

Lathing

Lathing is one of the most widely used operations in 3-D modeling. If you look at the objects around you, you'll see that many contain parts that are symmetrical. From a lamp bulb to the wheels on a car, many products can be created from the basic outline of the shape. ModelPro's tools let you generate 3-D objects based on 2-D contours you create with its drawing tools or from 2-D contours imported from products such as FreeHand, Illustrator, and most drawing and CAD products. This tutorial is a step-by-step tour to help you quickly familiarize yourself with the Lathe and Sweep tools, and access each of their special features.

Part I - Creating a Lathed Object

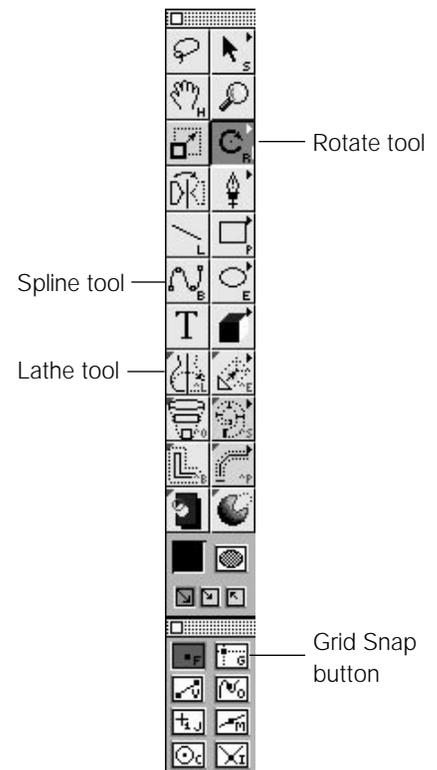
Lathe is the process where a 2-D contour is swept around a designated axis to create symmetrical 3-D shapes quickly and easily. ModelPro's Lathe Tool provides the ability to control the direction and the angle of the curve, allowing you to create simple or complex objects easily and accurately.

Designing a Gavel and Strike Plate

In this exercise, you will create a design with three component parts using just a single view. Groups will be used to make your modeling efforts more effective and efficient. You will use the Spline and Lathe tools for modeling, Guide Lines to help keep the design in proportion, the Rotate Tool to re-position an object. Launch ModelPro by double-clicking on its icon.

Preparing the Drawing Environment

Open the Front View to full screen size by clicking in the Zoom box in the upper-right hand corner of Front View window. Click and hold in the Zoom In icon at the bottom-right of the screen until at least 1 inch is showing at each end of all rulers. Click on the Grid icon in the Snap palette. All points will snap in 0.125 inch increments, which is the default setting.



Note: If you want a different grid size, you can change the grid settings in the Grid Preferences dialog from the Edit Menu.

Note: With the Grid Snap active, both spline points and the tangent line points snap to the grid.

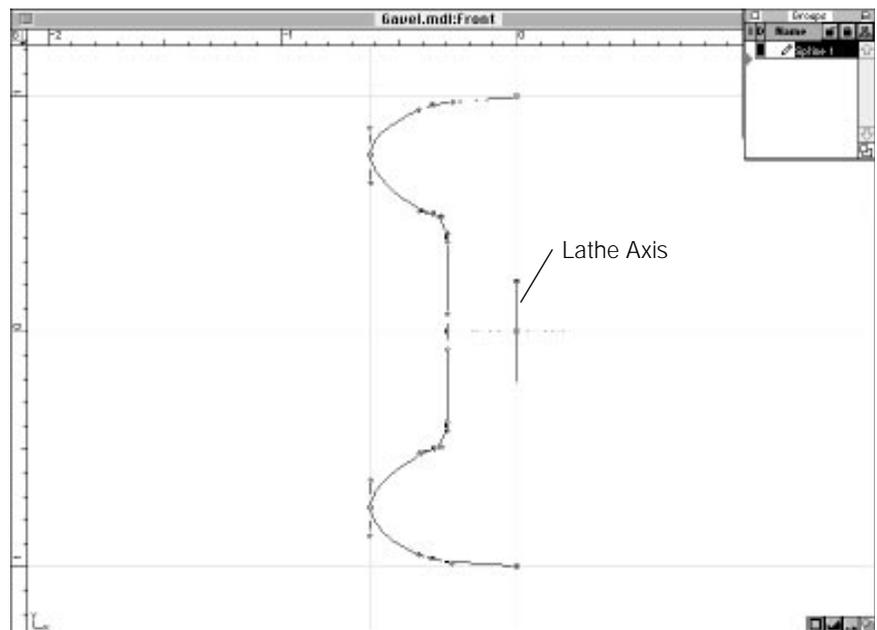
Note: To make a spline bend from point to point, hold the mouse down after clicking to set a vertex and move the cursor until you have the desired curvature. After the initial curve is drawn you can click on any of the points and move them or change the length and position of the tangent line.

Tip: The curvature can be changed after the spline is drawn by clicking and dragging a point or by adjusting the tangent line at a vertex. Stretching the tangent line broadens or narrows the curve.

Create the Head of the Gavel

You are going to use guide lines to help you keep the design in proportion. The head of the gavel will be drawn within a rectangle of dimensions 1.25 by 2.0. To set the first guide line, click in the ruler at the left and drag a guide line to the right and stop when the value of X in the Status Line at the bottom of the screen reads -0.625. To set the second guide line, click in the ruler at the top and drag a guide line down and stop when the value of Y in the Status Line at the bottom of the screen reads 1. Grab another guide line from the ruler at the top and place it where the value of Y in the Status Line reads -1. Now click on the Free icon in the Snap palette to turn snapping off and allow you to draw in free form.

Select the Spline Tool and draw a profile of a gavel head as shown. The Groups palette now contains a new group named Spline 1.



Lathe profile

Zoom Out

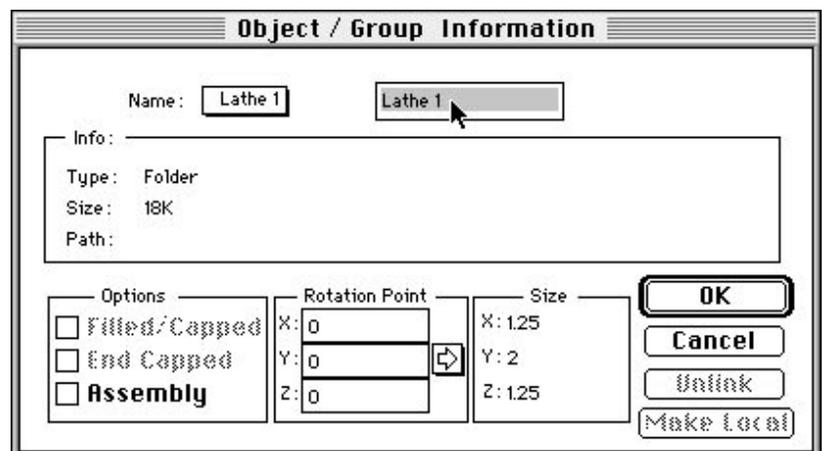
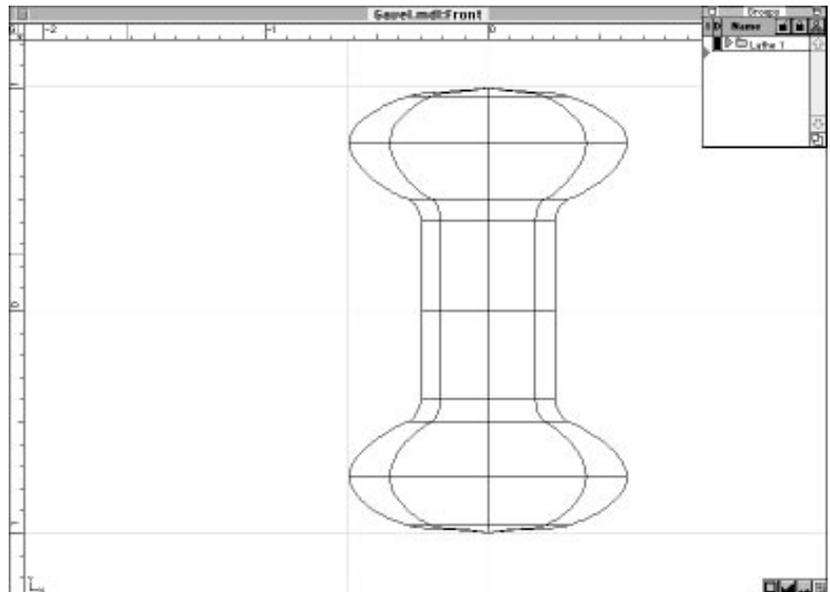
Line, and the Lathe Axis Indicator.

Choose the Lathe Tool in the Tool palette. Since the spline defining the gavel head is going to be lathed around the $Y=0$ axis, the Lathe axis indicator is already positioned at the right spot to spin the spline profile into a gavel head. Double-click to perform the Lathe.

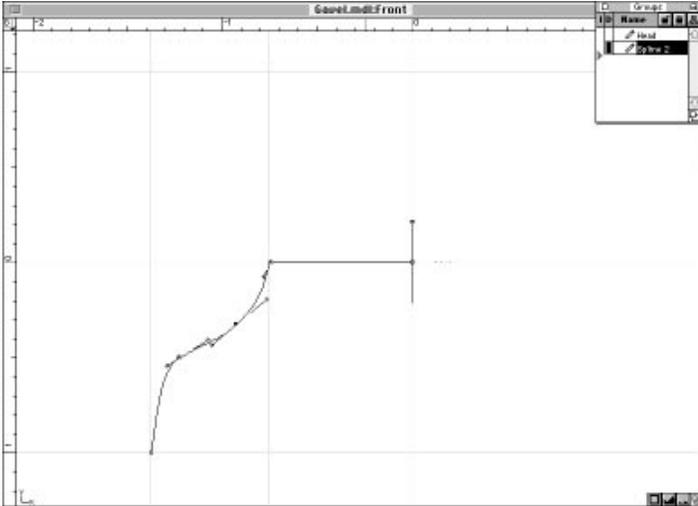
The Groups palette now contains a new folder named Lathe 1. Double-click on the name Lathe 1 in the Groups palette to bring up the Group Information dialog. To change the name of the folder, type Head in the box where Lathe 1 appears. Click in the OK box. The new name now appears in the Groups palette.

ModelPro makes it easy to keep the screen clear for doing additional work. To make the gavel head invisible, click in the D column next to the name Head in the Groups palette. Choose the Edit Menu and select Re-display (or hold the Command key down and type D).

Note: The Lathe axis indicator is automatically positioned at the Galactic Core ($X=0, Y=0, Z=0$) until moved.

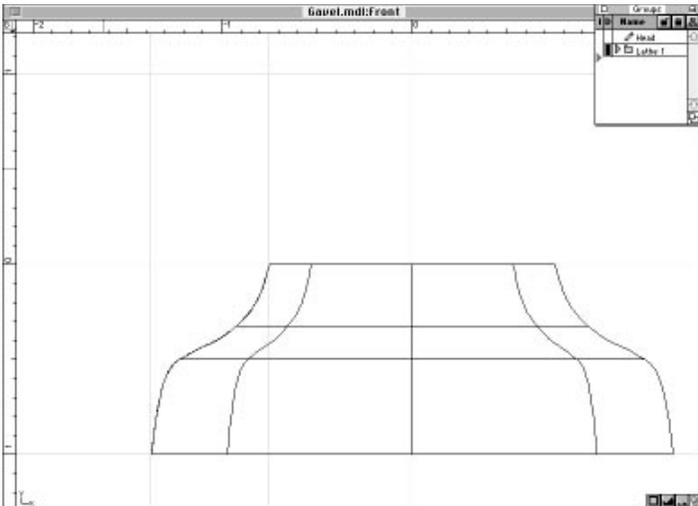


Group Information Dialog



Strike plate profile

Tip: To draw a curved spline, click the next point, hold, and drag to get the desired curve, and let go. To draw a straight spline, click the next point, and let go.



Lathed strike palette

Create the Strike Plate

The plate will be drawn within a rectangle of dimensions 2.75 by 2.0. Click on the Grid icon in the Snap palette. To set the first guide line, drag the the line at -0.625 left and stop when the value of X in the Status Line at the bottom of the screen reads -0.75. To set the second guide line, click in the ruler at the left and drag a guide line right and stop when the value of X in the Status Line at the bottom of the screen reads -1.375. Now click on the Free icon in the Snap palette to turn snapping off so you can draw in free form.

Select the Spline Tool and draw a profile of the strike plate as shown. Notice that the Groups palette now contains a new group named Spline 2.

Choose the Lathe Tool in the Tool palette. Since the spline defining the strike plate is going to be lathed around the Y=0 axis, the Lathe axis indicator is already positioned at the appropriate spot to spin the spline profile into a plate. Double-click to perform the Lathe.

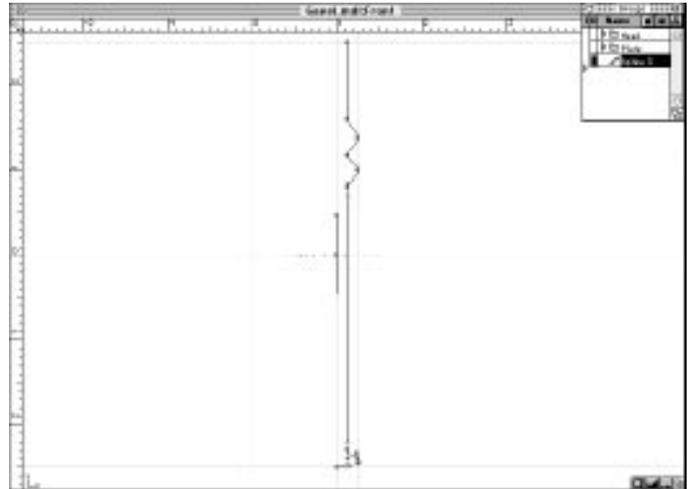
The Groups palette now contains a new folder named Lathe 1. Double-click on the name Lathe 1 in the Groups palette to bring up the Group Information dialog. To change the name of the folder, type Plate in the box where Lathe 1 appears. Click in the OK box. The new name now appears in the Groups palette.

Make the strike plate invisible by clicking in the D column next to the name Plate in the Groups palette. Select Re-display from the Edit Menu (or hold the Command key down and type D).

Create the Gavel Handle

The handle will be drawn within a rectangle of dimensions 0.5 by 5.0. To draw the handle, you will have to enlarge the drawing area. Click and hold in the Zoom In icon at the bottom-right of the screen until at least 2.5 inches is showing at each end of all rulers.

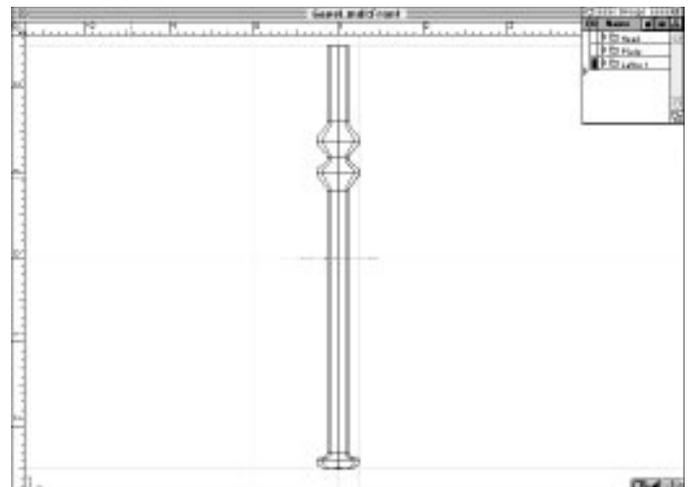
Click on the Grid icon in the Snap palette. You are going to re-arrange the guide lines for the design of the handle. To set the first guide line, drag the the vertical line at $X=-0.75$ right and stop when the value of X in the Status Line at the bottom of the screen reads 1.



Handle profile

To set the second guide line, drag the the vertical line at $X=-1.35$ right and stop when the value of X in the Status Line at the bottom of the screen reads 1.25. To set the third guide line, drag the the horizontal line at $Y=1$ up and stop when the value of Y in the Status Line at the bottom of the screen reads 2.5. To set the fourth guide line, drag the the horizontal line at $Y=-1$ down and stop when the value of Y in the Status Line at the bottom of the screen reads -2.5. Now click on the Free icon in the Snap palette to turn snapping off.

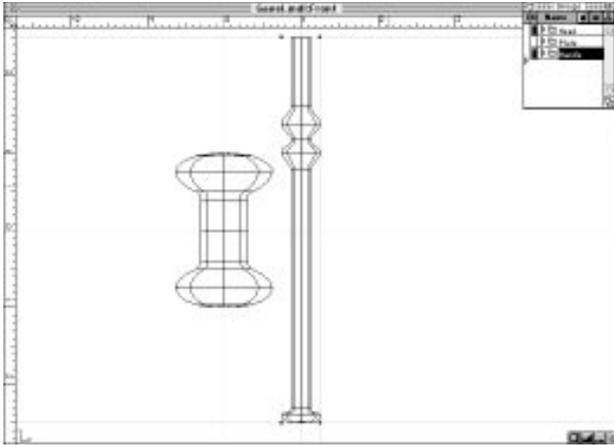
Select the Spline Tool and draw a profile of a gavel handle as shown. The Groups palette now contains a new group named Spline 3.



Lathed handle

Choose the Lathe Tool in the Tool palette. Position the Lathe axis indicator at the appropriate spot to revolve the spline profile into a gavel handle.

To move the indicator with the cursor, select and drag the center point. Since the spline defining the gavel head is going to be lathed around the $X=1$ axis, click on the Lathe axis indicator and drag it to the right to the guide line at $X=1$. Double-click to perform the Lathe.



Head and handle

The Groups palette now contains a new folder named Lathe 1. Double-click on the name Lathe 1 in the Groups palette to bring up the Group Information dialog. To change the name of the folder. Type Handle in the box where Lathe 1 appears. Click in the OK box. The new name now appears in the Groups palette.

Now make the gavel head visible by clicking in the D column next to the name Head in the Groups palette. Choose the Edit Menu and select Re-display (or hold the Command key down and type D).

Re-positioning the Gavel Handle

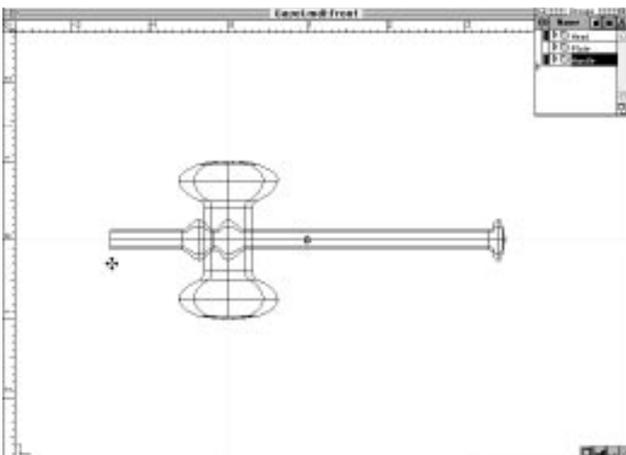
The handle needs to be rotated and moved to fit together with the gavel head. Hold the Option and Command keys (or hold the command key and click on the Arrow Tool icon in the Tool palette) and click on the handle to select it. Select the Rotate Tool in the Tool Palette (or type R). Look at the Status

Rotate Tool Info palette with Anchor pop-up



Line for the prompt to select the anchor point for the rotation.

Select Center Object from the Anchor pop-up in the Rotate Tool Info palette.

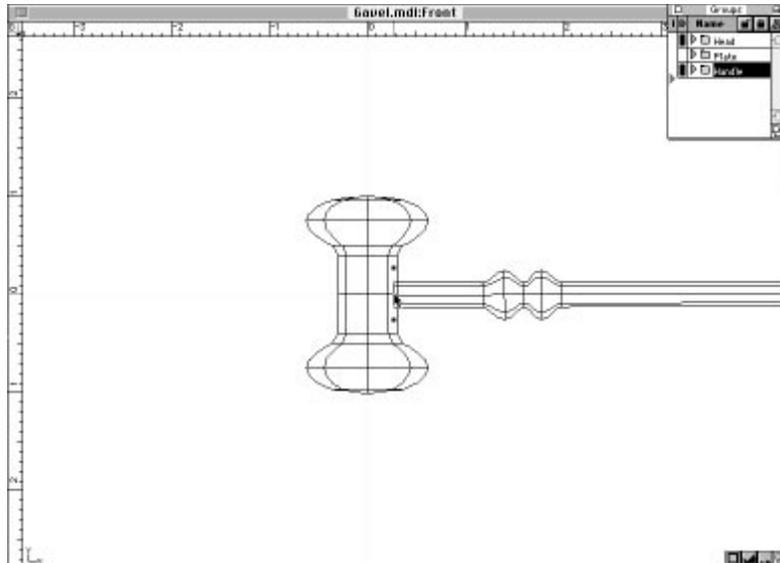


Rotated Handle

Click in the box to the left of Incremental Degrees to fix the increment of rotation. Enter 90 in the box to the right to specify the angular increment. This will cause the handle to rotate in 90 degree increments.

Grab a point on the handle and rotate it so the top is pointing toward the head of the gavel.

Click, hold, and drag the handle to the right till it is positioned as shown.



Re-positioned handle

Note: If the Groups palette is covering the Zoom box, double-click on the title bar to bring the Front View back to normal size.

Re-positioning the Strike Plate

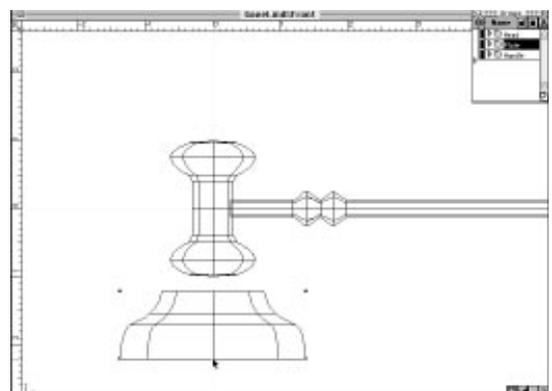
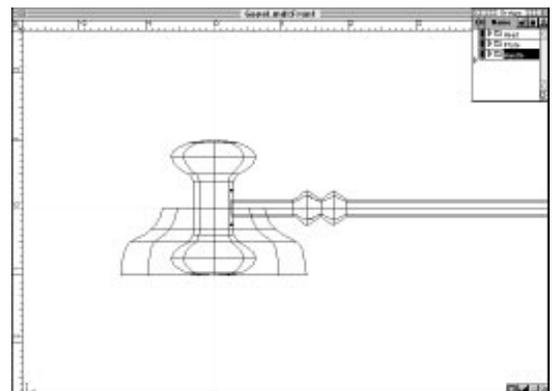
Make the strike plate visible by clicking in the D column next to the name Plate in the Groups palette. Select Re-display from the Edit Menu (or hold the Command key down and type D).

To display the object bounding box and not the vertices, select the Arrow Tool, hold the Option key down, and click on the strike plate. Drag the plate down till it is clear of the gavel.

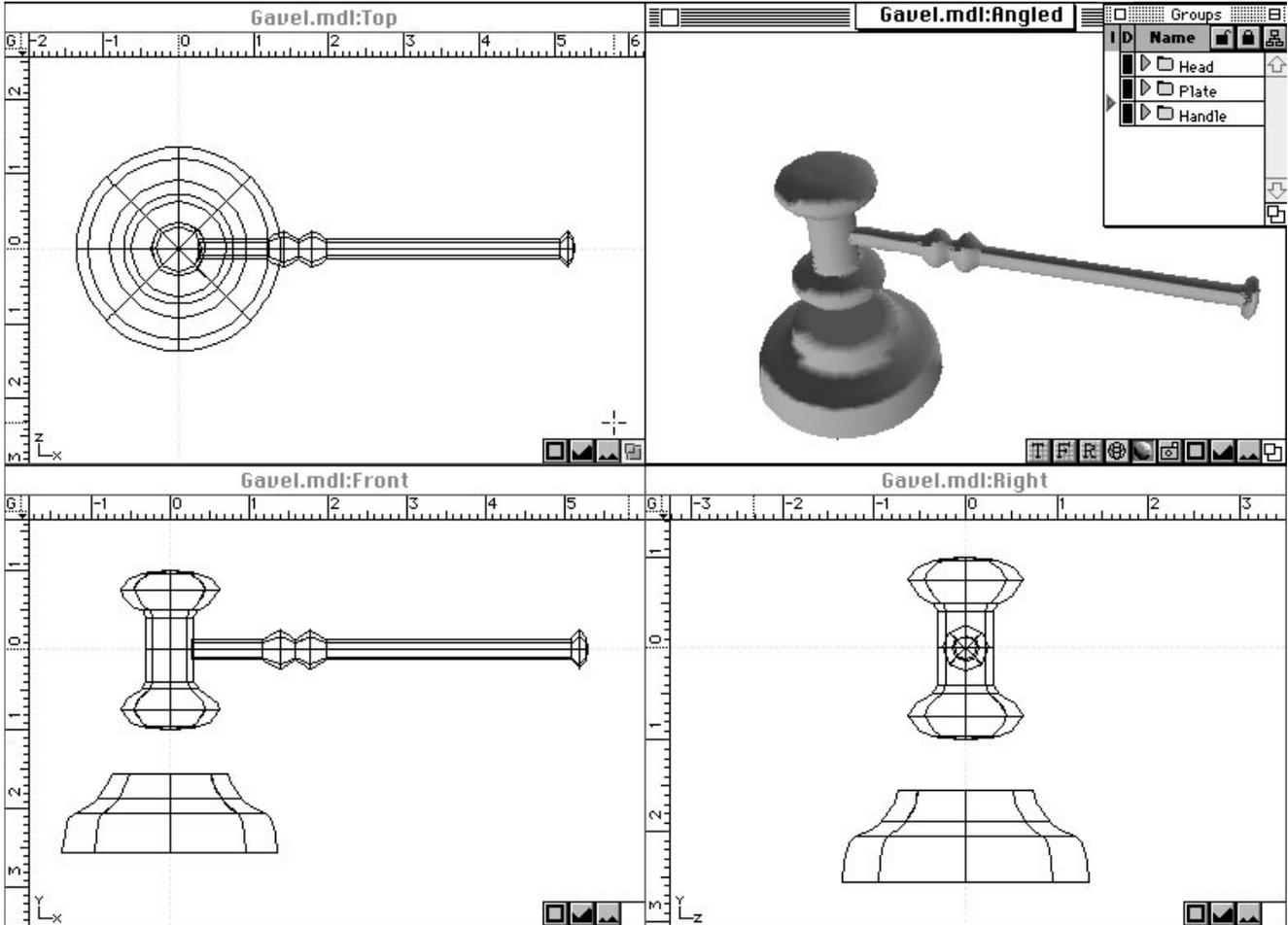
Revert to the four view display by clicking in the Zoom box in the upper-right hand corner of the Front View window. Hold the Command key and click in the Fit to Window box in any view to re-size all the pieces to fit in each window. Click on the Quick Render icon in the 3D Window to preview your object.

Select Save As under the File Menu and enter MyGavel.mdl when prompted for the name.

Gavel and strike plate



Re-positioned strike plate



Shaded gavel

Part II - Creating a Swept Object

Sweep is the process where a 2-D contour is swept in a spiral around a designated axis to create coiled, spiraling, and nautilus-shaped objects. The Sweep Tool provides a 3-D extension to the lathe process by letting you spiral the shape as you are revolving it. In this example, you will use the Sweep Tool to create a spring.

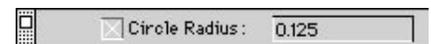
Designing a Spring

In this exercise, you will create a spring that has a diameter of one inch, has six coils, and is three inches high. You will use the Ellipse and Sweep tools for modeling. Launch ModelPro by double-clicking on its icon or select New under the File menu if you are already in ModelPro.

Preparing the Drawing Environment

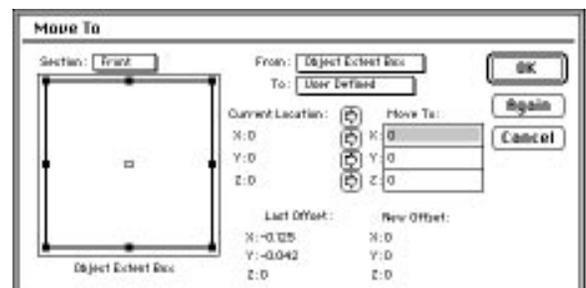
Click on the Snap Grid icon in the Snapping palette. Open the Front View to full screen size by clicking in the Zoom box in the upper-right hand corner of Front View window. Click in the Fit to Window icon at the bottom-right of the window. Click and hold on the Zoom Out icon until there is 3 inches showing in the ruler at the left. This will let you fit the spring in the drawing window.

Select the Ellipse Tool. Click in the Circle Radius box in the Tool Info palette to set the fixed radius option. Type 0.125 in the radius box in the Tool Info palette to set the radius. Hold the Shift key down and draw a circle of radius 0.125 with center at (0,0) in the Front View.

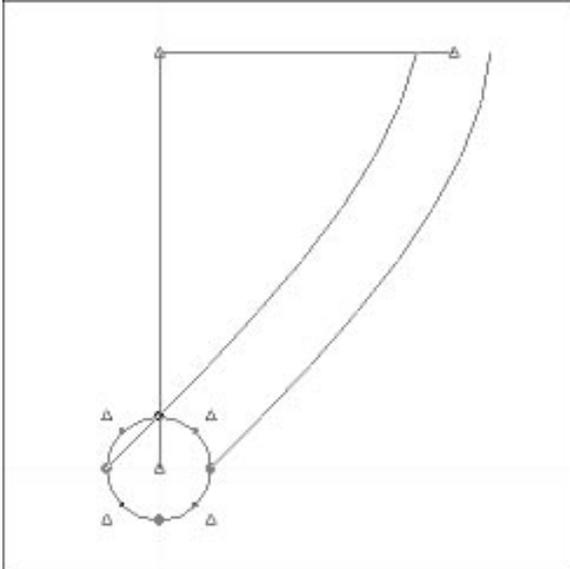


Ellipse Tool Info palette

Tip: You can use the Move To command to position an object exactly where you want. Move To can be selected under the Options Menu or by holding the Command key and typing M. Click on the center dot in the Object Extent Box and with X=0, Y=0, and Z=0 as the Move To coordinates, click in the Ok box and the circle will be centered around (0,0) in the Front View.



Move To dialog



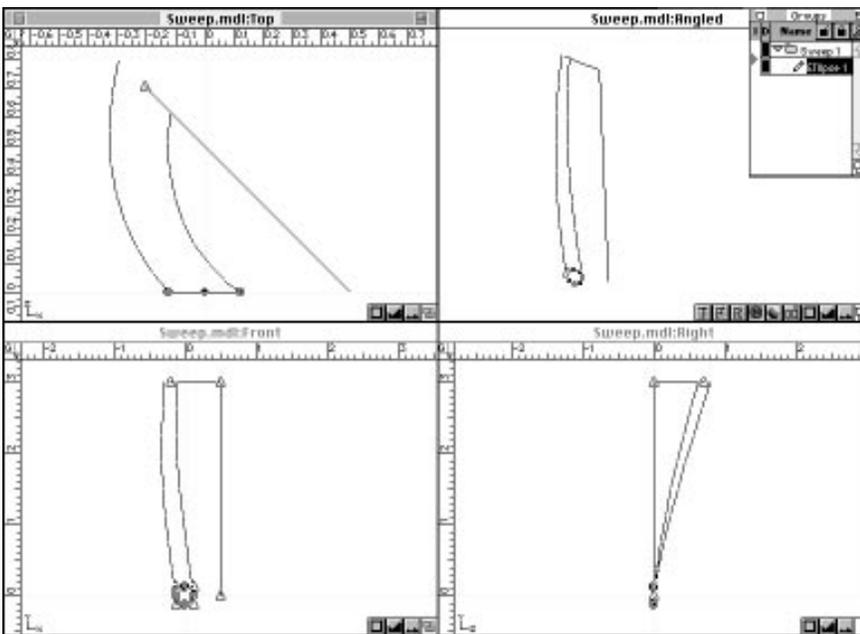
Control points set

Define the Sweep

Select the Sweep Tool and click on the circle. It will be the 2-D contour that swept into a spring. This causes the sweep control points to appear. The center control point is used to set the center of the sweep. The offset control point sets the height of the sweep. The angle control points is used to perform the sweep.

Move the center control point 0.5 inches to the right. This will set the radius of 0.5 inches (or a diameter of 1 inch) for the sweep. The Status Line at the bottom of the screen should read X: 0.5, Y: 0, Z:0.

Raise the off-set control point to a height of three inches. The Status Line at the bottom of the screen should read X: 0.5, Y: 3, Z:0.



Sweep control

Look in the ΔY box in the Sweep Tool Info palette. This is the value of the height you set. You can change it by double-clicking in the box and entering new value.

Revert to the four view display by clicking in the Zoom box in the upper-right hand corner of the Front View window. Click in the Fit to Window box in The Top View to re-size all the pieces to fit in each window.

Click-hold on the angle control point in the Top View. Slowly move to the right and down and around



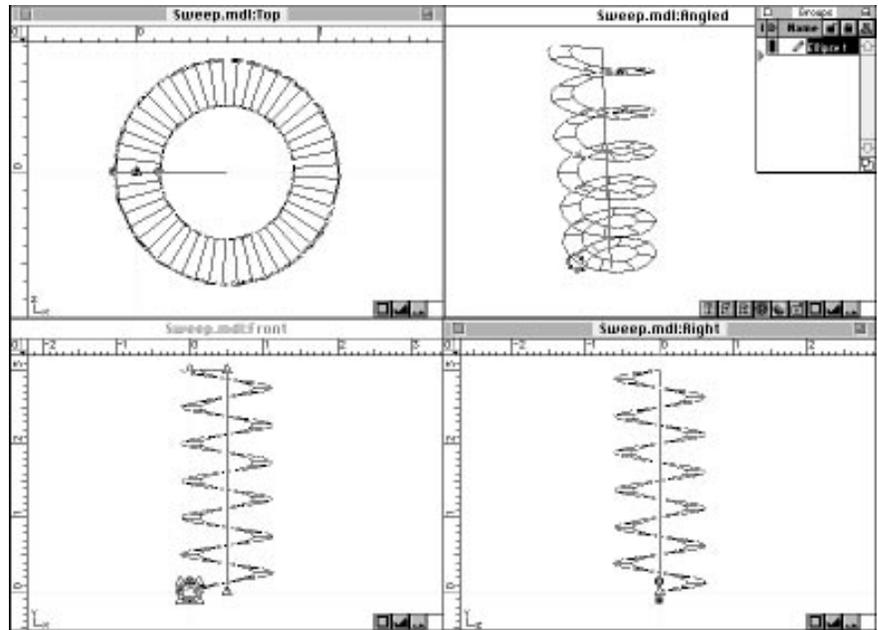
Sweep Tool Info palette

until you make six revolutions. Here is the important part in making the coil rise evenly up as it goes around. While still holding on the angle control point and move the anchor point so that the end of the sweep meets the beginning. The angle in the sweep° box should read 2160°. If not, type 2160 in the sweep° box. If you correctly matched the beginning and the end of the sweep you will now have a three inch high spring with six coils and a diameter of one inch

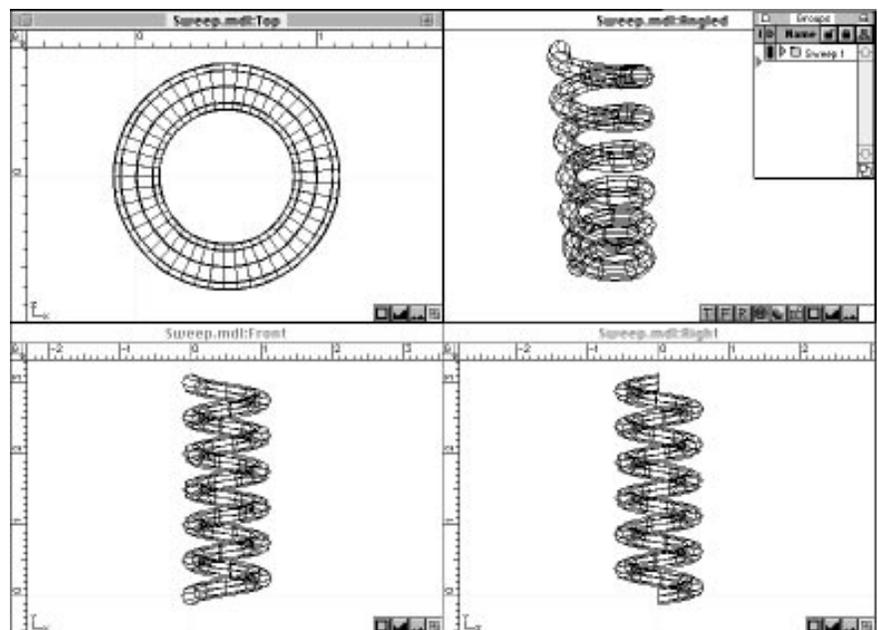
Tip: To help you in making sure that the beginning and end of the sweep match, enlarge the Top View and make the object fit to the window. This will allow you to match both ends more accurately.

Double-click in any view or click in the Sweep box in the Sweep Tool Info palette

Note: The Selected object(s) will be “swept” around the axis of rotation line and transformed in a gradual fashion according to the ending bounding rectangle. A new, surfaced object will be created along that sweep. The original selected object is saved separately and “turned-off” in the Group palette, unless otherwise specified in your Preferences, and may be restored at anytime.



Sweep Control



Final



Notes