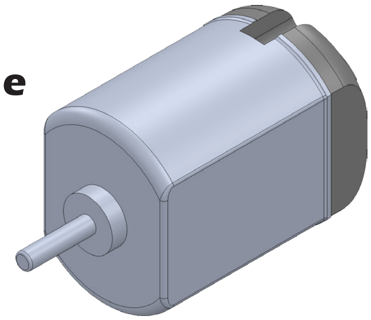
Chapter 14

Cluster Wheel Vehicle
Motor



A. Extrude1.

Step 1. Click File Menu > New, click **Part Metric** and OK.

Step 2. Click **Front Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 1**.

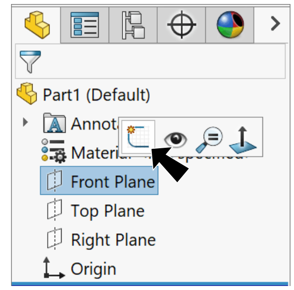


Fig. 1

Step 3. Click **Circle** (**S**) on the Sketch toolbar.

Step 4. Sketch circle at Origin, **Fig. 2**.

Step 5. Click **Line** (**L**) on the Sketch toolbar.

Step 6. Sketch **two vertical lines (chords)** across circle, **Fig. 3**.

Step 7. **Unselect Line tool**. To un-select, right click graphics area and click Select from menu.

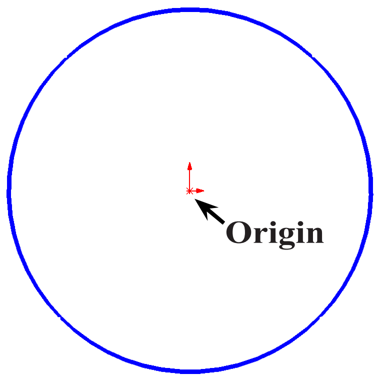


Fig. 2

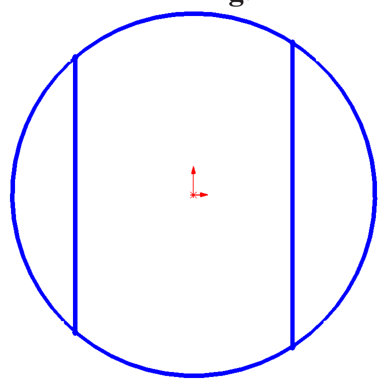


Fig. 3

Step 8. **Ctrl click both lines** to select both. Release Ctrl key and click **Make Equal** on the context toolbar, **Fig. 4**.

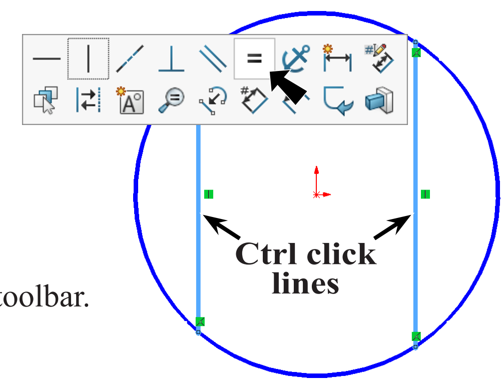


Fig. 4

Step 9. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 10. Add dimensions, **Fig. 5**.

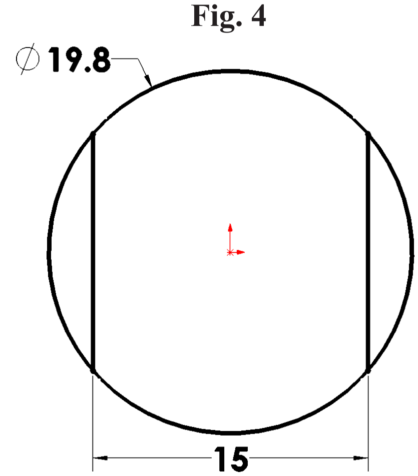


Fig. 5

Step 11. Click **Features** [Features] on the Command Manager toolbar.

Step 12. Click **Extruded Boss/Base** [Extruded Boss/Base] on the Features toolbar.

Step 13. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 6**

Depth 25
under Selected Contours
click **contour**, **Fig. 7**
click OK .

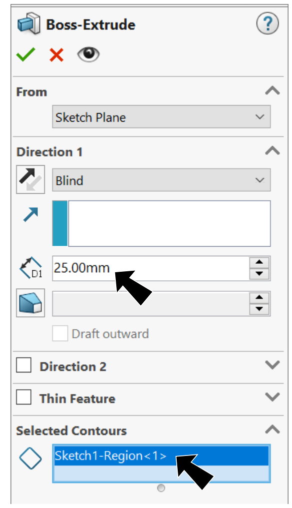


Fig. 6

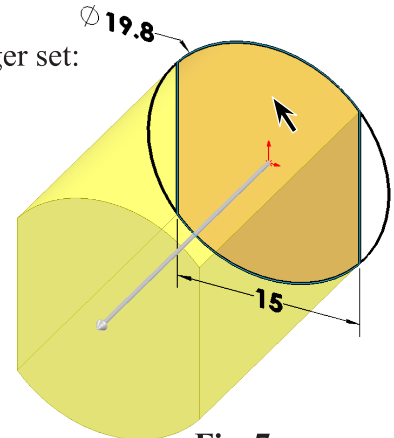


Fig. 7

B. Save as "MOTOR".

Step 1. Click File Menu > Save As.

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

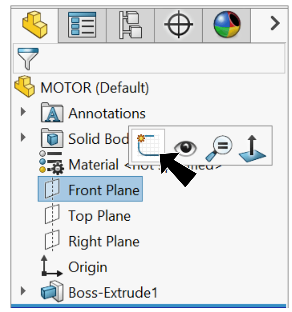


Fig. 8

C. Extrude2.

Step 1. Click **Front Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 8**.

Step 2. Click **Offset Entities** [Offset Entities] on the Sketch toolbar.

Step 3. In the Offset Entities Property Manager set:
under Parameters, **Fig. 9**

Distance .1
click **front face**, **Fig. 10**
click OK .

Front face

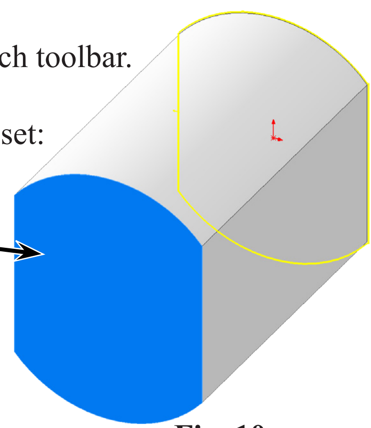


Fig. 10

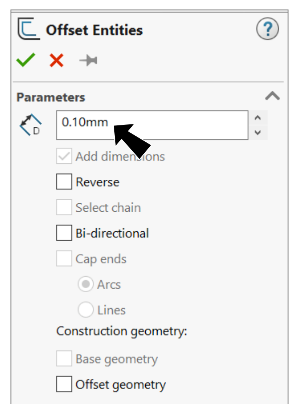


Fig. 9

Step 4. Click **Features** [Features] on the Command Manager toolbar.

Step 5. Click **Extruded Boss/Base** [Extruded Boss/Base] on Features toolbar.

Step 6. In the Boss-Extrude Property Manager:
under From, **Fig. 11**
Start Condition **Offset**
Offset value **4.6**
under Direction 1

Depth .5
click OK .

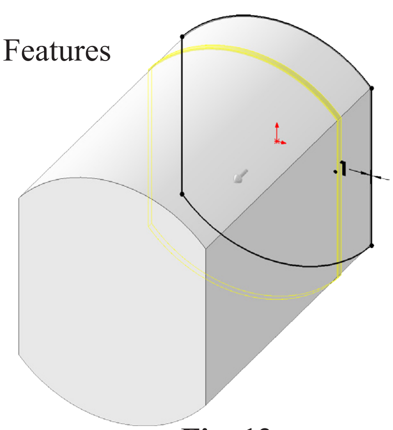


Fig. 12

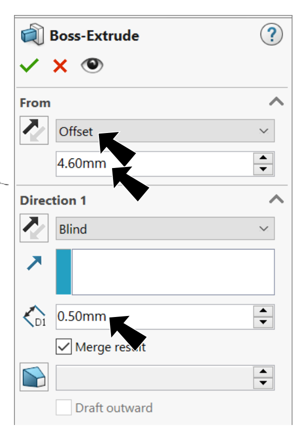


Fig. 11

D. Extrude3.

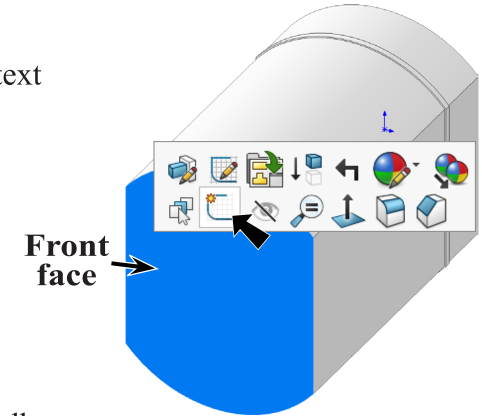


Fig. 13

Step 1. Click the **front face** and click **Sketch** on the context toolbar, **Fig. 13**.

Step 2. Click **Circle** (**S**) on the Sketch toolbar.

Step 3. Sketch circle at Origin , **Fig. 14**.

Step 4. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 5. Dimension **diameter 6**, **Fig. 14**.

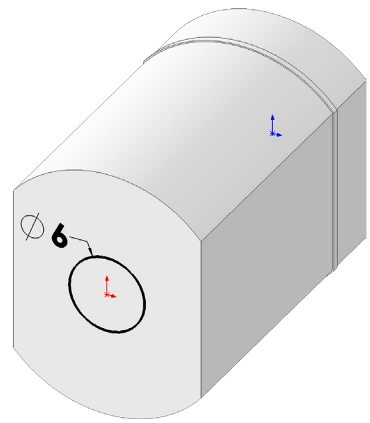


Fig. 14

Step 6. Click **Features** on the Command Manager toolbar.

Step 7. Click **Extruded Boss/Base** on the Features toolbar.

Step 8. In the Boss-Extrude Property Manager set:
under Direction 1, **Fig. 15**

Depth **1.8**

click OK .

Step 9. Save **(Ctrl-S)**.

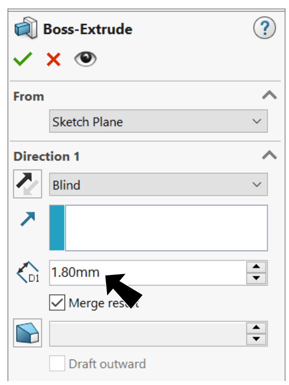


Fig. 15

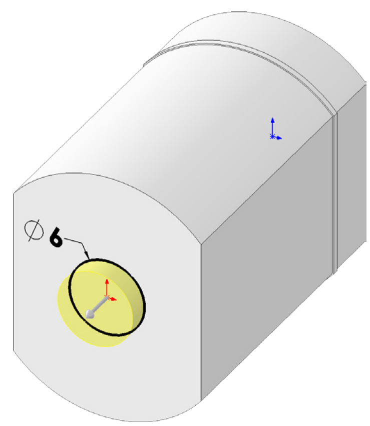


Fig. 16

E. Extrude4.

Step 1. Click the **front face for Extrude3** and click **Sketch** on the context toolbar, **Fig. 17**.

Step 2. Click **Circle** (S) on the Sketch toolbar.

Step 3. Sketch circle at Origin , **Fig. 18**.

Step 4. Click **Smart Dimension** Smart Dimension (S) on the Sketch toolbar.

Step 5. Dimension **diameter 2, Fig. 18**.

Step 6. Click **Features** Features on the Command Manager toolbar.

Step 7. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 8. In the Boss-Extrude Property Manager set:

under Direction 1, **Fig. 19**

Depth D1 **8**

under Direction 2

Depth D2 **29.8**

click OK .

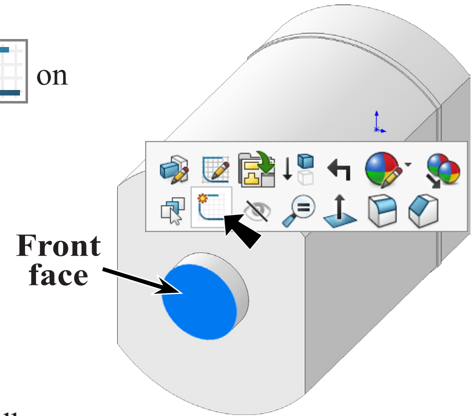


Fig. 17

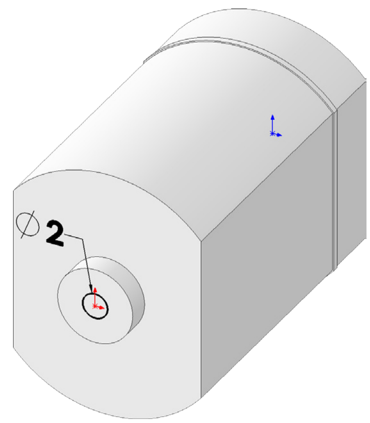


Fig. 18

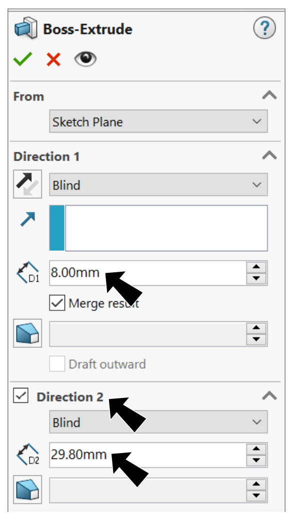


Fig. 19

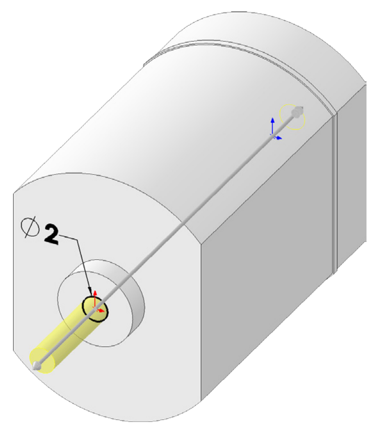


Fig. 20

F. Cut Extrude.

Step 1. Click **Front Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 21**.

Step 2. Click **Back** on the Standard Views toolbar. **(Ctrl-2)**

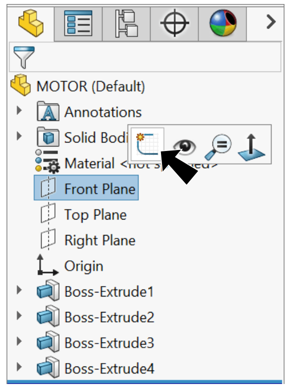


Fig. 21

Step 3. Click **Center Rectangle** in the **Rectangle flyout** on the Sketch toolbar.

Step 4. Sketch center rectangle above Origin, **Fig. 22**.

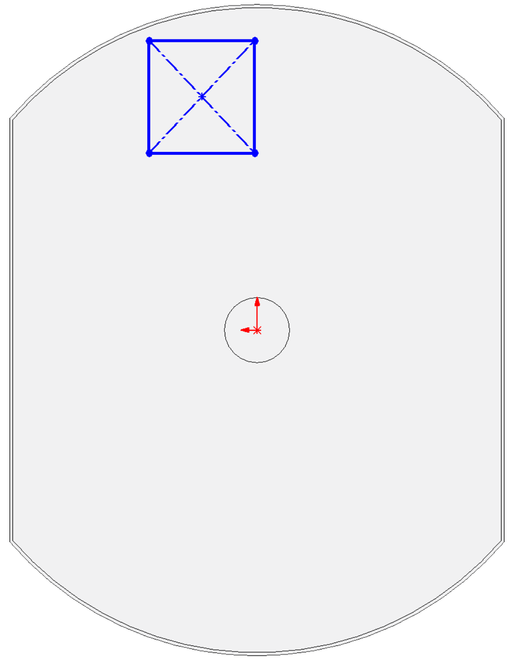


Fig. 22

Step 5. Click **3 Point Arc** (**S**) in the **Arc flyout** on the Sketch toolbar.

Step 6. Sketch **arc bottom horizontal line endpoints and radius below**, **Fig. 23**.

Step 7. **Unselect Arc tool**. To unselect, right click graphics area and click Select from menu.

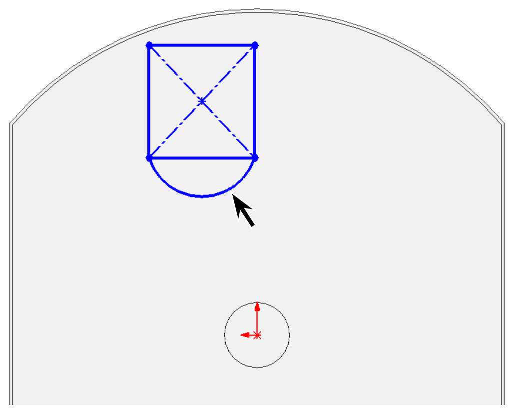


Fig. 23

Step 8. **Ctrl click centerpoint of rectangle** and **Origin** to select both. Release Ctrl key and click **Make Vertical** on the context toolbar, **Fig. 24**.

Step 9. **Ctrl click centerpoint of arc** and **bottom line of rectangle** to select both. Release Ctrl key and click **Coincident** on the context toolbar, **Fig. 25**.

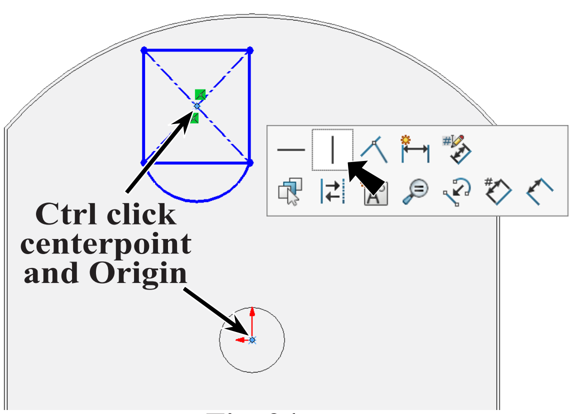


Fig. 24

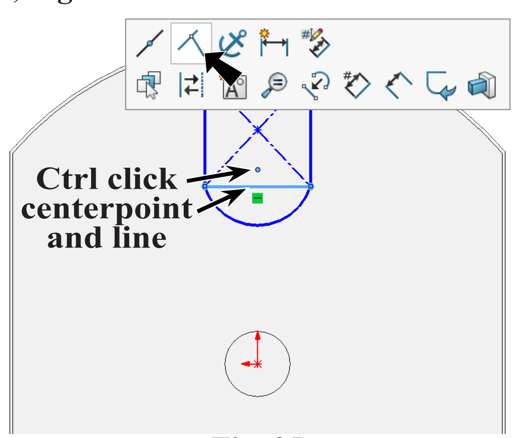


Fig. 25

Step 10. Click **Smart Dimension** (**S**) on the Sketch toolbar.

Step 11. Add dimensions, **Fig. 26**.

Step 12. Rotate view to view **inside cut**, **Fig. 28**. Use **Right Arrow key** and **Down Arrow key** .

Step 13. Click **Features** on the Command Manager toolbar.

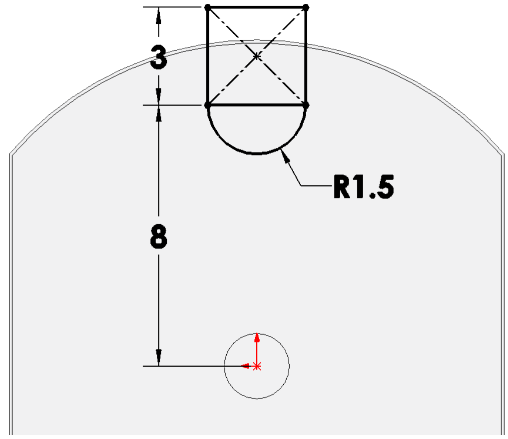


Fig. 26

Step 14. Click **Extruded Cut** on the Features toolbar.

Step 15. In the Cut-Extrude Property Manager set:

under Direction 1, **Fig. 27**

Depth 5

Reverse Direction

under Selected Contours

click **both contours**, **Fig. 28**

click OK .

Step 16. Save (**Ctrl-S**).

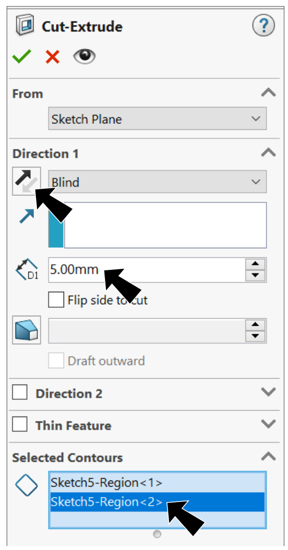


Fig. 27

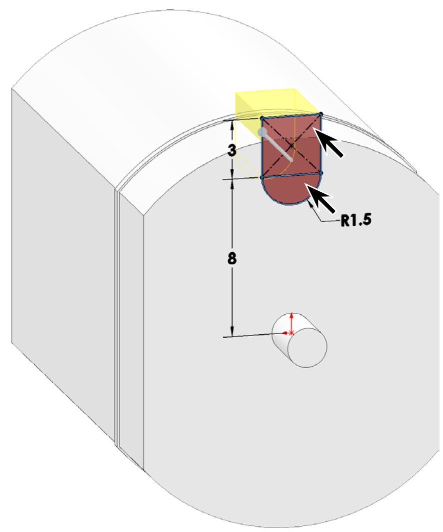


Fig. 28

G. Draft.

Step 1. Click **Draft** Draft on the Features toolbar.

Step 2. In the Draft Property Manager:
under Type of Draft, **Fig. 29**
select **Neutral plane**
under Draft Angle
10º
Neutral Plane
Expand flyout Feature Manager design tree and click **Top Plane**, **Fig. 30**
Faces to Draft
click **face at bottom of cut**, **Fig. 31**
click OK.

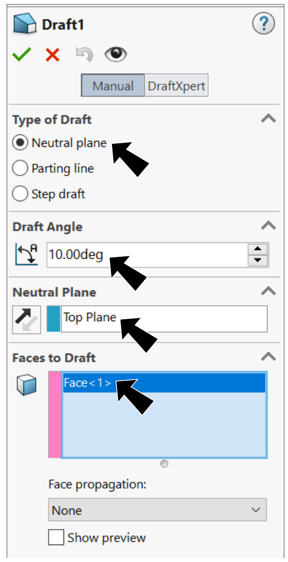


Fig. 29

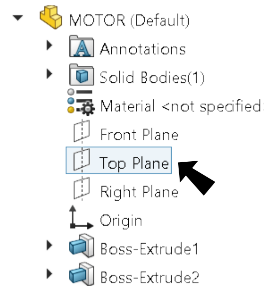


Fig. 30

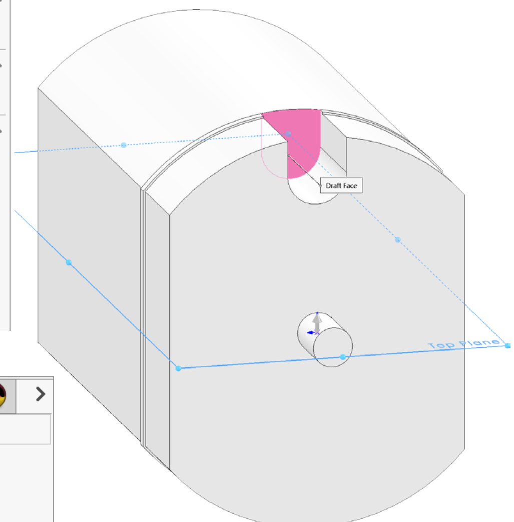


Fig. 31

H. Mirror Cut Features.

Step 1. **Ctrl click Top Plane**, **Cut-Extrude1** and **Draft1** feature to select Plane and features, **Fig. 32**.

Step 2. Click **Mirror** Mirror on the Features toolbar.

Step 3. In the Mirror Property Manager
click OK, **Fig. 33**.

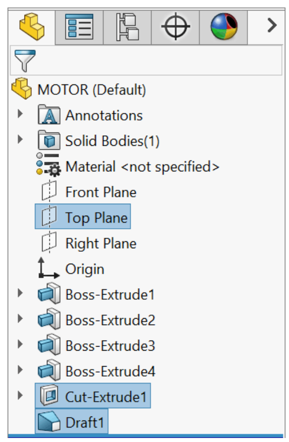


Fig. 32

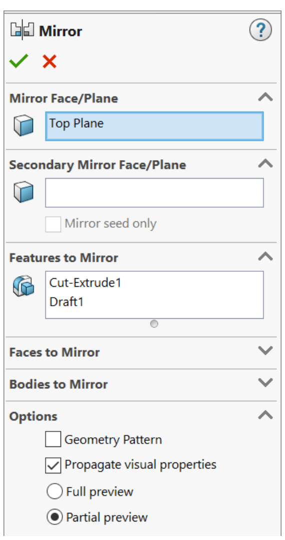


Fig. 33

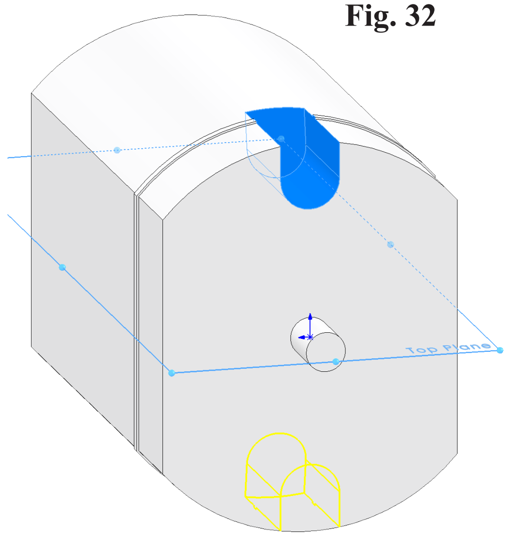


Fig. 34

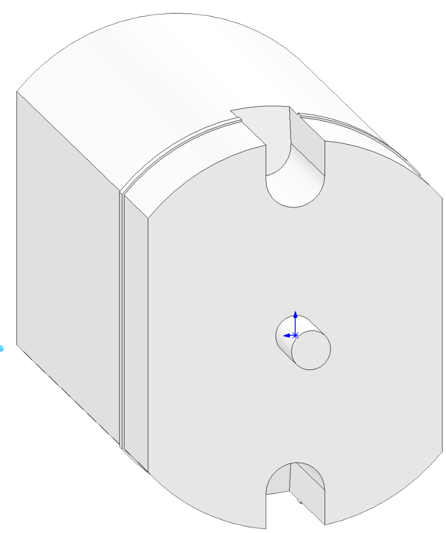


Fig. 35

I. Extrude5.

Step 1. Click **Front Plane** in the Feature Manager and click **Sketch** on the context toolbar, **Fig. 36**.

Step 2. Click **Circle** (**S**) on the Sketch toolbar.

Step 3. Sketch circle at Origin , **Fig. 37**.

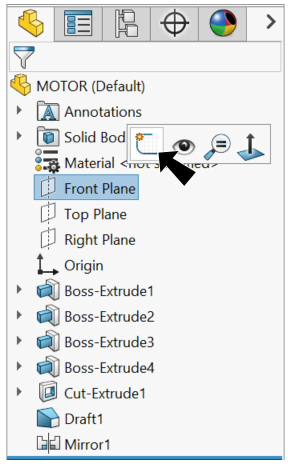


Fig. 36

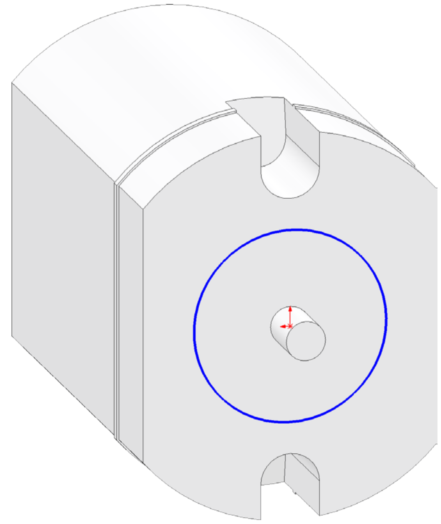


Fig. 37

Step 4. Click **Line** (**L**) on the Sketch toolbar.

Step 5. Sketch **vertical line** (chord), **Fig. 38**.

Step 6. Click **Smart Dimension** Smart Dimension (**S**) on the Sketch toolbar.

Step 7. Add dimensions, **Fig. 39**.

Step 8. Click **Features** Features on the Command Manager toolbar.

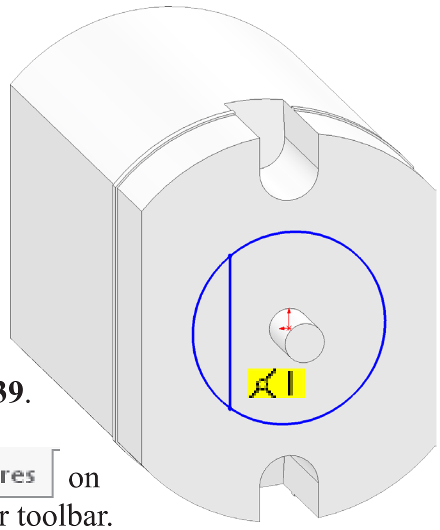


Fig. 38

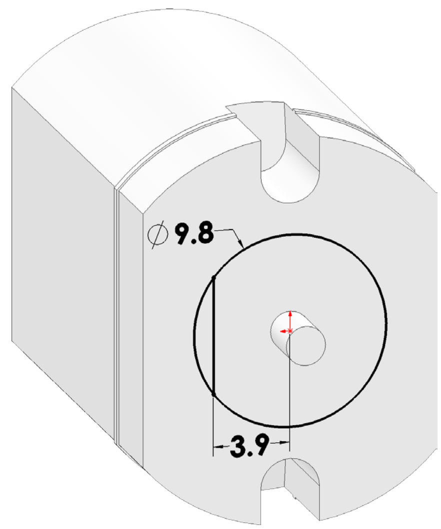


Fig. 39

Step 9. Click **Extruded Boss/Base** Extruded Boss/Base on the Features toolbar.

Step 10. In the Boss-Extrude Property Manager set:

under Direction 1, **Fig. 40**

Depth 2.2

Reverse Direction

under Selected Contours

click **contour**, **Fig. 41**

click OK .

Step 11. Save (**Ctrl-S**).

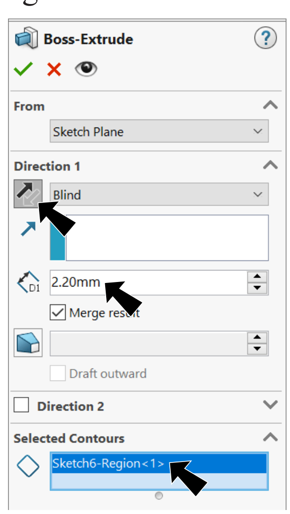


Fig. 40

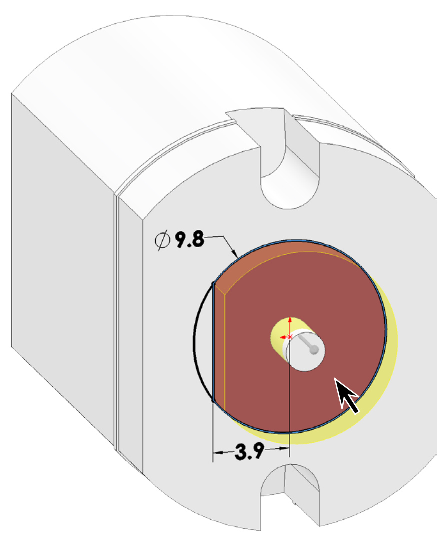


Fig. 41

J. Fillet Edges.

Step 1. Click **Fillet** on the Features toolbar.

Step 2. In the Fillet Property Manager set:
select **FilletXpert**, **Fig. 42**

① **Radius** 3
click **rear circular edges** (2)
of **Extrude1**, **Fig. 43**
click **Apply**

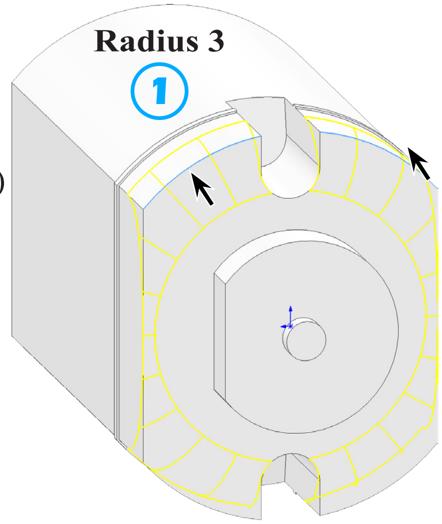


Fig. 43

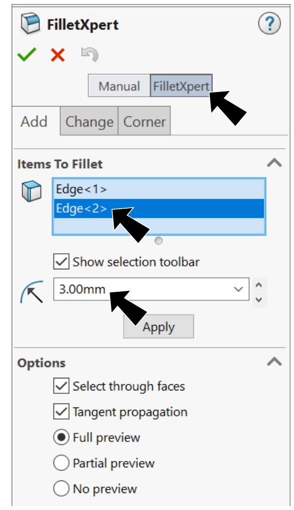


Fig. 42

② **Radius** .25, **Fig. 44**
click **rear circular edge of shaft**, **Fig. 45**.

click **Isometric** on the Standard Views toolbar. (**Ctrl-7**)
click **front circular edge of shaft**, **Fig. 46**
click **Apply**

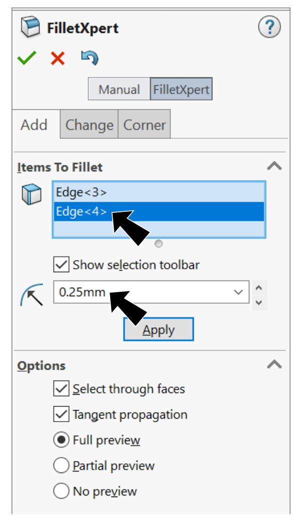


Fig. 44

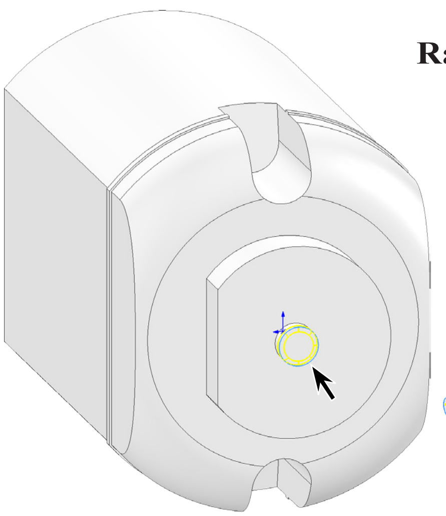


Fig. 45

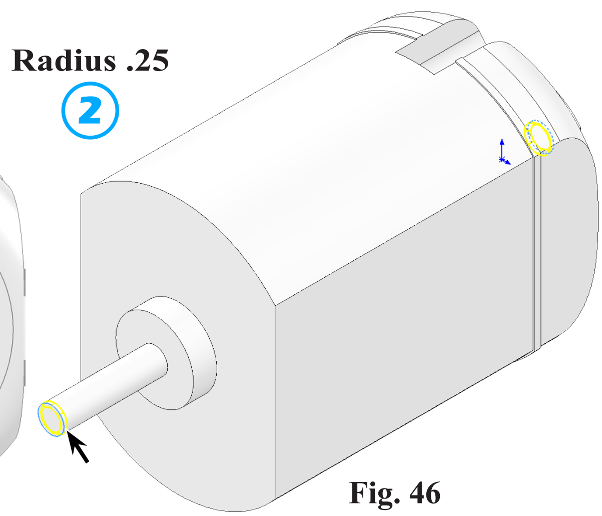
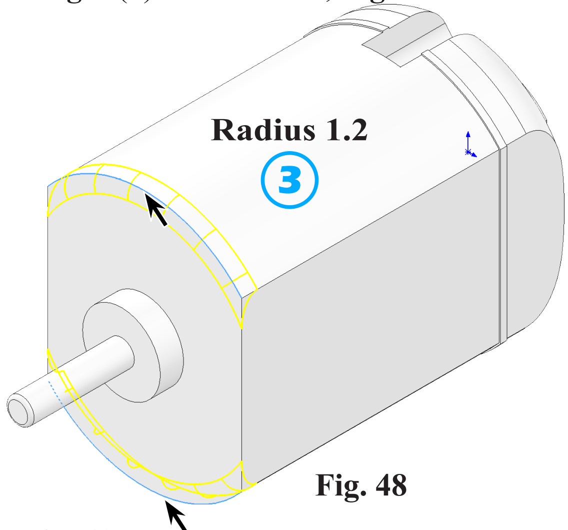


Fig. 46

3 **Radius** 1.2 , **Fig. 47**

click **front circular edges** (2) of **Extrude1**, **Fig. 48**



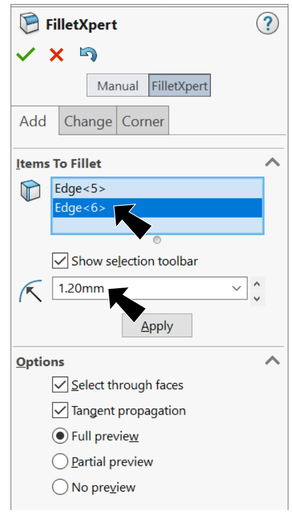


Fig. 47

click **Apply**

Fig. 48

4 **Radius** .5, **Fig. 49**

click **front edges of Extrude2 at Extrude1** (6), **Fig. 50**

click **Apply**

5 click **edge of flats on Extrude1** (2), **Fig. 51**

click OK .

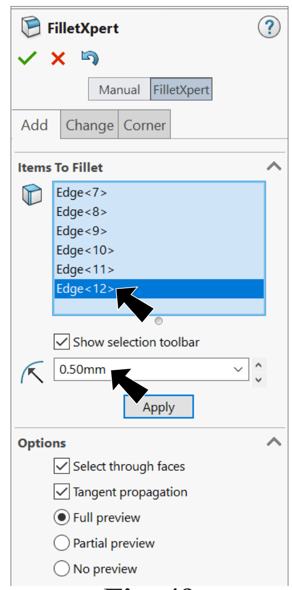


Fig. 49

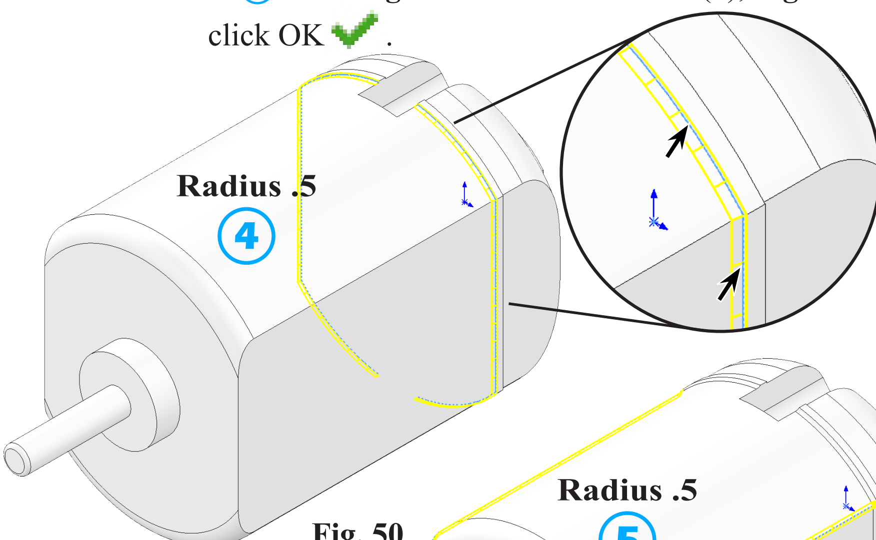


Fig. 50

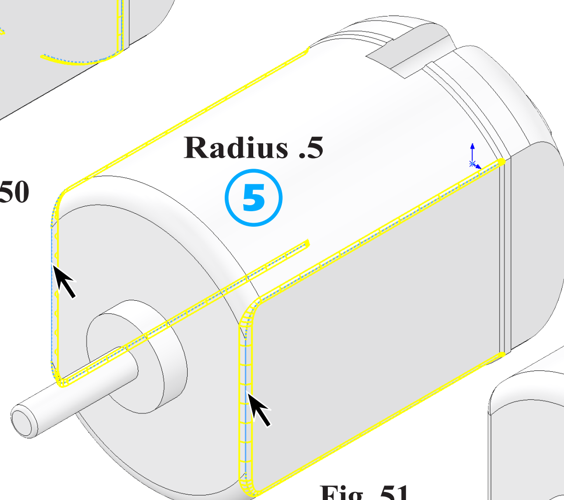
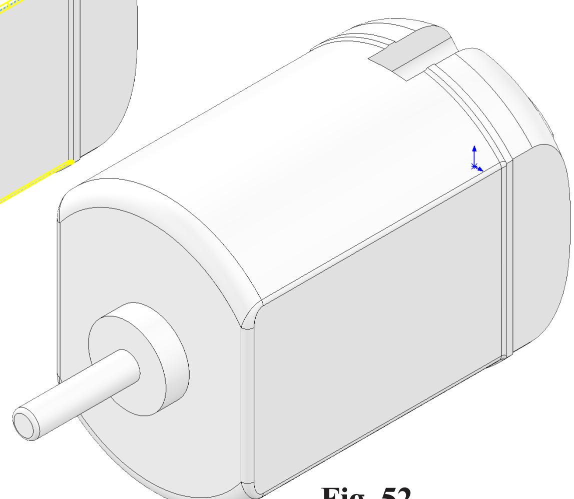


Fig. 51



Step 3. Save (**Ctrl-S**).

Fig. 52

K. Appearance.

Step 1. Rotate view to view **rear**, **Fig. 53**. Click **Back** (**Ctrl-2**) then **Right Arrow key** and **Down Arrow key** .

Click part

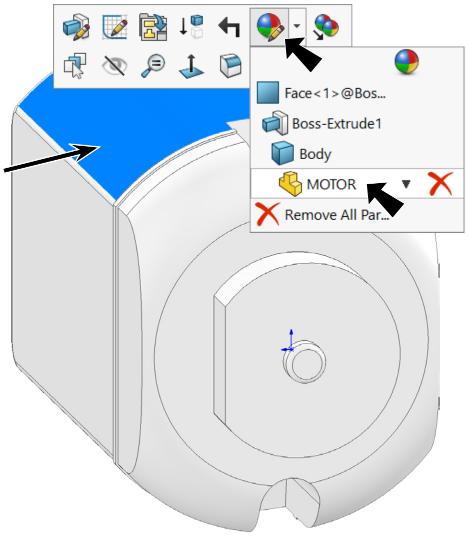


Fig. 53

Step 2. Click the Motor to select part, click **Appearances Call-out** on the context toolbar and click **Motor** , **Fig. 53**.

Step 3. In the Appearances Task pane, expand **Metal**, click **Aluminum** and in the lower pane select **polished aluminum**, **Fig. 54**.

Step 4. In the Appearances Property Manager:
under Color, **Fig. 55**
set **RGB values:**
R 170
G 178
B 196
click **Keep Visible** and OK . The Push Pin on allows selection of another appearance.

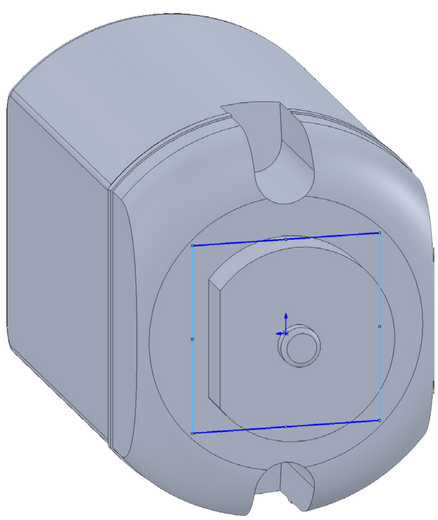


Fig. 56

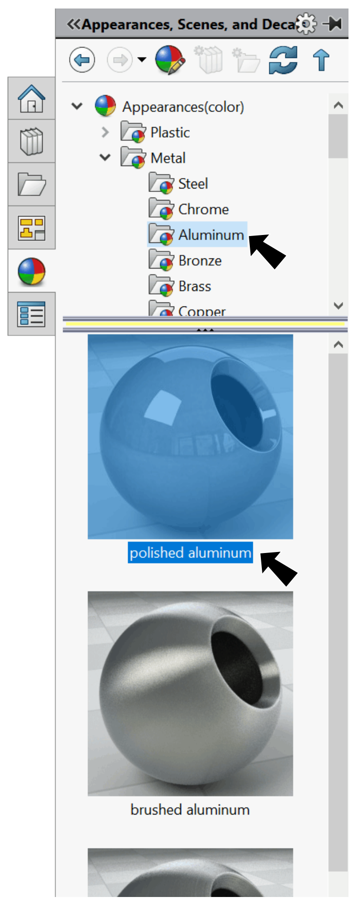


Fig. 54

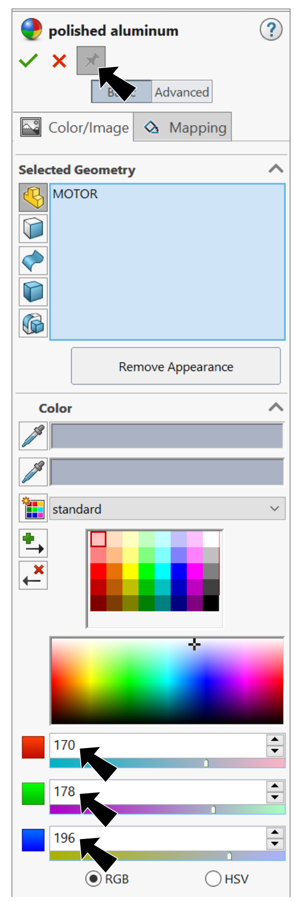


Fig. 55

Step 5. In the Appearances Task pane, expand **Plastic**, click **High Gloss** and in the lower pane select **light gray high gloss plastic**, **Fig. 57**.

Step 6. In the Appearances Property Manager,
under Color, **Fig. 58**
set **RGB values:**
R 122
G 122
B 122
under Selected Geometry
click **Select Features**
click **Boss-Extrude5**, **Cut-Extrude1**, **Mirror1** and **Fillet1** **Fig. 59**

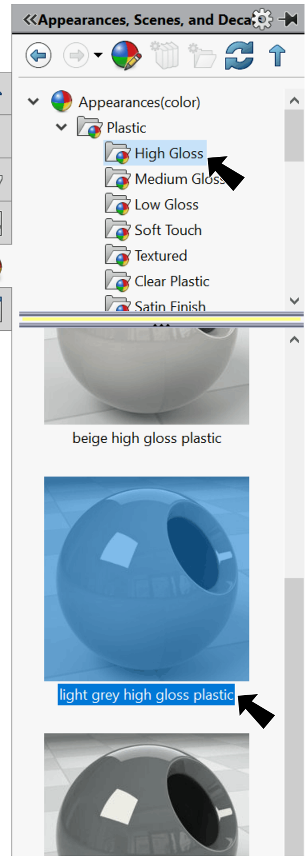


Fig. 57

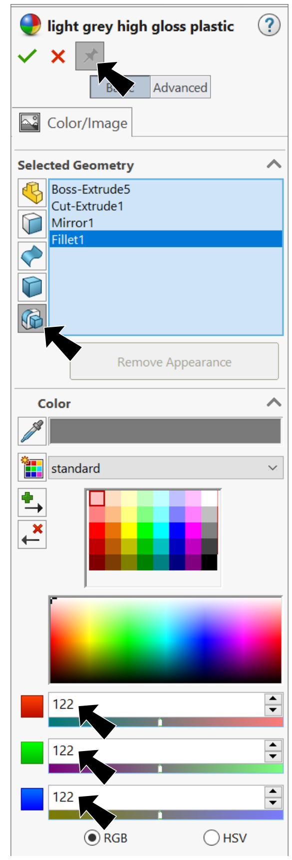


Fig. 58

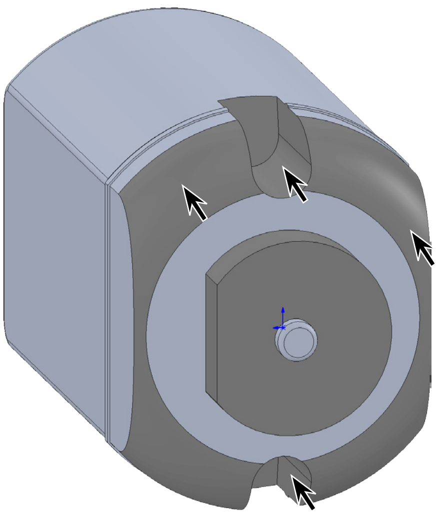


Fig. 59

click **Select Faces** **Fig. 60**
click **other faces** at rear **end**, **Fig. 61**
rotate (**7 total**), **Fig. 62**
click OK and
click Cancel.

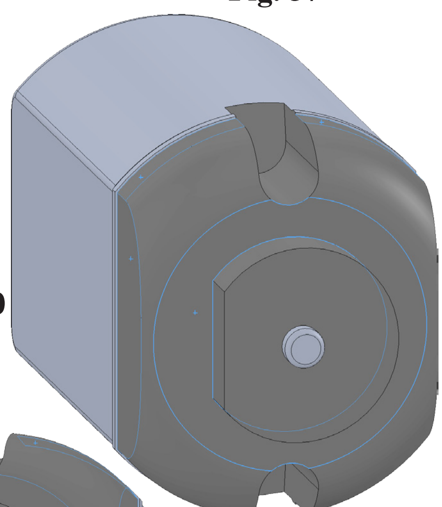


Fig. 61

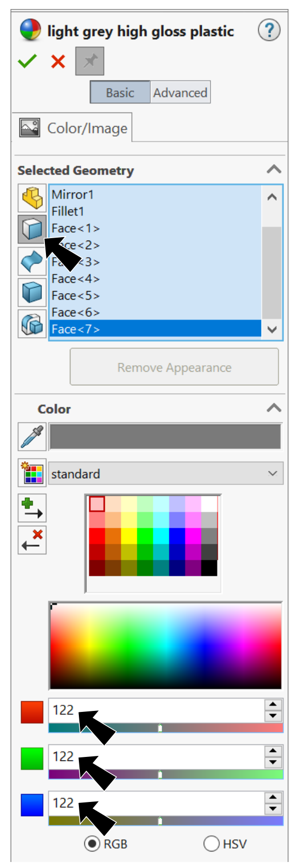


Fig. 60

Step 7. Save (Ctrl-S).

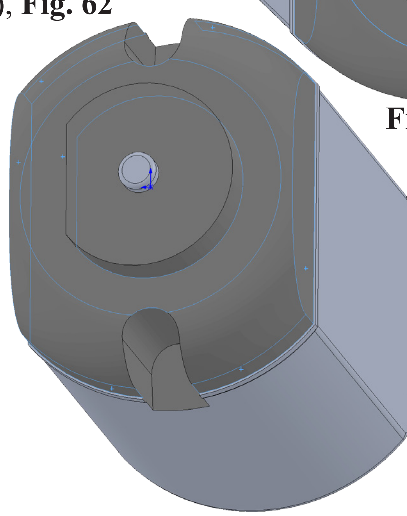


Fig. 62