Clip to clip connection

Application to Minifig Mechanical Arm (MMA)

Introduction

Clips are connecting elements and their counterparts are rods such as bars, handles or arms. Clips are not as usual as studs and appear only on a few parts, fortunately among the most widely available such plates.

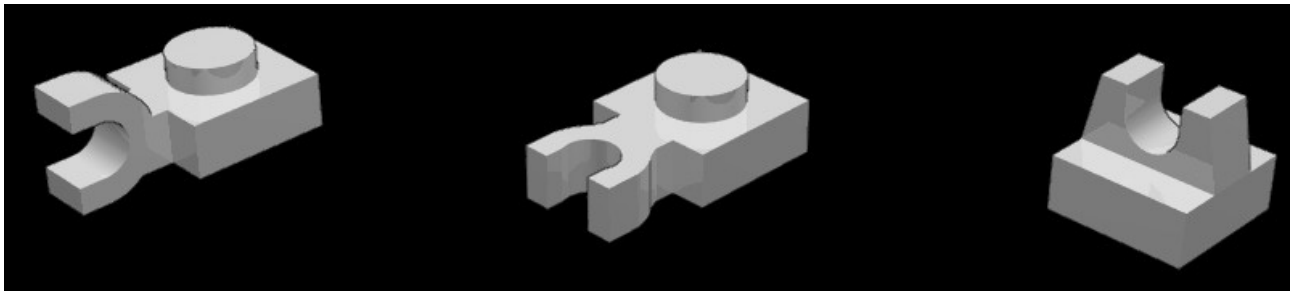
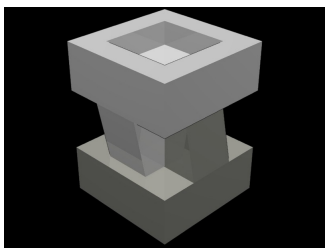


Illustration 1 - 1x1 plates and tile with clip

Clip to clip connection



Clips are not limited to being attached to rods but can also be linked togethers. The force of this clip to clip connection depends on the parts as clips are slightly different depending on the element.

This clip to clip connection between two 1x1 tiles with clip (2555) can be used for some SNOT 180. The link is very tight, each clip pinching the other one. If you adjust the connection as you can see on illustration 3, you can achieve a one stud and plate width tube-to-tube SNOT 180 connection. This particular clip to clip connection is worth quoting in itself..

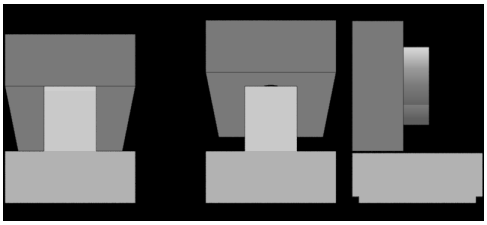


Illustration 3 – Tube-to-tube SNOT 180 connection

.Of course, the clip to clip connection can be achieved between elements of different sorts and will please builders connoisseurs of the smallest creations.

Minifig Mechanical Arm (MMA)

The MMA is mainly composed of two clips bent at a 35° angle - nothing else, no stud, no hole, no rod. It is 2L long and is widely available in grey, black and blue. The two clips of the MMA are of slightly different type but it will not be taken into account in the further discussion. MMA, as its complete name says, can be attached to a Mechanical Minifig Torso via a rod. Fan of LEGO trains know it is also used as pantograph legs[1], attached to plate with handle or bars, or as rungs of ladder[2]. MMA is also a versatile linking element.

Illustration 4 – Minifig Mechanical Arms (MMAs)

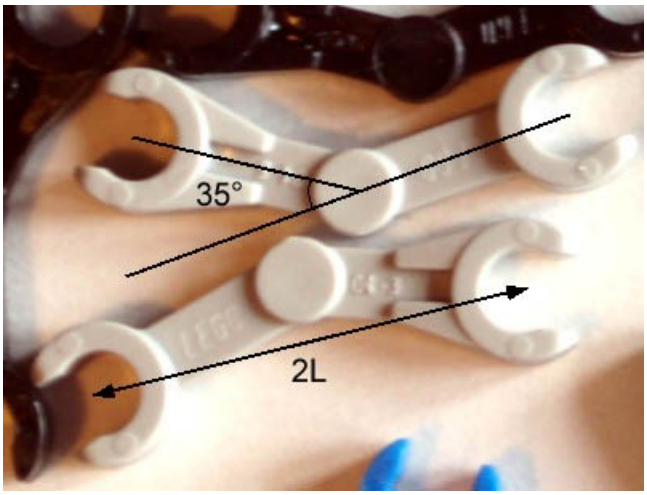


Illustration 5 – MMA geometry

So what about if we link two MMAs together through a clip to clip connection? The first step is shown in the left of illustration 6. The link is weak and can not be used extensively. Could we performed a better – stronger - link? Yes, just let us push the parts farther. And then the link is tighter because the MMAs pinch each others not on the clip hole but on the clip itself. The link is even so strong that, sometimes, you could have some difficulty attaching the two MMAs together this way.

One thing interesting with this link is that, while the MMA is achiral, the newly built assembly is chiral[3] – two enantiomers can be created – we don't take into account here the fact that the clips of the MMA are of two slightly different types. So the origin of the chirality is in the link itself. Let us say the link presented in the illustration is of the R configuration. The newly built assembly still has two unused clips. So there is some possibility for "supramolecular" building :

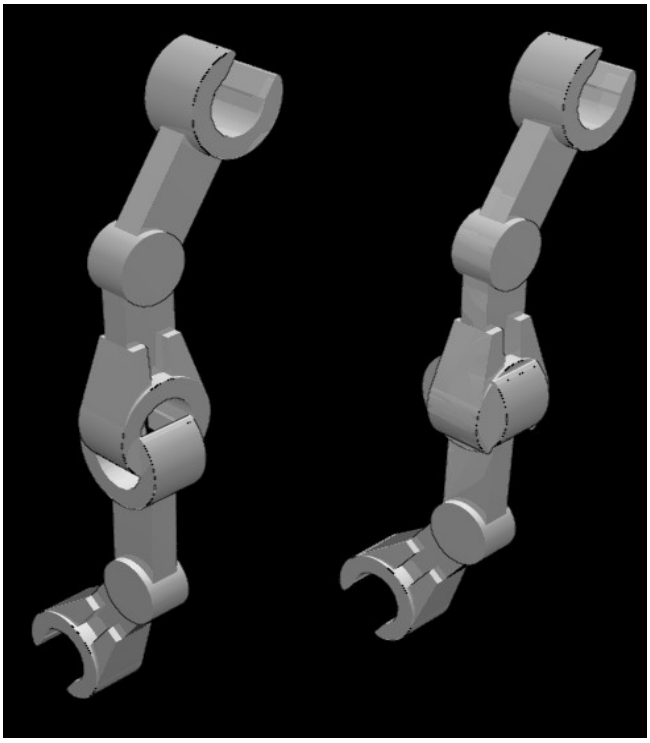


Illustration 6 – MMAs clip to clip connections

1 James Mathis Brickshelf gallery, http://www.brickshelf.com/gallery/jamathis/Trains/Locomotives/PantagraphIdeas/v1v2v3v5/pantagraph_ideas_v1_v2_v3_v5.jpg

2 Tim Gould Brickshelf gallery, http://www.brickshelf.com/gallery/timgould/Trains/EstHopper/hopperfront.png

3 Didier Enjary Lugnet post, http://news.lugnet.com/build/schleim/?n=239

MMA's Superstructures

Helix :

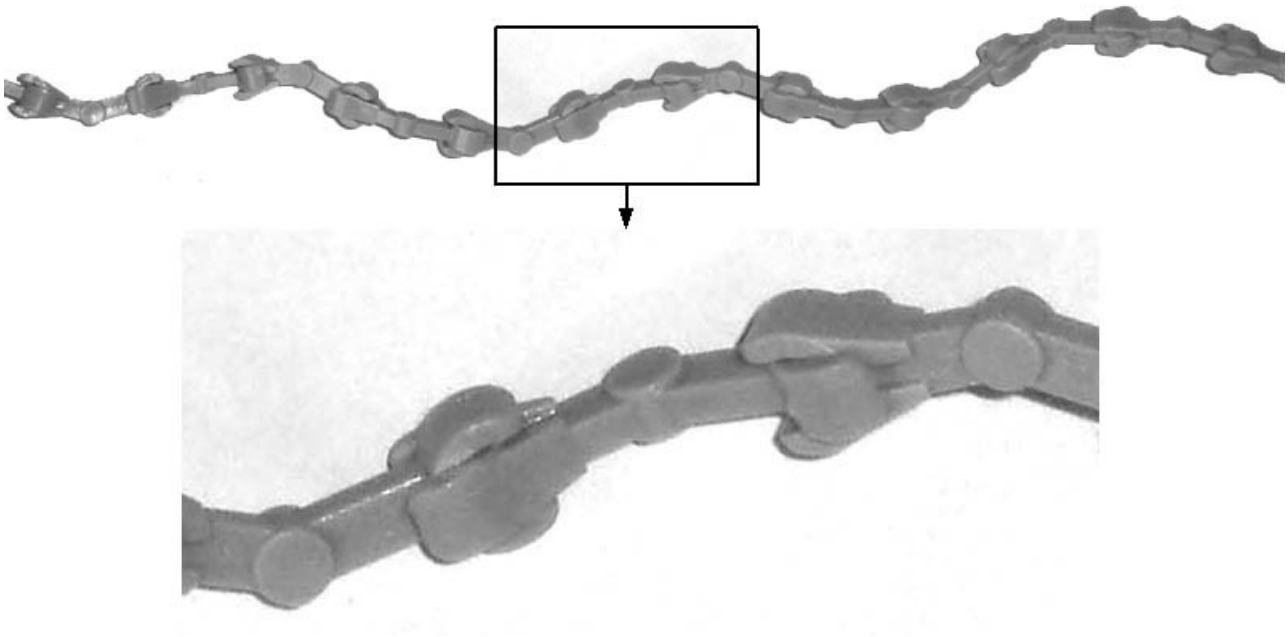


Illustration 7 – Helix

is obtained by connecting MMAs with a serie of R (R helix) or L (L helix) configuration links.

Circles :

are obtained by connecting MMAs through a serie of links following the -RL- configuration. The different sizes of the two circles are only due to the stress applied to the links between MMAs. Here the circles are respectively made of 12 and 14 elements (only even numbers are solution unless adding more stress on the links).

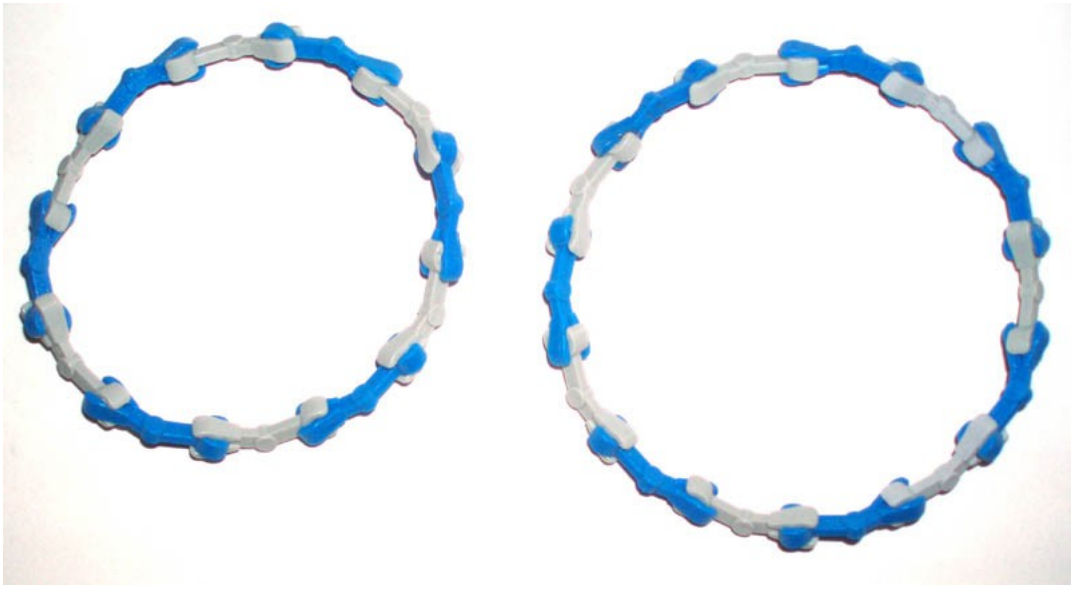


Illustration 8 – Circles (-RL- configuration)

Bigger circle :

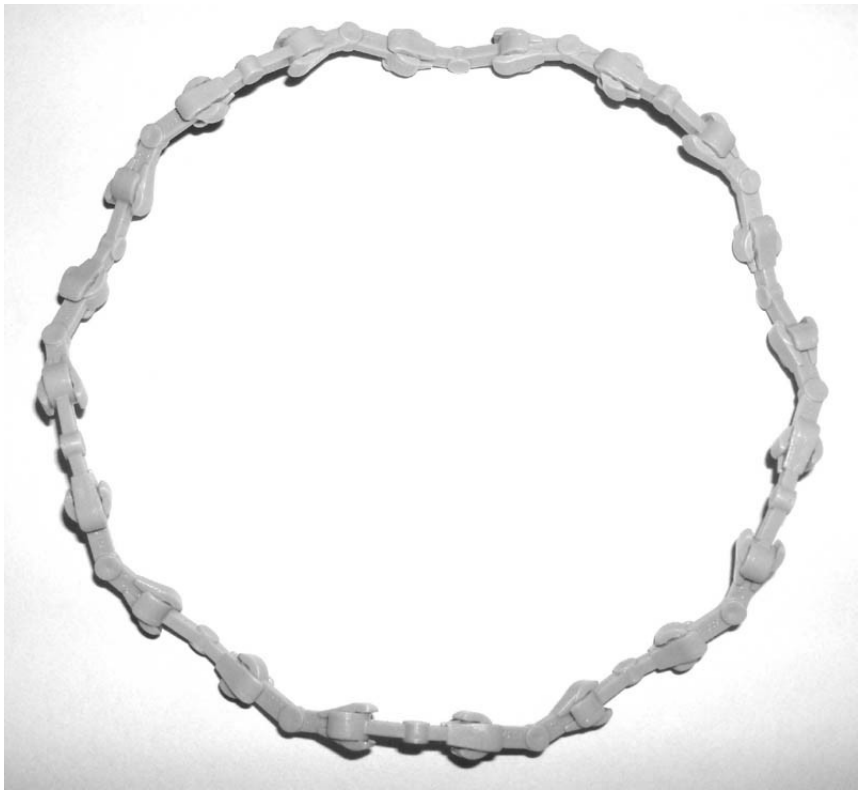


Illustration 9 – Bigger circle (-RRLL- configuration)

is obtained by connecting MMAs with a serie of links following the -RRLL- configuration. Here the circle is made of 20 MMAs.

What do we obtain when connecting MMAs following the -RRRLLL- configuration? Just a bigger circle than the one presented on illustration 9. In fact it looks more like a polygon than a circle. So you can create circles as big as you desire by increasing the size of the polygon's sides, with the sides looking more and more like helix.

Multiclip to clip connection

Playing around with the MMA, you may have found another interesting way to connect them together. Instead of linking one MMA to another one, you can link them in threes at a 90° angle like this :

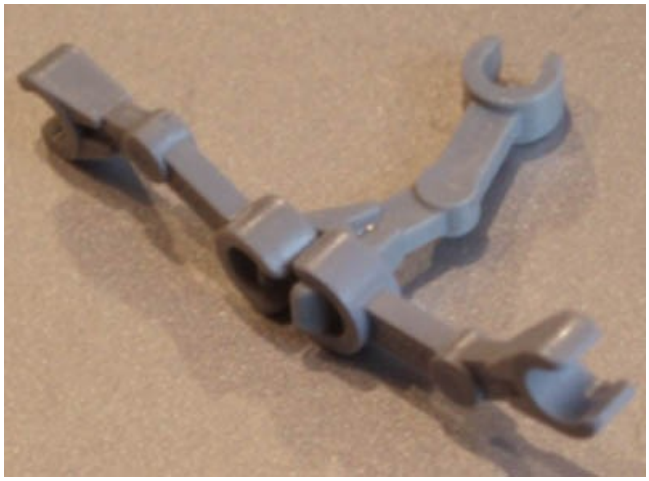


Illustration 10 – Tri-MMAs connection

While one clip pinching another one on the clip hole, the link is unexpectingly strong and you can imagine supersize structures like ladders or tunnels (closed ladder).

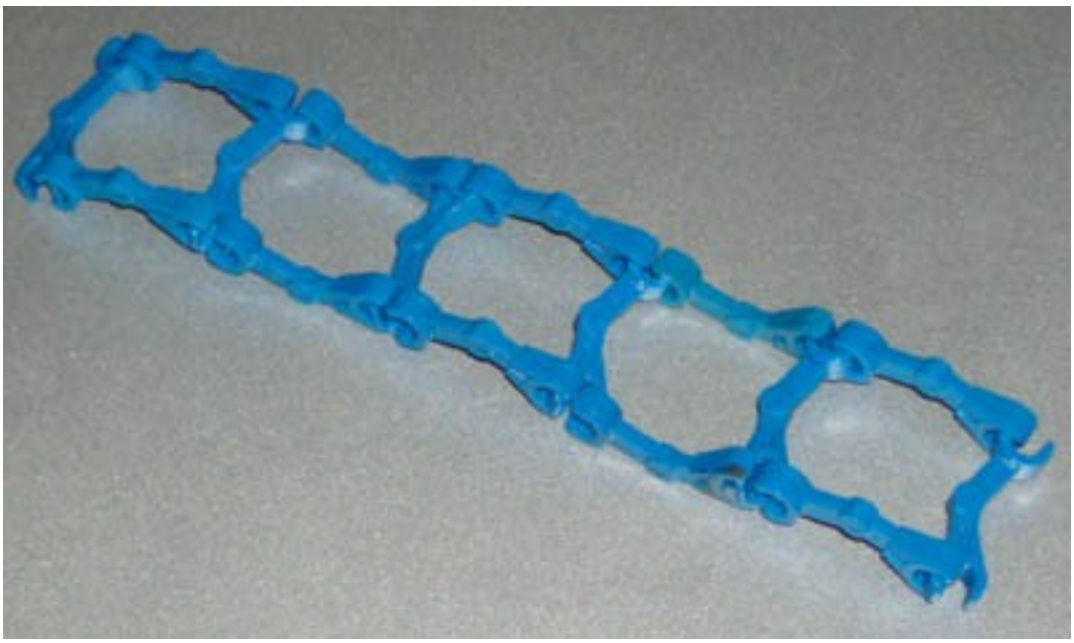


Illustration 11 – Ladder MMA superstructure

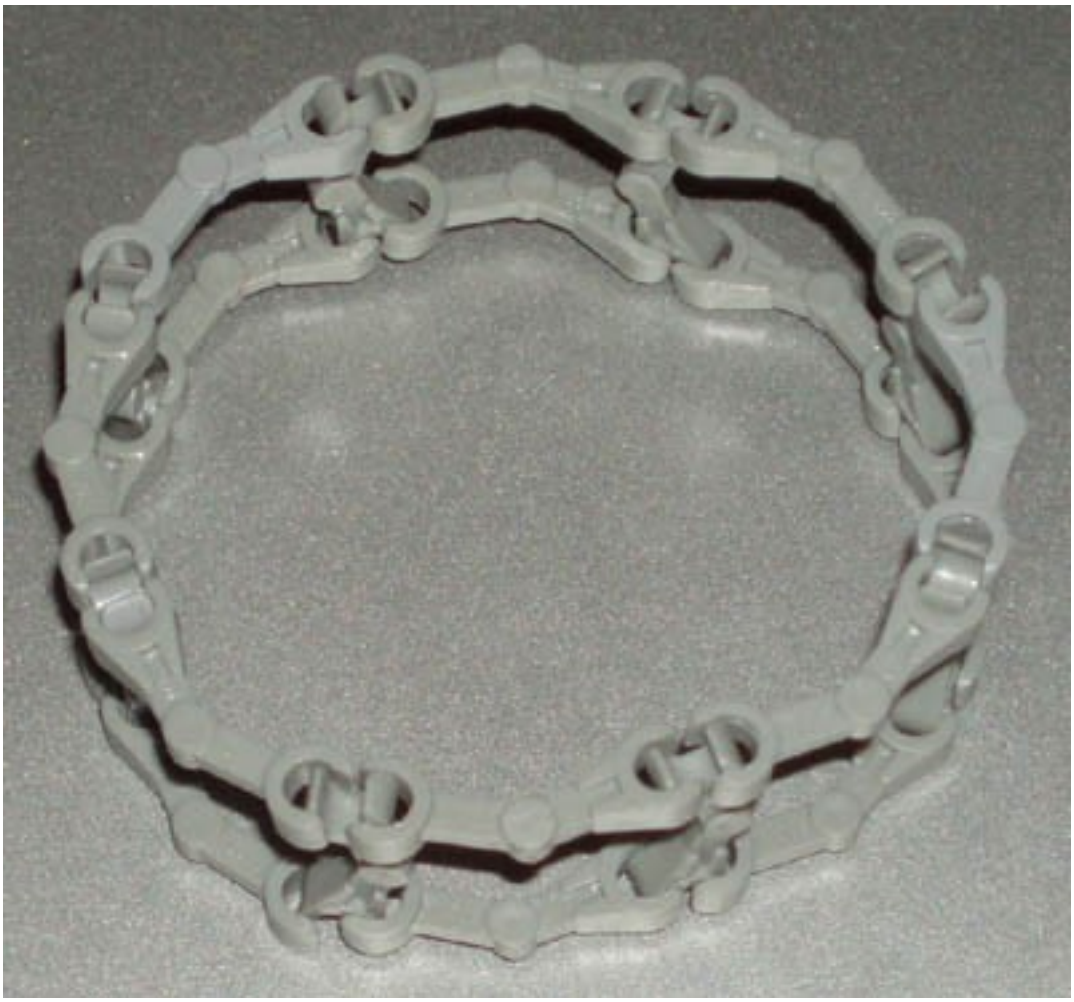


Illustration 12 – Tunnel MMA superstructure

Conclusion

Clip to clip is an unrecognized but strong building connection. The delicacy and fineness of the MMA, its double clips and its bended geometry open creativity to some previously unexpected buildings. Brickshelf user Squieu[4] use the clip to clip connection for his mecha creations, in a nicely and intricated combination with clip to tile connection.

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December, 2006

4 Squieu Brickshelf gallery, http://www.brickshelf.com/cgi-bin/gallery,cgi?f=197119