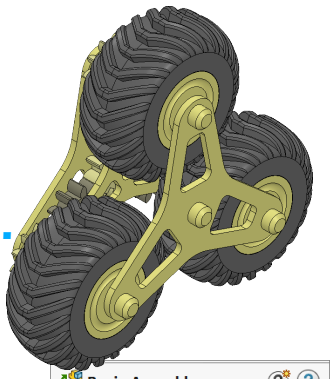
Chapter 12

Cluster Wheel Vehicle

Cluster Assembly



A. Insert Inside Cluster Bracket, Gears and Rim.

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

Step 2. Select your **INSIDE BRACKET** file and click Open from the Open dialog box.

Step 3. In the Begin Assembly Property Manager set:

click **Keep Visible**, **Fig. 1**
under Options
Only fix first component

Click OK in the Property Manager.
This will place Bracket origin at the assembly origin and fix the position so Bracket cannot move. This fixed component should have a **(f)** before its name in the Feature Manager (f) INSIDE BRACKET<1>.

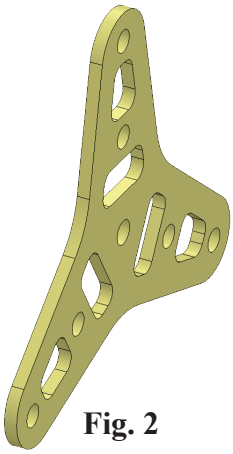


Fig. 2

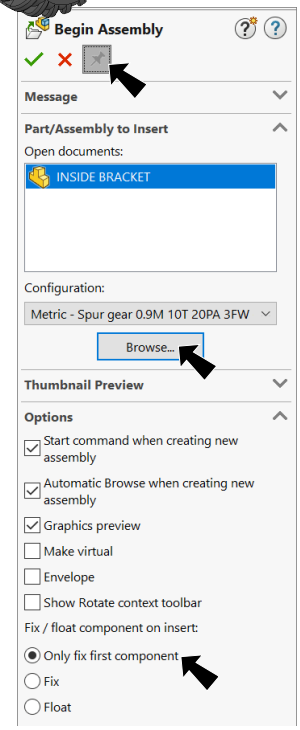


Fig. 1

Step 4. Click **Browse** Browse... in the Property Manager, **Fig. 1**.

Step 5. **Ctrl click** your **DRIVE GEAR**, **IDLER GEAR** and **RIM** files and click Open.

Step 6. Back in the Begin Assembly Property Manager:
under Part/Assembly in Insert, **Fig. 3**
select **DRIVE GEAR** to highlight it.

Step 7. In the graphic area position Drive Gear over center axle hole in Bracket, **Fig. 4**. When Gear snaps into place and cursor changes to indicate Concentric mate, click to release Gear.

Step 8. Click Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate, **Fig. 5**. No lock.

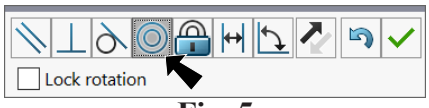


Fig. 5

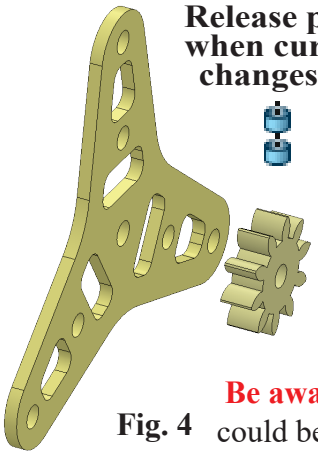


Fig. 4

Be aware Gear could be outside your view.

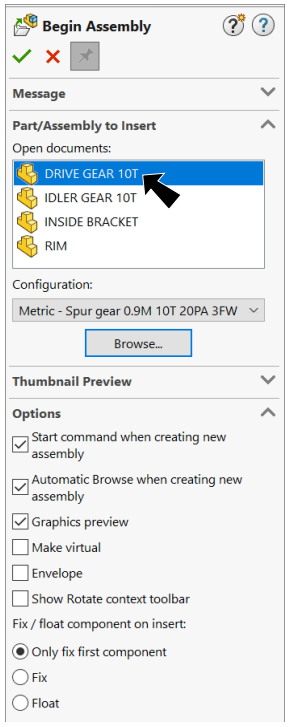


Fig. 3

Step 9. Back in Begin Assembly Property Manager: under Part/Assembly in Insert, **Fig. 6** select **IDLER GEAR** to highlight it.

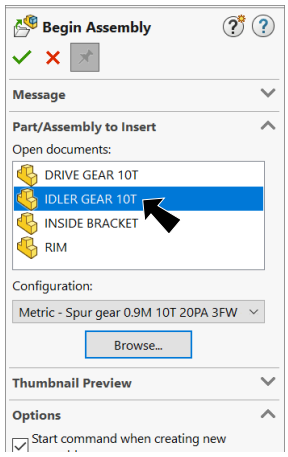


Fig. 6

Step 10. Position Idler Gear over Idler axle hole in Bracket, **Fig. 7**. When Idler snaps into place and cursor changes to indicate Concentric mate, click to release Idler.

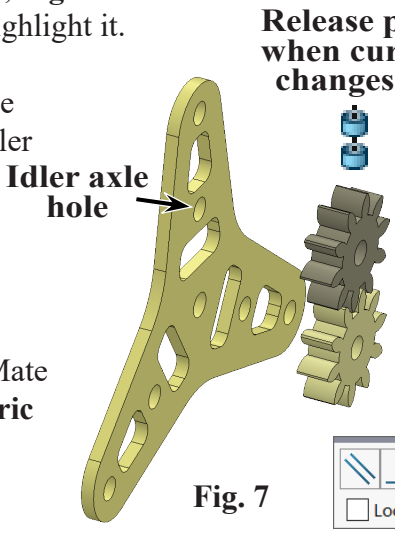


Fig. 7

Step 11. Click Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate, **Fig. 8**.

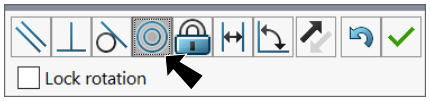


Fig. 8

Step 12. Place **RIM** at driven gear hole in Bracket, **Fig. 7**.

Step 13. Click **Flip Mate Alignment** in the Mate pop-up to flip gear to inside.

Click Add/Finish Mate to add **Concentric** mate, **Fig. 11**.

Step 14. Click OK in the Property Manager.

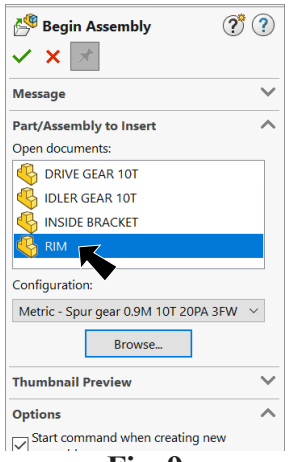


Fig. 9

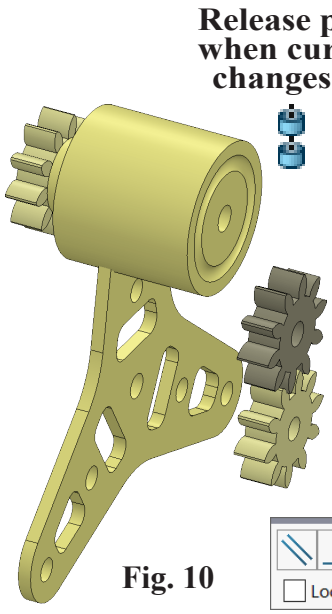


Fig. 10

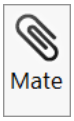
Fig. 11

B. Save as "CLUSTER ASSEMBLY".

Step 1. Click File Menu > Save As.

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

C. Mate: Gears Multiple Mode.

Step 1. Click **Mate** 

on the Assembly toolbar.

Step 2. In the Mate Property Manager set:
under Mate Selections, **Fig. 12**
click **Multiple mate mode** 
for Common reference
click **outside of Bracket face**, **Fig. 13**

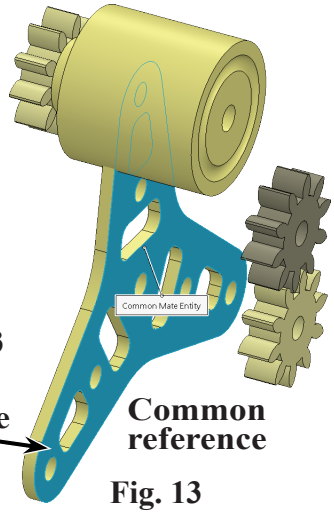


Fig. 13

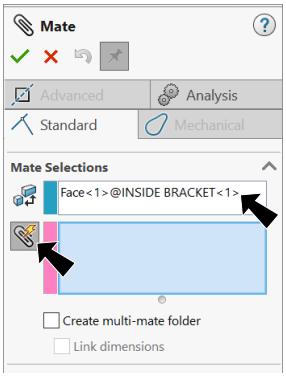
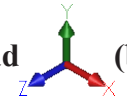


Fig. 12

Rotate view to **view backside of Gears**.
To rotate view, **Ctrl-Shift click the Y axis of the Reference Triad**  (bottom left corner of graphics area).

for Component references
click **back face of the Rim gear**, **Fig. 15**
click **Distance**  in Mate pop-up, **Fig. 16**.
Set **distance .5**.
Click the **other gear back faces**, **Fig. 18**.

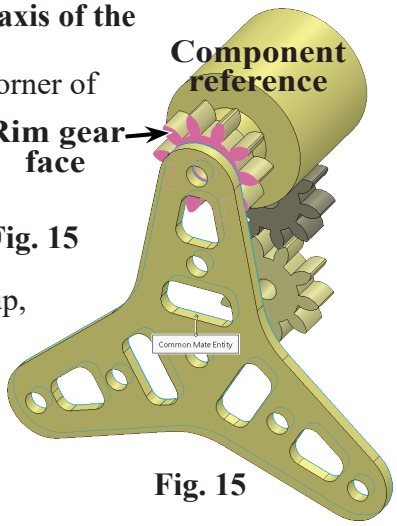


Fig. 15

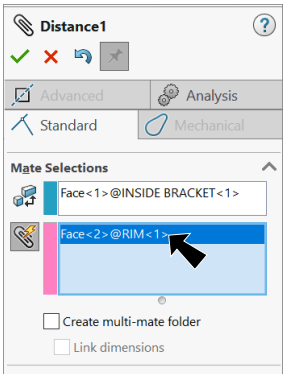


Fig. 14

Click **Front**  on the Standard Views toolbar. (**Ctrl-1**)

Fig. 16

The Gears should be aligned .5 from Bracket, **Fig. 19**. If positioned in opposite direction, click **Flip Dimension**  in the Mate pop-up.

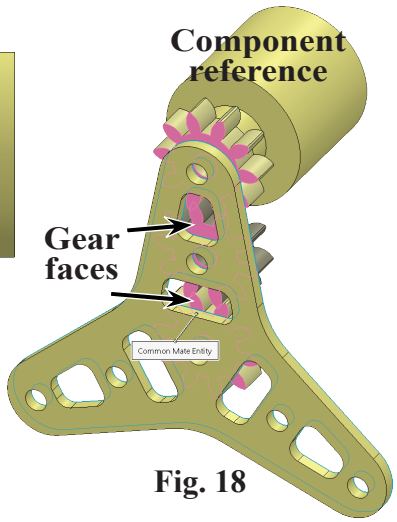


Fig. 18

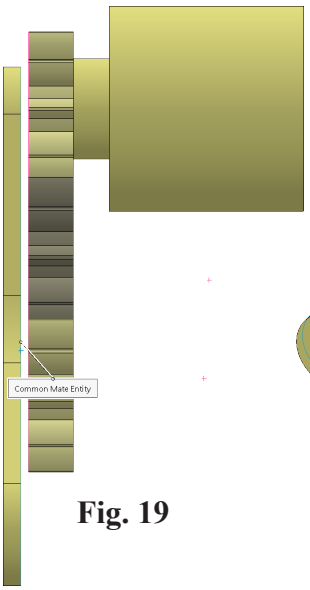


Fig. 19

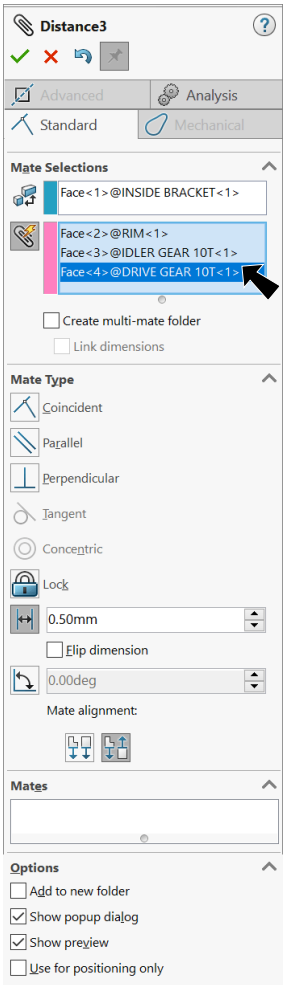


Fig. 17

Step 3. Click OK ✔ **twice** in the Property Manager.

Step 4. Save  (**Ctrl-S**).

D. Insert Axles.

Step 1. Click **Trimetric** on the Standard Views toolbar.

Step 2. Click **Insert Components** Insert Components on the Assembly toolbar.

Step 3. In the Insert Component Manager set:
click **Browse** Browse... .

Step 4. **Ctrl click** your **IDLER AXLE AND RIM AXLE** files and click Open.

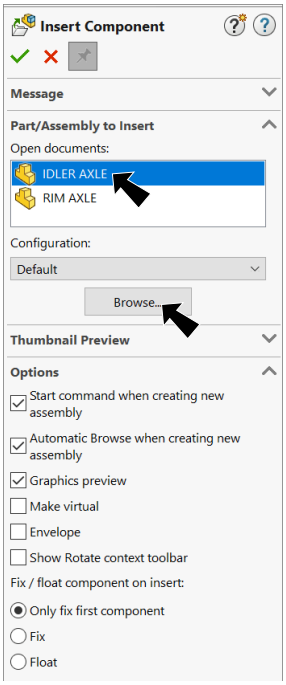


Fig. 20

Step 5. Back in the Begin Assembly Property Manager:
click **Keep Visible**, **Fig. 20**
under Part/Assembly in Insert
select **IDLER AXLE** to highlight it.

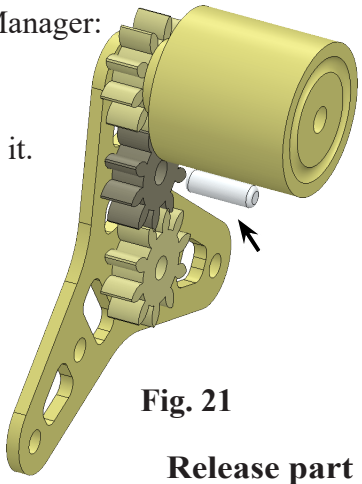


Fig. 21

Step 6. Position **Idler Axle over Idler Gear**, **Fig. 21**. When Axle snaps into snaps into alignment and cursor changes to indicate Concentric mate, click to release Axle.

Step 7. Click Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate.

Release part when cursor changes to

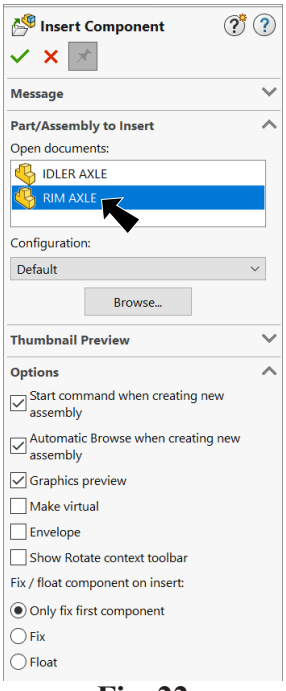


Fig. 22

Step 8. Back in Begin Assembly Property Manager:
under Part/Assembly in Insert, **Fig. 22**
select **RIM AXLE** to highlight it.

Step 9. Position **Rim Axle over Gear of Rim**, **Fig. 23**. When Axle snaps into snaps into alignment and cursor changes to indicate Concentric mate, click to release Axle.

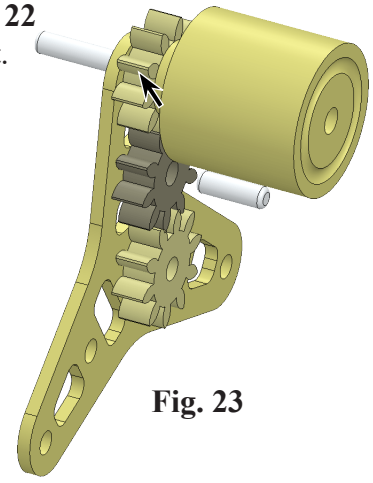


Fig. 23

Step 10. Click Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate.

Step 11. Click OK in the Property Manager.

E. Mate: Axles.

Step 1. Drag the Axles out the back side of Bracket, **Fig. 24**.

Step 2. Rotate view to back side, **Fig. 25**. To rotate view, **Ctrl-Shift click the Y axis of the Reference Triad** (bottom left corner of graphics area).

Step 3. Click **Mate** on the Assembly toolbar.

Step 4. Click **back face Bracket** and **end face of Idler Axle**, **Fig. 25**.

Step 5. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 6. Click **back face Bracket** and **end face of Rim Axle**, **Fig. 26**.

Step 7. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 8. Click OK in the Property Manager when done.

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

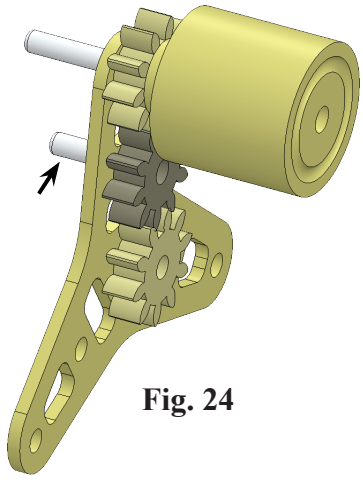


Fig. 24

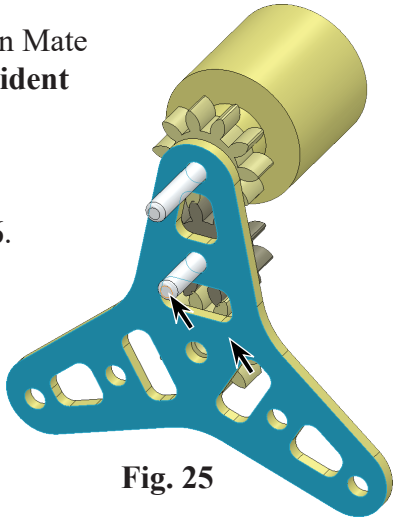


Fig. 25

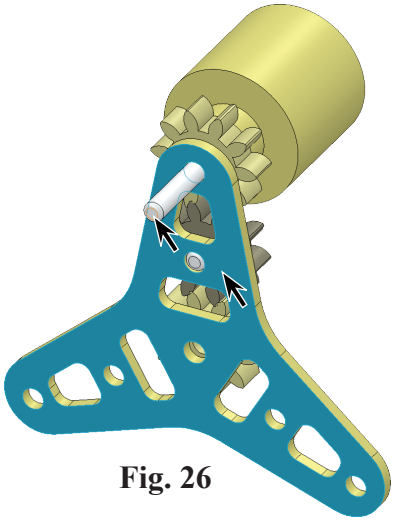


Fig. 26

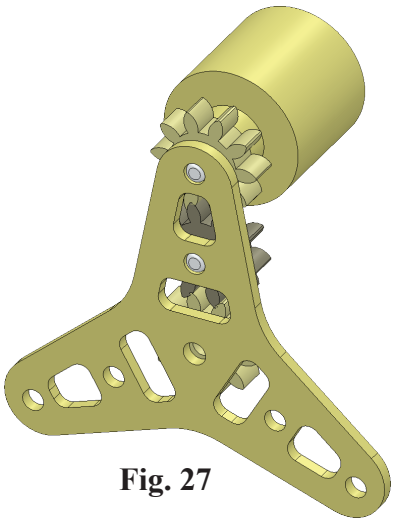
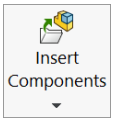


Fig. 27

F. Insert Middle and Outside Bracket.

Step 1. Click **Trimetric** on the Standard Views toolbar.

Step 2. Click **Insert Components** 

on the Assembly toolbar.

Step 3. In the Insert Component Manager click **Browse** 

.

Step 4. **Ctrl click** your **MIDDLE AND OUTSIDE BRACKET** files and click Open.

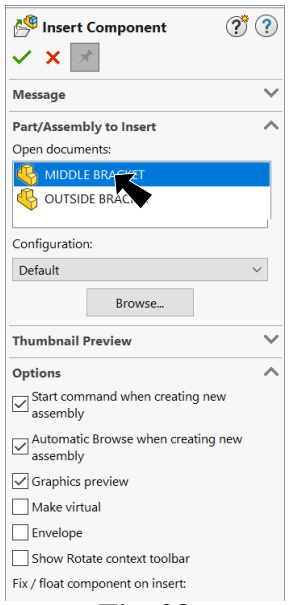


Fig. 28

Step 5. Back in Begin Assembly Property Manager:
click **Keep Visible** , **Fig. 28**
under Part/Assembly in Insert
select **MIDDLE BRACKET** to highlight it.

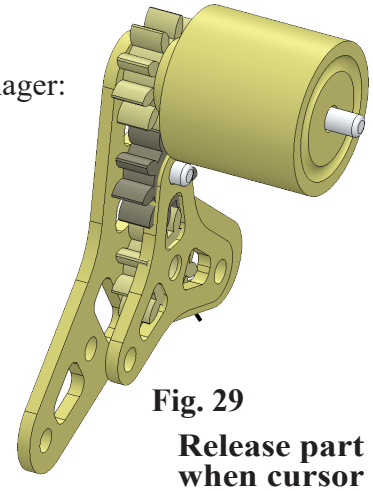


Fig. 29

Step 6. Position cursor over **axle hole in Drive Gear**, **Fig. 29**. When Bracket snaps into place and cursor changes to indicate Concentric mate , click to release Bracket.

Release part when cursor changes to

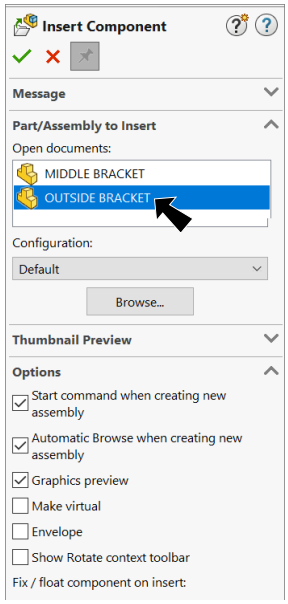


Fig. 30

Step 7. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 8. Back in Begin Assembly Property Manager:
under Part/Assembly in Insert, **Fig. 30**
select **OUTSIDE BRACKET** to highlight it.

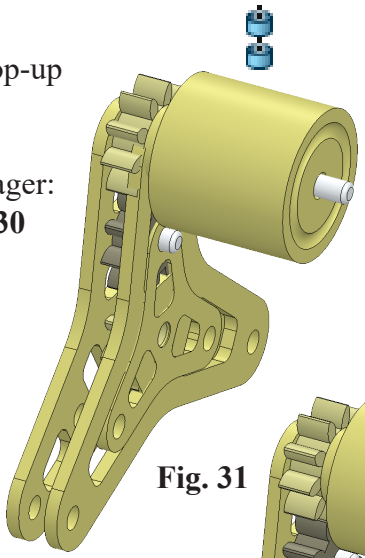


Fig. 31

Step 9. Position Outside Bracket over **Middle Bracket center hole**, **Fig. 31**. When Bracket snaps into place and cursor changes to indicate Concentric mate , click to release Bracket.

Step 10. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 11. Click OK in the Property Manager.

Step 12. Drag Brackets out to view Axles, **Fig. 32**. Unimportant if Brackets rotate.

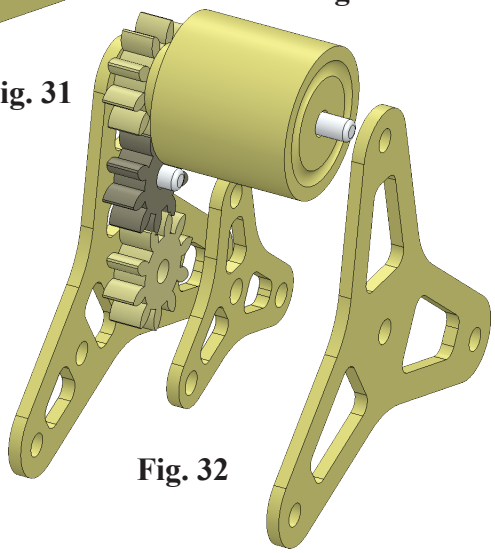


Fig. 32

G. Mate: Brackets.

Step 1. Click **Mate** Mate on the Assembly toolbar.

Step 2. Click **cylindrical face of Idler Axle hole in Inside Bracket** and **in Middle Bracket**, **Fig. 33**.

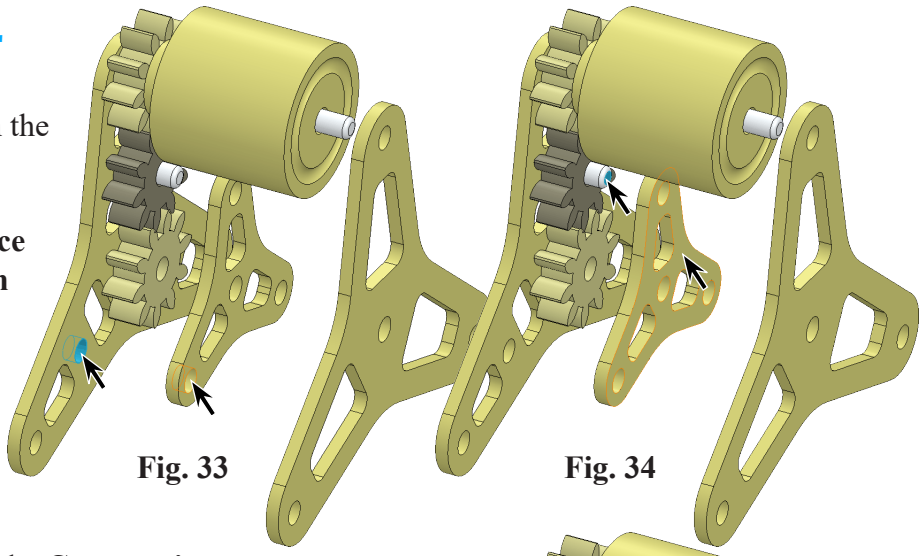


Fig. 33

Fig. 34

Step 3. Check Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate.

Step 4. Click **end face of Idler Axle** and **outside face of Middle Bracket**, **Fig. 34**.

Step 5. Click Add/Finish Mate in Mate pop-up toolbar to add a **Coincident** mate.

Step 6. Click a **cylindrical face of Rim Axle** and **cylindrical face of Rim Axle hole in Outside Bracket**, **Fig. 35**.

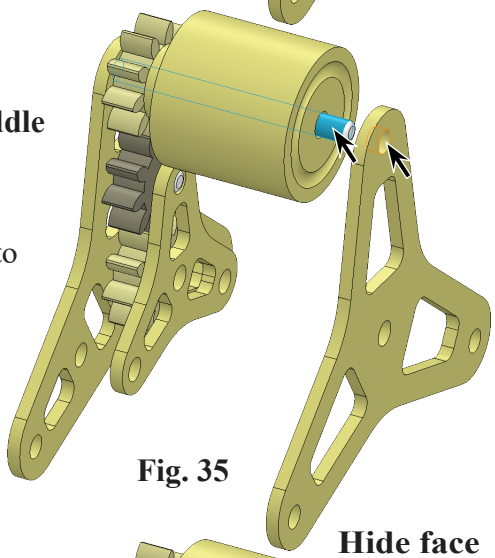


Fig. 35

Step 7. Check Add/Finish Mate in Mate pop-up toolbar to add a **Concentric** mate.

Step 8. Click **side face of Rim** and **hide outside face of Outside Bracket**, click **inside face of Outside Bracket**, **Fig. 36**. To hide face, hover cursor over face and press **Alt key**.

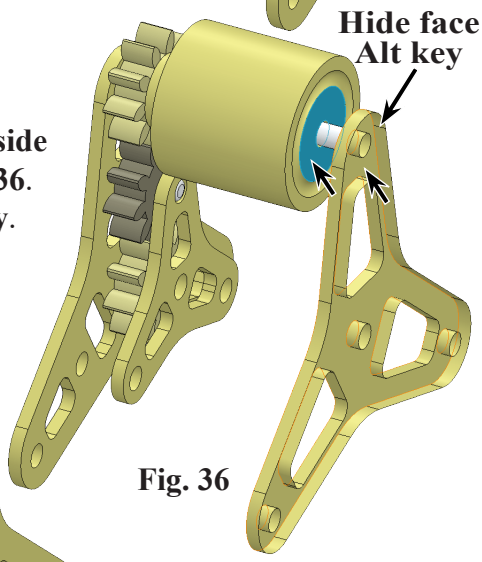


Fig. 36

Step 9. Click **Distance** in Mate pop-up, **Fig. 37**.
Set **distance .5** and press ENTER. The Outside Bracket should positioned outside the Rim, **Fig. 38**. Click Add/Finish Mate to add Distance mate.

Fig. 37

Step 10. Click OK in the Property Manager when done.

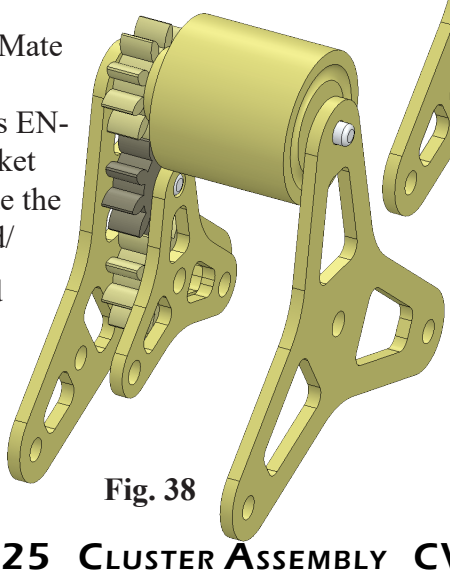
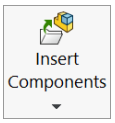


Fig. 38

H. Insert Tire.

Step 1. Click **Insert Components** 

on the Assembly toolbar.

Step 2. Browse and open your **TIRE** file.

Step 3. **Position Tire over Rim**, **Fig. 39**. When Tire aligns and cursor changes to indicate Concentric mate  , click to release Tire.

Release part when cursor changes to  **and** 

Step 4. Click **Flip Mate Alignment**  in the Mate pop-up to align Threads correctly. Click Add/Finish Mate  to add **Concentric** mate, **Fig. 40**.

Step 5. Save  **(Ctrl-S)**.

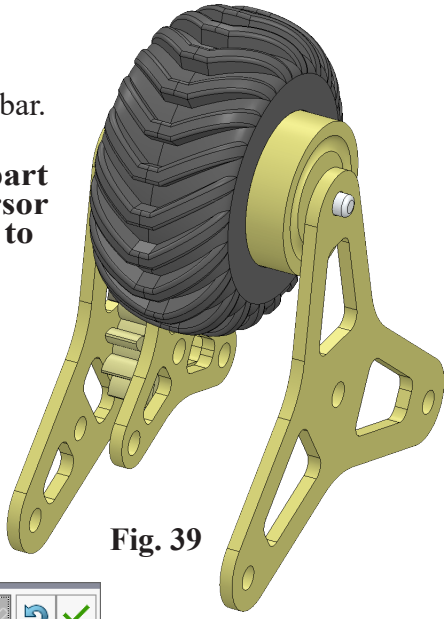
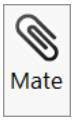


Fig. 39

Fig. 40

I. Mate: Tire.

Step 1. Click **Mate** 

on the Assembly toolbar.

Step 2. Click **side face of Rim** and **side face of Tire**, **Fig. 41**.

Step 3. Click Add/Finish Mate  in Mate pop-up toolbar to add a **Coincident** mate.

Step 4. Click OK  in the Property Manager when done.

Step 5. Save  **(Ctrl-S)**.

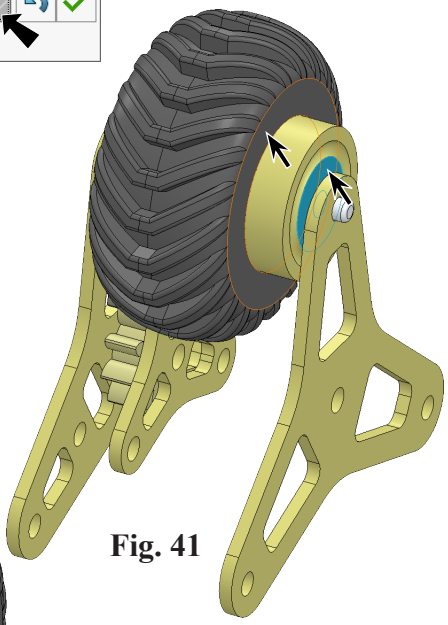


Fig. 41

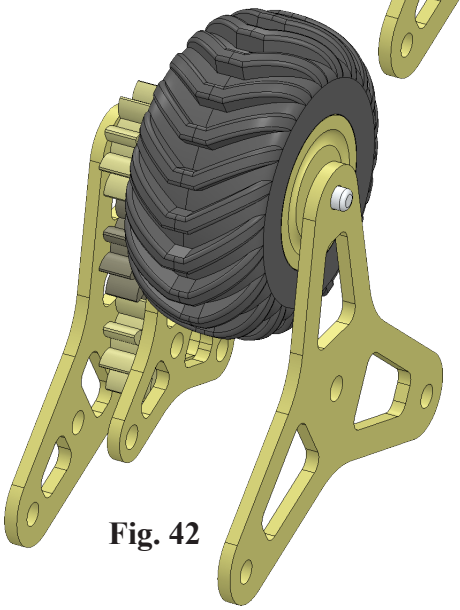
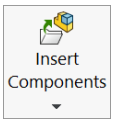


Fig. 42

J. Insert Axle Caps.

Step 1. Click **Insert Components** 

on the Assembly toolbar.

Step 2. **Browse** 

and Open your **AXLE CAP** file.

Step 3. In the Insert Component Manager set:
click **Keep Visible**  , **Fig. 43**

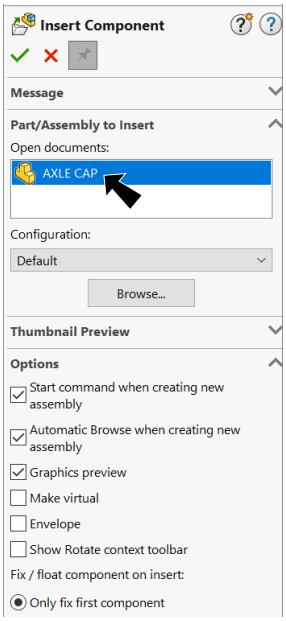


Fig. 43

Step 4. Position Cap over Rear (center) Axle hole in Outside Bracket , **Fig. 44**. When Cap snaps into place and cursor changes to indicate Concentric mate  , click to release Cap.

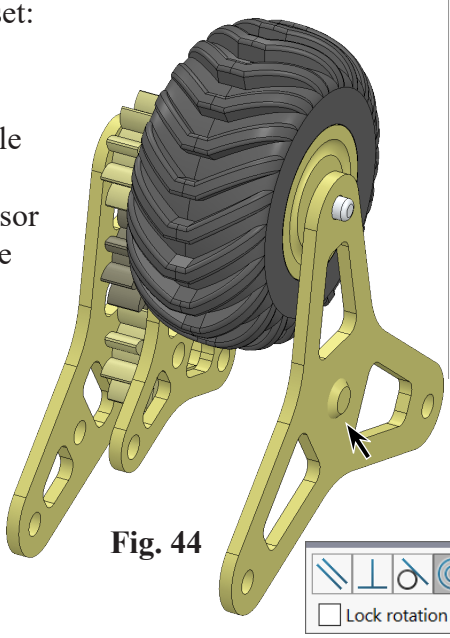


Fig. 44

Step 5. Click **Flip Mate Alignment** 
in the Mate pop-up to align Cap correctly. Click Add/Finish Mate 
to add **Concentric** mate, **Fig. 45**.

Fig. 45

Step 6. Repeat and place **CAP** on Rim Axle, **Fig. 46**. No flip.

Step 7. Click OK 
in the Property Manager.

Step 8. Save 
(**Ctrl-S**).

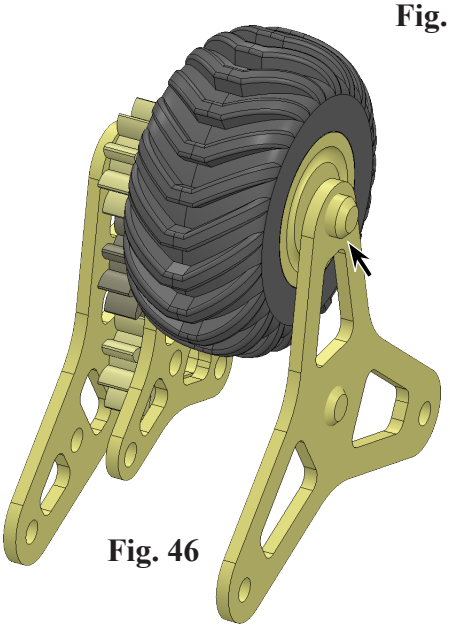
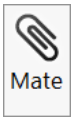


Fig. 46

K. Mate: Axle Caps.

Step 1. Drag Caps to outside Bracket, **Fig. 47**.

Step 2. Click **Mate** 

on the Assembly toolbar.

Step 3. Click **side face of Outside Bracket** and **hide cylindrical face of Cap**, click **bottom face of Cap**, **Fig. 48**. To hide face, hover cursor over face and press **Alt key**.

Step 4. Click Add/Finish Mate  in Mate pop-up toolbar to add a **Coincident** mate.

Step 5. Repeat mate on other **CAP**, **Fig. 49**.

Step 6. Click OK in the Property Manager.

Step 7. Save (**Ctrl-S**).

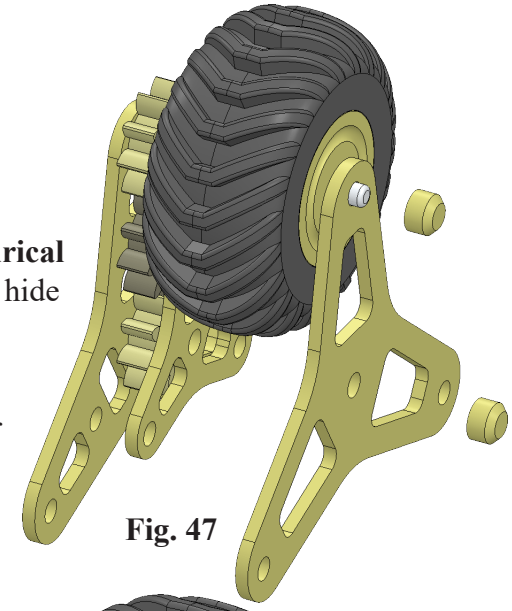


Fig. 47

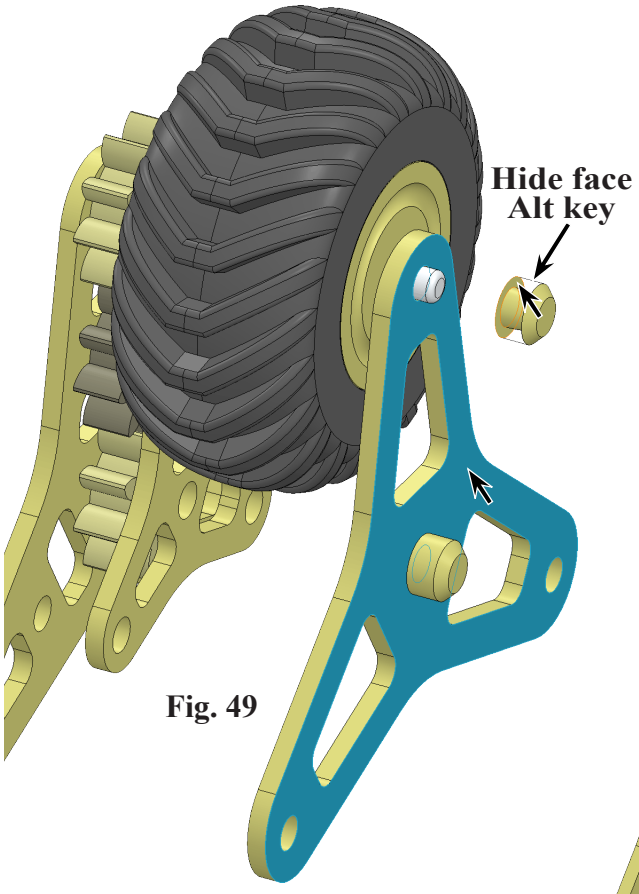


Fig. 49

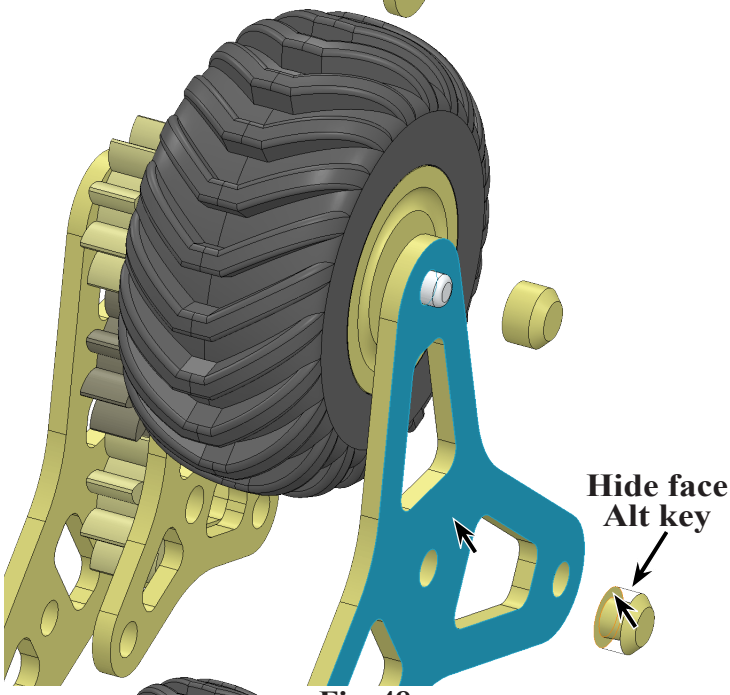


Fig. 48

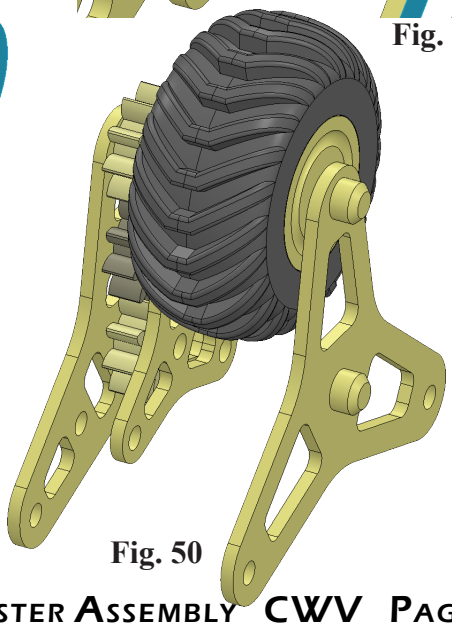


Fig. 50

L. Circular Component Pattern.

Step 1. In the Feature Manager **Ctrl click** to select these 6 components:

Idler Gear
Rim
Idler Axle
Rim Axle
Tire
Axle Cap <2> on Rim Axle, **Fig. 51**.

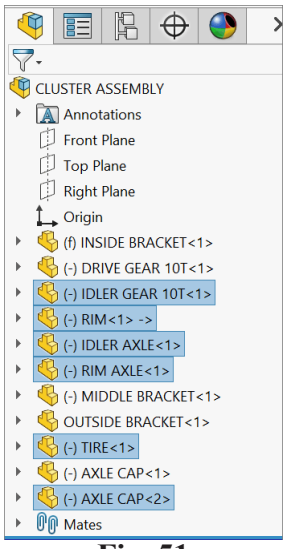


Fig. 51

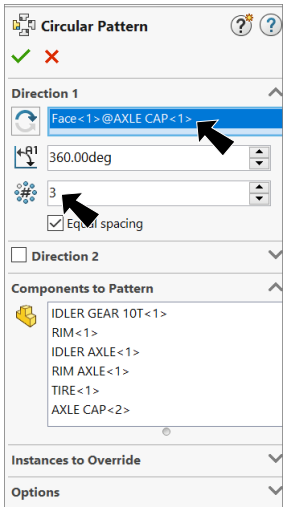
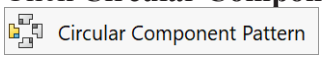
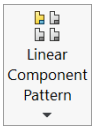


Fig. 52

Step 2. Click **Circular Component Pattern**  in the **Linear Component Pattern flyout**  on the Features toolbar.

Step 3. In the Circular Pattern Property Manager set:

under Components to Pattern, **Fig. 52**
were preselected
under Direction 1
click in **Pattern Axis** box
click **cylindrical face of center Cap**, **Fig. 53**
select **Equal spacing**
Number of Instances  **3**
click OK  .

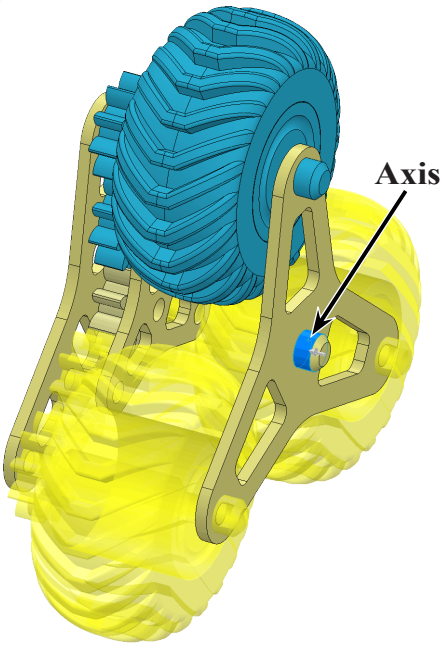


Fig. 53

Step 4. Save  **(Ctrl-S)**.

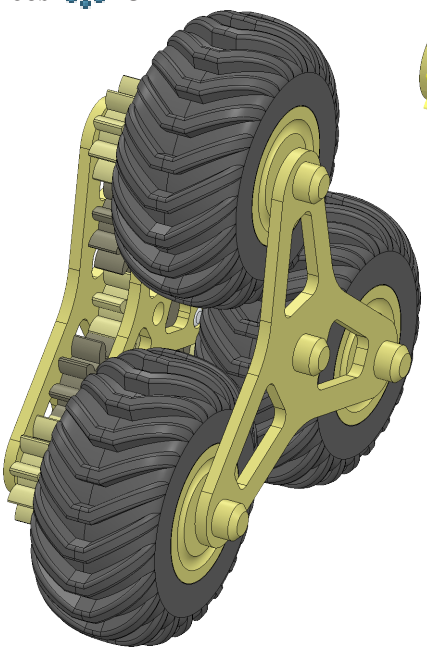


Fig. 54