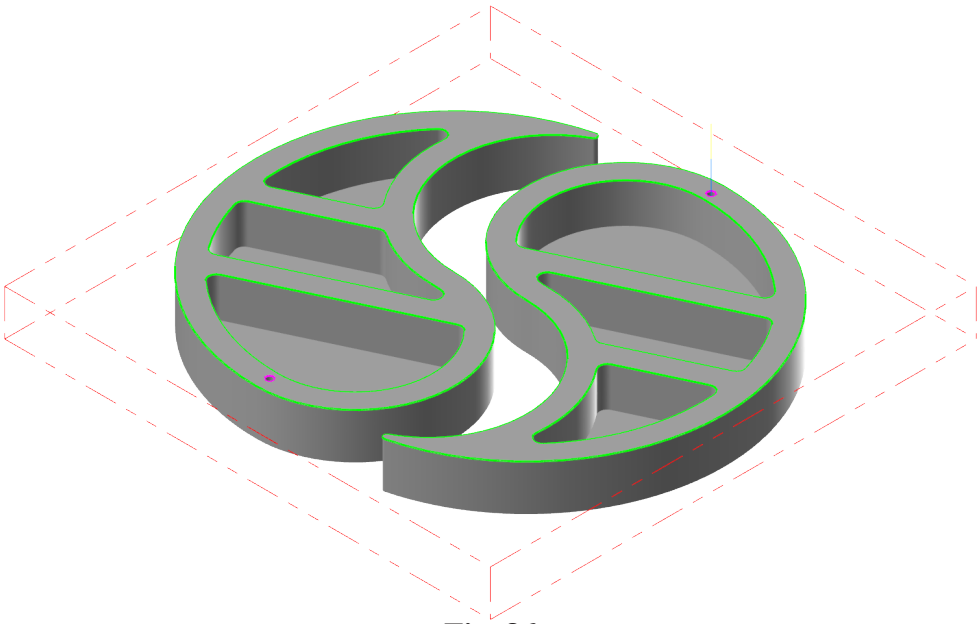

Fig. 86

V. FBM Drill Toolpath Left Tray.

Step 1. Click TOOLPATHS Menu > **FBM Drill**.

Step 2. Click the **left Tray solid** and params are all set so just click **Detect** button , **Fig. 87**.

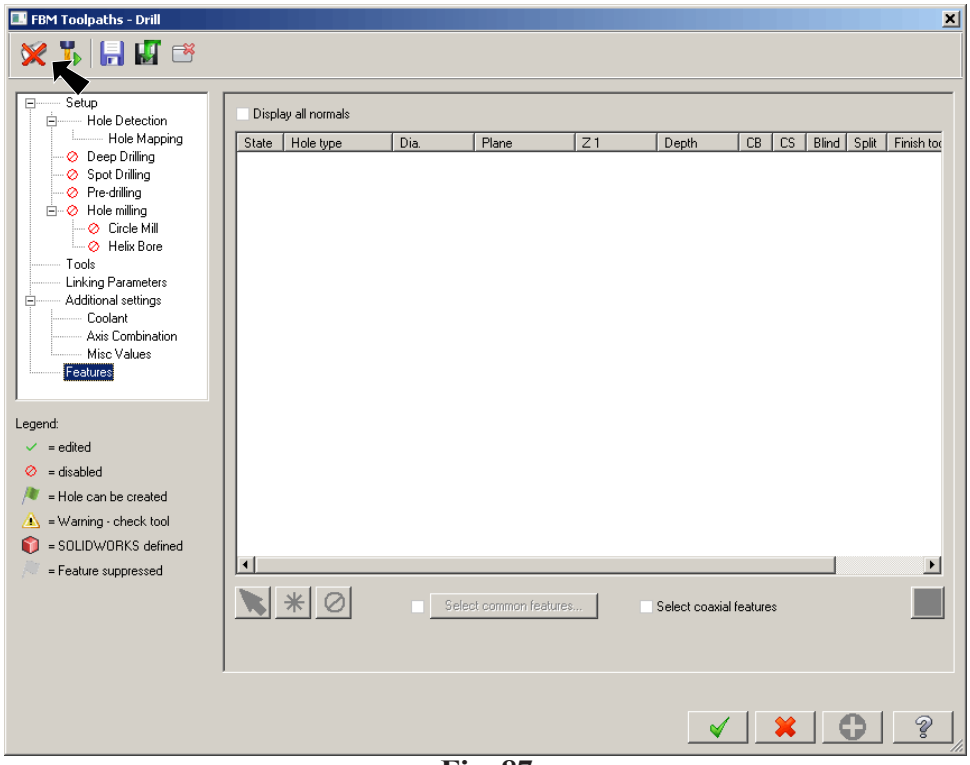

Fig. 87

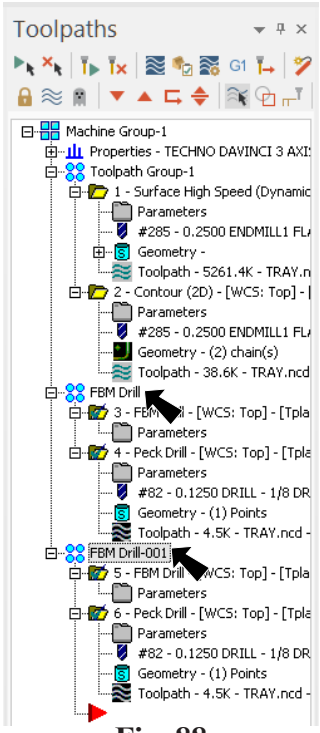

Fig. 88

Step 3. **Ctrl click both FBM Drill Toolpath Groups** in the Toolpaths Manager to select both groups, **Fig. 88**.

Step 4. Save **(Alt-F S)**.

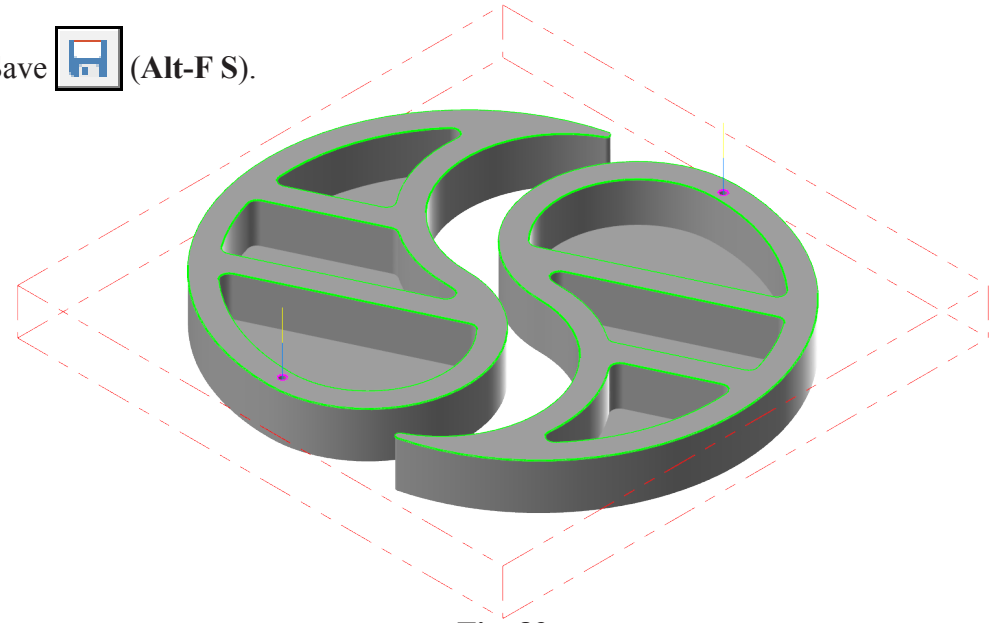

Fig. 89