PACK 9

THE TERMINATOR™

BUILD THE T-800

1:2 SCALE

THE MOST LEGENDARY CYBORG IN SCIENCE FICTION HISTORY!

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AGORA MODELS

THE TERMINATOR™

BUILD THE T-800

PACK 9

CONTENTS

T-800 ASSEMBLY: STAGES 81–90

IDENTIFYING YOUR COMPONENTS: Each of your Terminator packs is divided into stages. Each stage contains a number of components, and can be identified by referring to the images in your assembly guide or the number located on the sticker on the back of each stage. Each number begins with '77' and is followed by a further three digits. The last three digits indicate the number of each stage. For example, 77 001 indicates stage 01, 77 002 indicates stage 02, etc.

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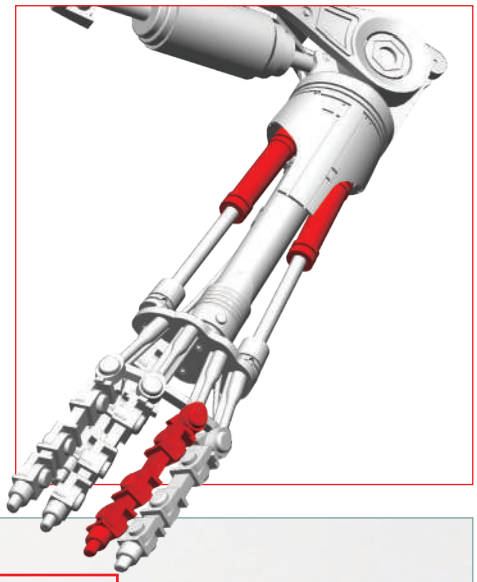
STAGE 81: COMPONENTS FOR THE FOREARM AND THIRD FINGER OF THE LEFT HAND



Construct the third finger of the left hand and attach two shafts to the left forearm assembly.

LIST OF PIECES

81-1	Left forearm shaft (x2)
81-2	Left forearm shaft connector (x2)
81-3	Three KM 2 x 16mm screws (1 spare)
81-4	Left hand finger tip
81-5	Left hand finger part
81-6	Left hand finger part
81-7	Left hand finger part
81-8	Left hand finger part
81-9	Finger joint pin
81-10	Finger joint connector
81-11	Plastic sleeve for finger joint

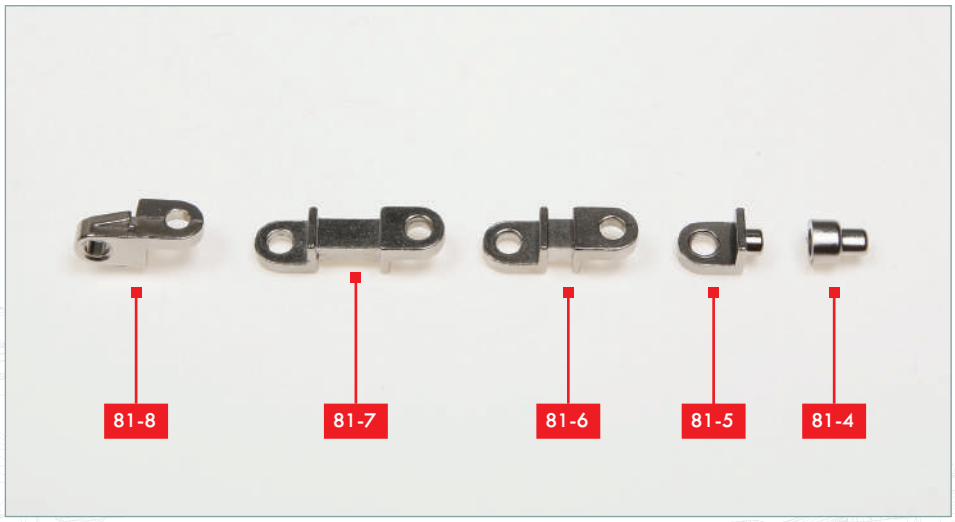
YOU WILL ALSO NEED

Gel-type superglue and a cocktail stick

Tweezers (optional)

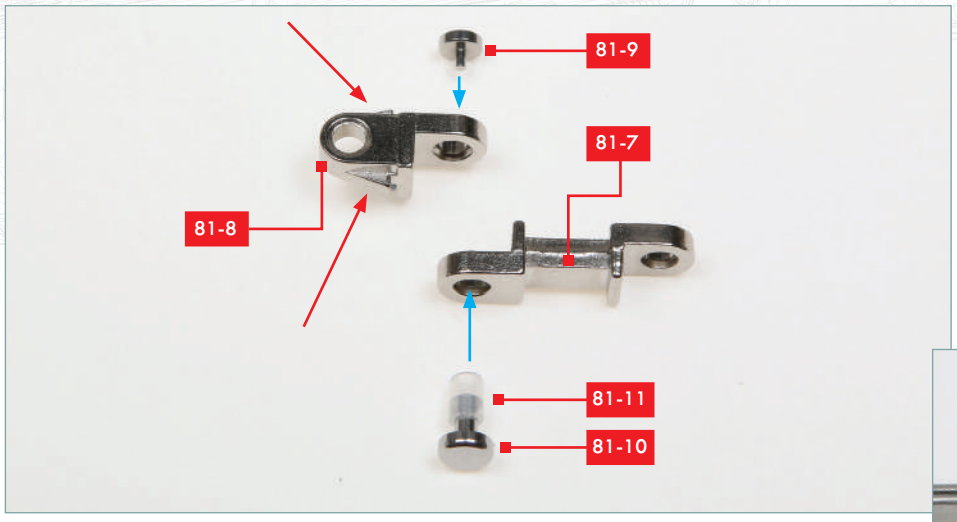
Fine crosshead screwdriver

Finished parts for left forearm from stage 80



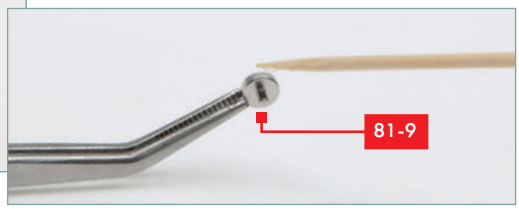
STEP 1

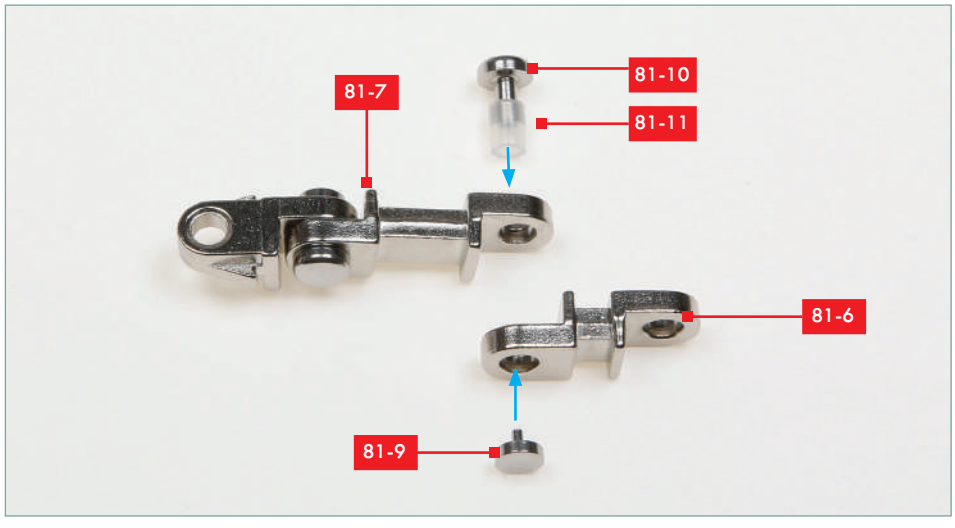
Lay out the finger parts **81-8**, **81-7**, **81-6**, **81-5** and **81-4** in the order they will be assembled, as shown.



STEP 2

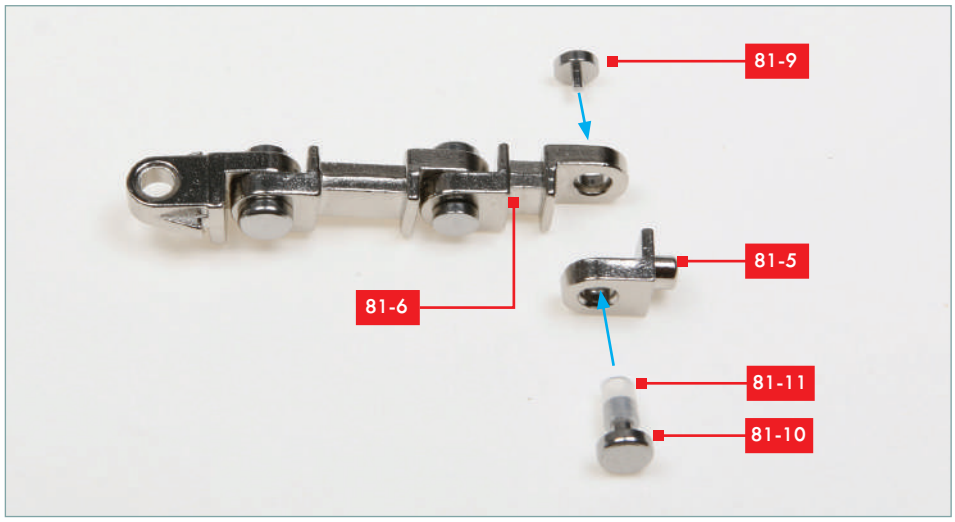
Fit a sleeve **81-11** over a finger joint connector **81-10**. Then fit the connector through the hole in one end of part **81-7** and the hole in the finger component **81-8**. Note the orientation of part **81-8** and ensure the fins (red arrows) are positioned as shown. Apply a little superglue to a connector pin **81-9** (inset) and fix in place, as indicated.





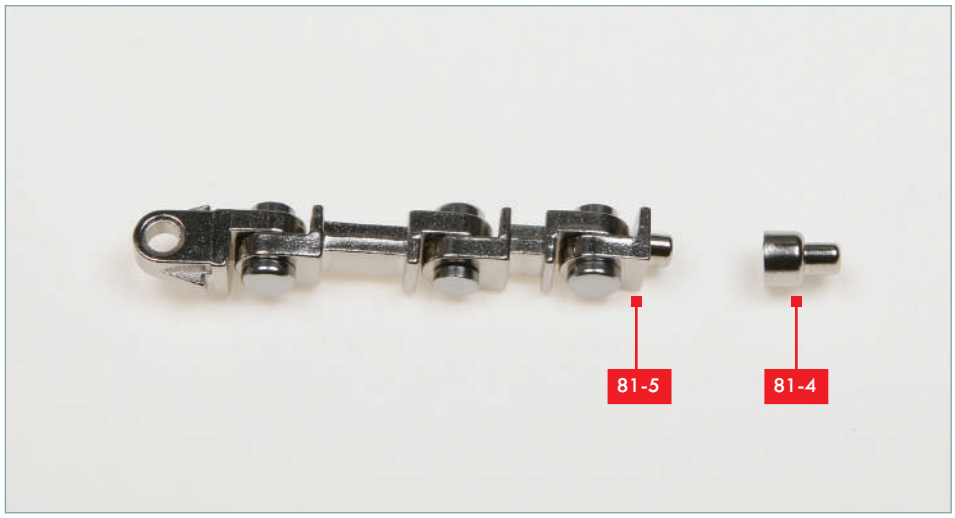
STEP 3

Take the next finger part **81-6** and position it as shown, with one hole aligned with the free hole in part **81-7**. Fit a plastic sleeve **81-11** over the end of a connector **81-10**. Fit the connector down through the free hole in part **81-7** and one of the holes in part **81-6**. Apply a little superglue to a connector pin **81-9** and fix the joint together.



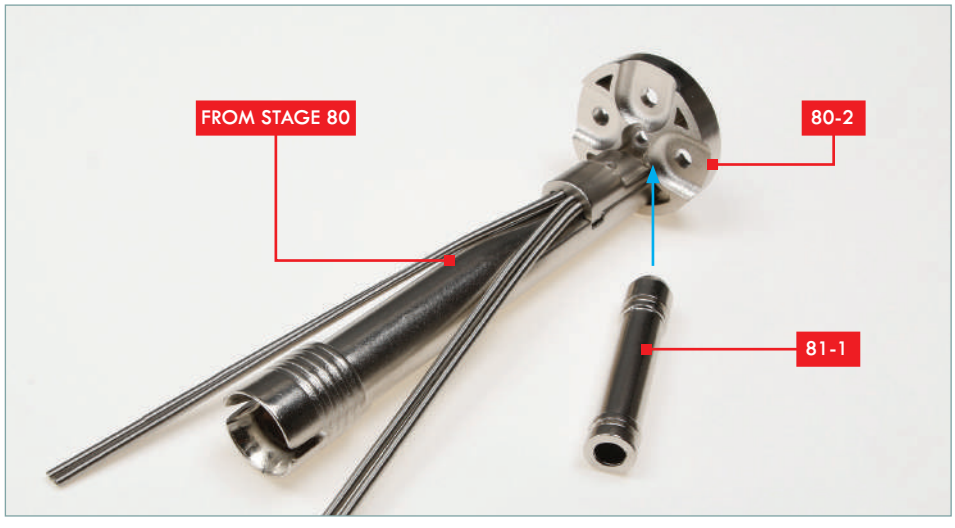
STEP 4

Take the next finger part **81-5** and position it as shown, with the hole aligned with the free hole in part **81-6**. Fit a plastic sleeve **81-11** over the end of a connector **81-10**. Fit the connector up through the hole in part **81-5** and the free hole in part **81-6**. Apply a little superglue to a connector pin **81-9** and fix the joint together.



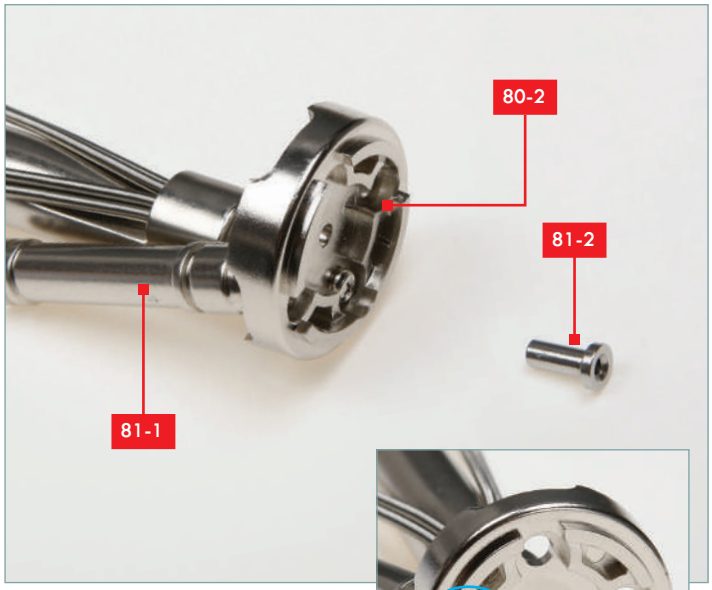
STEP 5

Use a cocktail stick to apply a little superglue to the peg on part **81-5**. Fit part **81-4** on to the peg and allow the glue to dry.



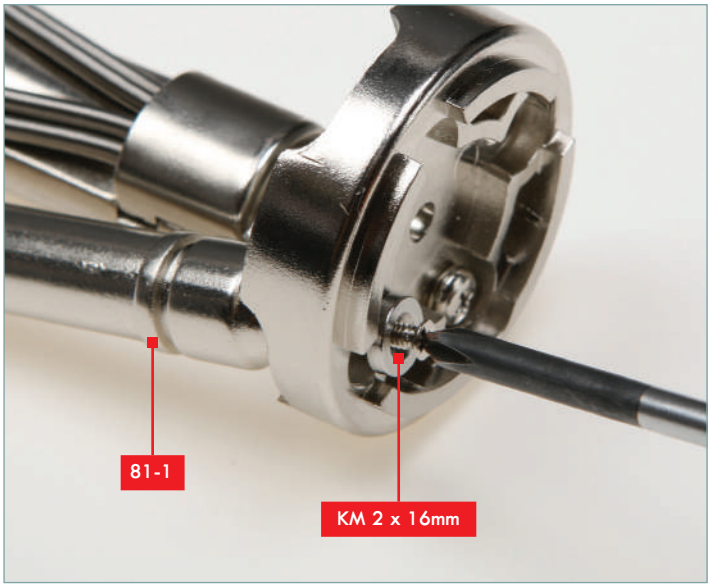
STEP 6

Take the forearm assembly from stage 80, and one of the shafts **81-1**. Identify the hole in the joint **80-2** where the shaft will fit, next to the shaft fitted in the previous stage.



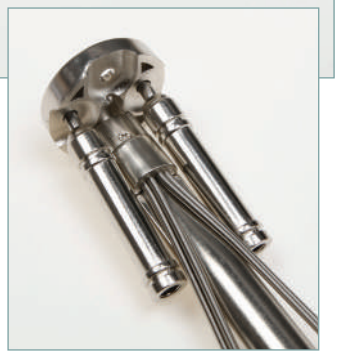
STEP 7

From the other side of the joint **80-2**, fit a shaft connector **81-2** through the hole and into the hole in the end of the shaft **81-1**.



STEP 8

Fit a **KM** 2 x 16mm screw into the connector **81-2** and through to the hole in the end of the shaft **81-1**. Tighten the screw fully.



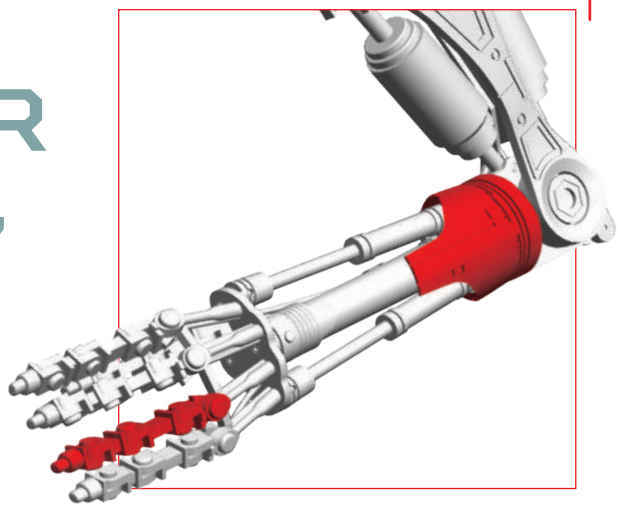
STEP 9

Repeat steps 6, 7 and 8 to fit the second shaft **81-1** on the other side of the joint **80-2**, as shown. The shaft connectors fit loosely at this stage, and can move back and forth through the holes in the joint **80-2**.

STAGE COMPLETE!

Two more shafts have been added to the forearm and another finger has been assembled.

STAGE 82: COMPONENTS FOR UPPER LEFT ARM, FOREARM AND LEFT HAND



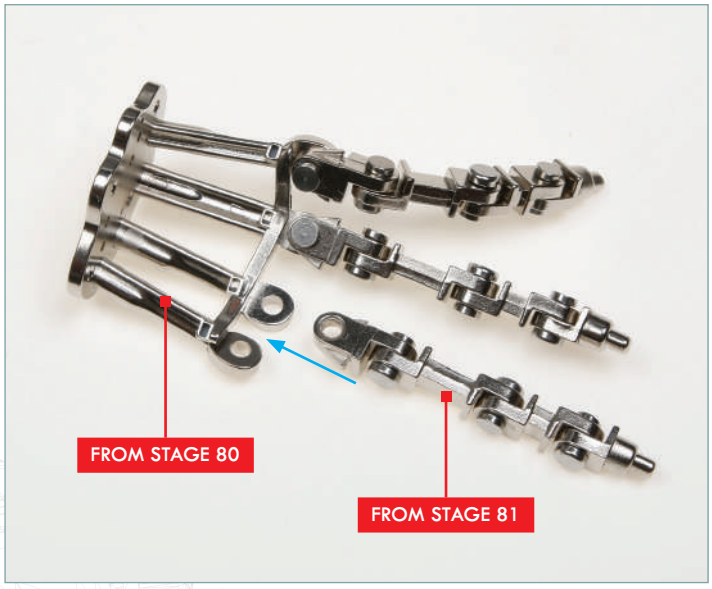
Attach the third finger to the hand, and, after assembling further connective elements, join the upper left arm with the forearm.

LIST OF PIECES

82-1	Left forearm cover
82-2	Left forearm shaft
82-3	Joint center part
82-4	Left forearm shaft connector
82-5	Two KM 2 x 16mm screws (1 spare)
82-6	Two PM 3 x 12mm screws (1 spare)
82-7	M3 washer (1 spare)
82-8	Finger joint connector
82-9	Finger joint pin
82-10	Plastic sleeve for finger joint

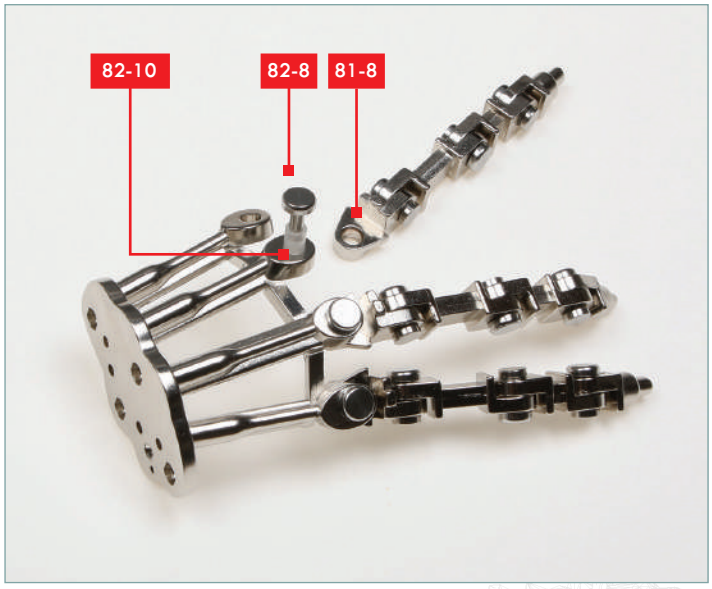
YOU WILL ALSO NEED

- Gel-type superglue and a cocktail stick
- Tweezers (optional)
- Fine crosshead screwdriver
- Hand assembly from stage 80
- Finished third finger from stage 81
- Left forearm assembly from stage 81
- Left upper arm assembly from stage 79



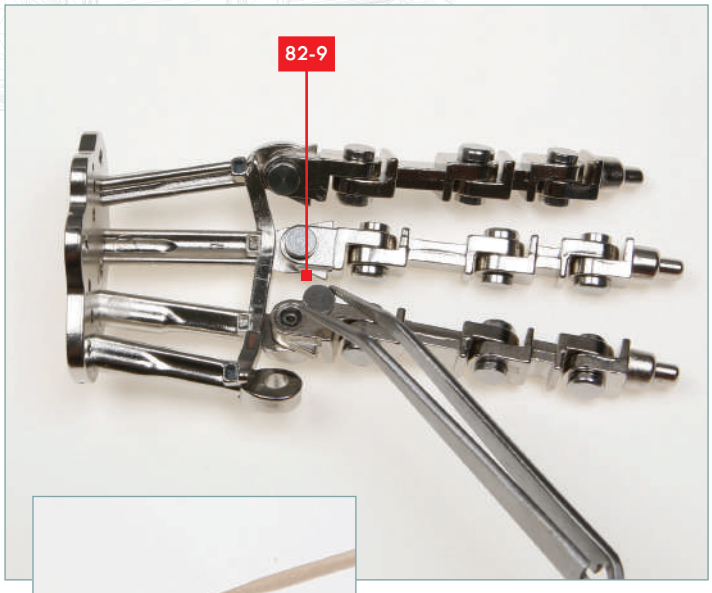
STEP 1

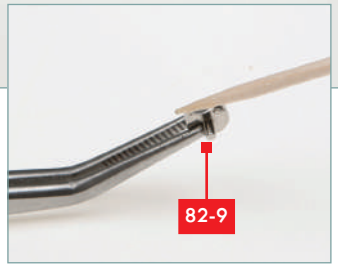
Take the hand assembly from stage 80 and the third finger from stage 81. Identify the fixing point for the finger.



STEP 2

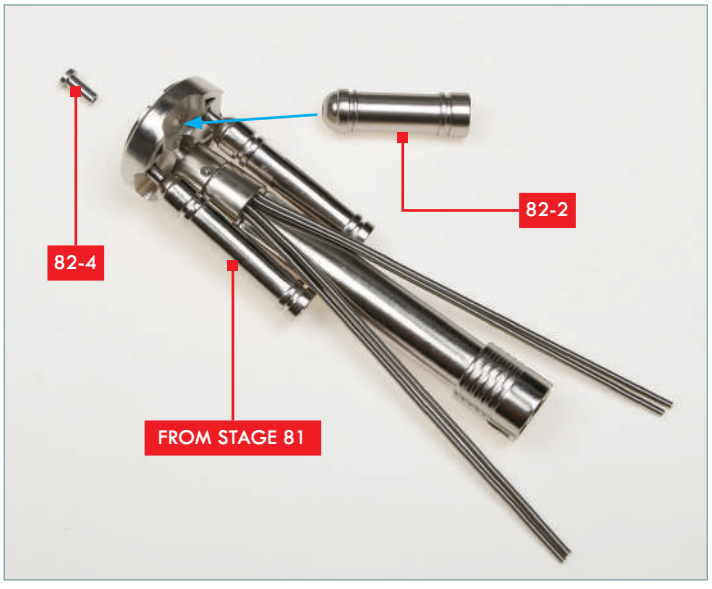
Check the fit of the second finger of the left hand. Fit the plastic sleeve **82-10** over a connector **82-8** and, starting from the outside of the knuckle, fit it through the hole in the frame of the left hand, and the hole in part **81-8** at the end of the finger.





STEP 3

Turn the hand over and apply a little superglue to a connector pin **82-9** (inset) and fix in place, as indicated.



STEP 4

Take the lower arm assembly from stage 81. Identify the fixing point for the left forearm shaft **82-2**, as indicated. Have the shaft connector **82-4** ready.

STEP 5

Fit the shaft connector **82-4** through the arm joint **80-2** and into the hole in the end of the shaft **82-2**.

STEP 6

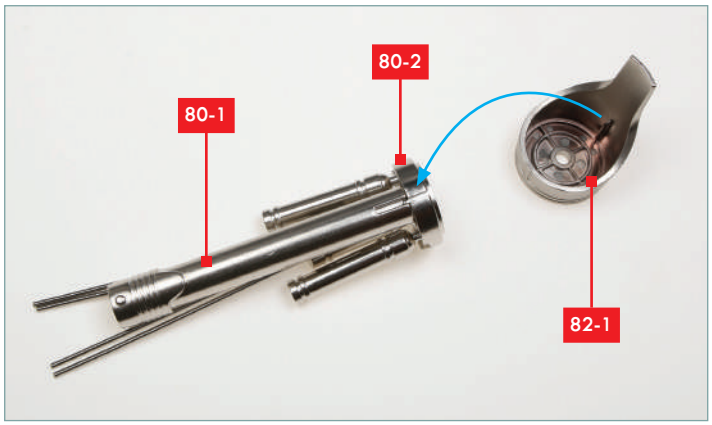
Take a **KM** 2 x 16mm screw and fit it into the connector **82-4** and through into the shaft **82-2**. Tighten fully. As with the other shafts, the connector can move around.

STEP 7

Take the upper arm assembly from stage 79. Check the fit of the joint center part **82-3** in the elbow joint (arrow). Apply a little superglue to the four studs on the back of the washer (inset).

STEP 8

Fit the joint centre part into the joint, as shown.

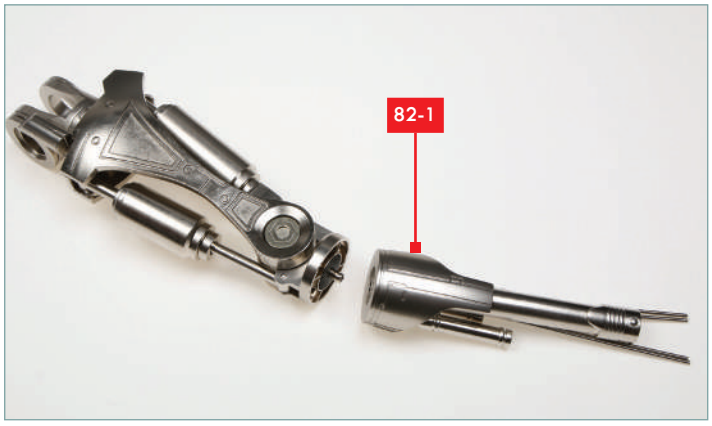


STEP 9

Take the lower arm assembly and the lower arm cover **82-1**. Note the rib on the inside of part **82-1**, which needs to be aligned with the notches on parts **80-1** and **80-2** (arrow).

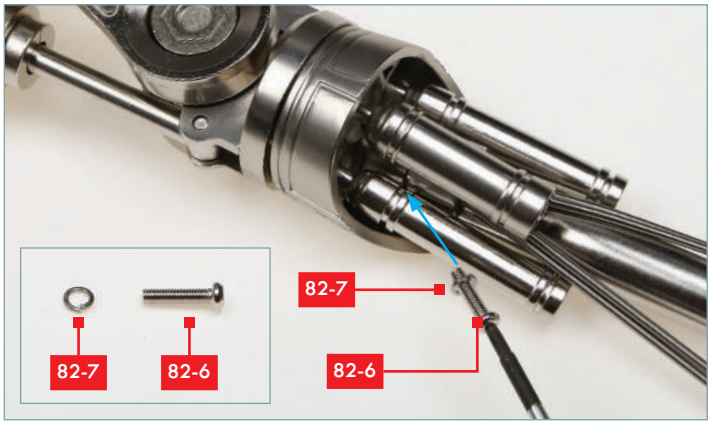
STEP 10

Fit part **82-1** over the joint **80-2** so that the rib fits into the notches.



STEP 11

The next step is to attach the lower arm to the upper arm. Note the orientation of the two arm assemblies. Fit the peg on the base of the upper arm into the hole in part **82-1**.



STEP 12

Fit an M3 washer **82-7** onto a **PM** 3 x 12mm screw **82-6** (inset). Turn the arm assembly over, holding the parts together, so that you can fit the **PM** 3 x 12mm screw into the screw hole in the center of the joint part **80-1**.

STEP 13

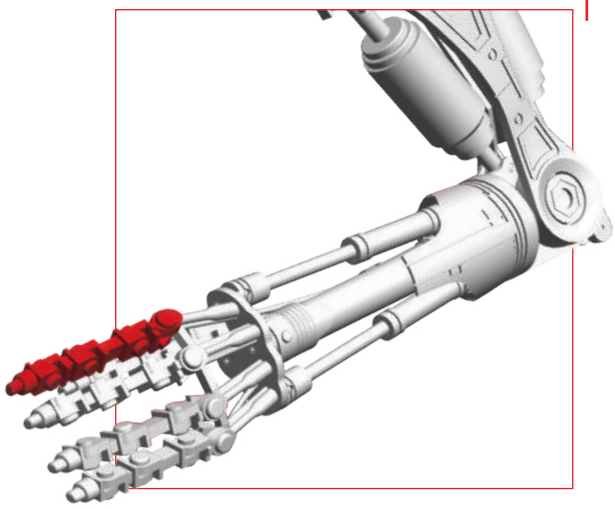
Tighten the screw so that the parts of the arm are held together.

STAGE COMPLETE!

Another finger has been fitted to the left hand and the upper and lower left arm have been joined at the elbow.

STAGE 83: ASSEMBLE THE LEFT FOREFINGER

Build an additional finger, connect it to the left hand, and attach three ball joints to the wrist.



LIST OF PIECES

83-1	Left wrist ball joint (x3)
83-2	Forefinger part
83-3	Forefinger part
83-4	Forefinger part
83-5	Forefinger part
83-6	Forefinger tip
83-7	Finger joint connector (x3)
83-8	Finger joint connector (large)
83-9	Finger joint connector pin (x3)
83-10	Plastic sleeve for finger joint (x3)
83-11	Plastic sleeve for finger joint (large)
83-12	Four KB 2 x 6mm screws (1 spare)

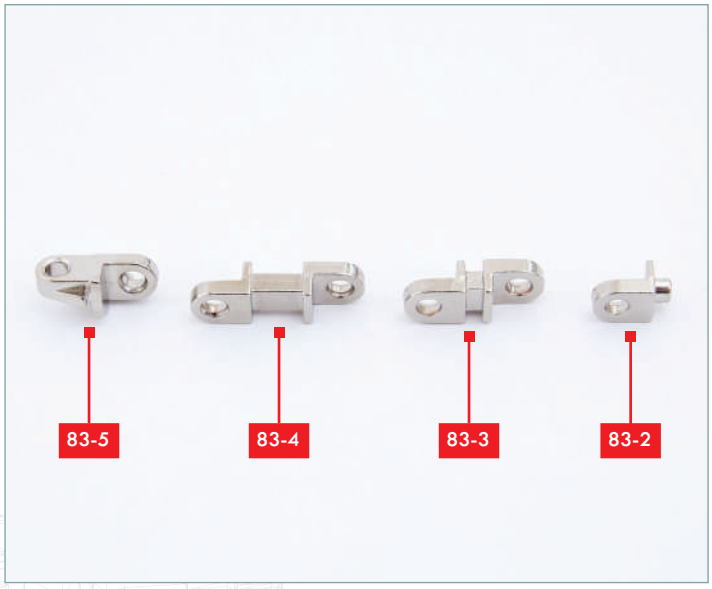
YOU WILL ALSO NEED

Gel-type superglue and a cocktail stick

Tweezers (optional)

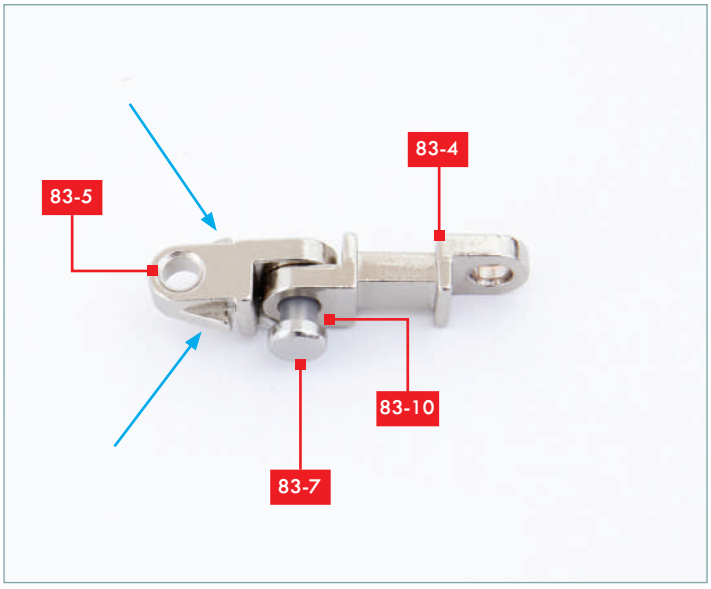
Fine crosshead screwdriver

Finished parts for left hand from stage 82



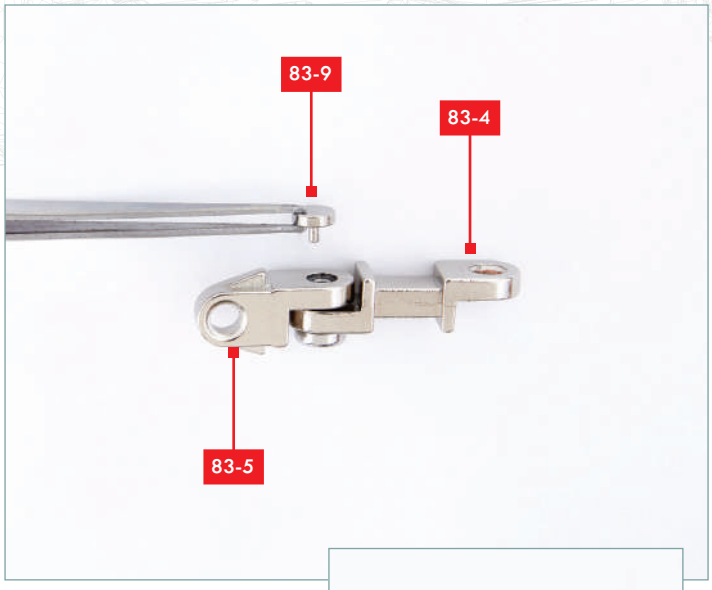
STEP 1

Lay out the finger parts **83-5**, **83-4**, **83-3** and **83-2** in the order they will be assembled, as shown.



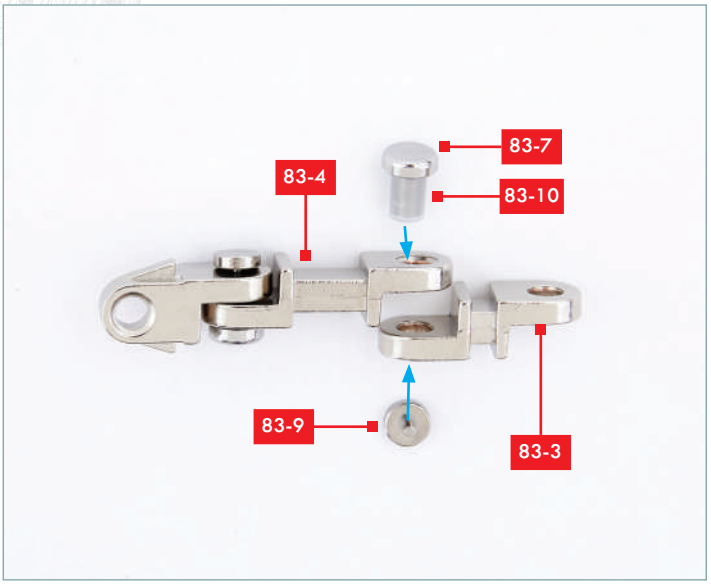
STEP 2

Fit a sleeve **83-10** over a finger joint connector **83-7**. Then fit the connector through the hole in one end of part **83-4** and the hole in the finger component **83-5**. Note the orientation of part **83-5** and ensure the 'fins' (blue arrows) are positioned as shown.



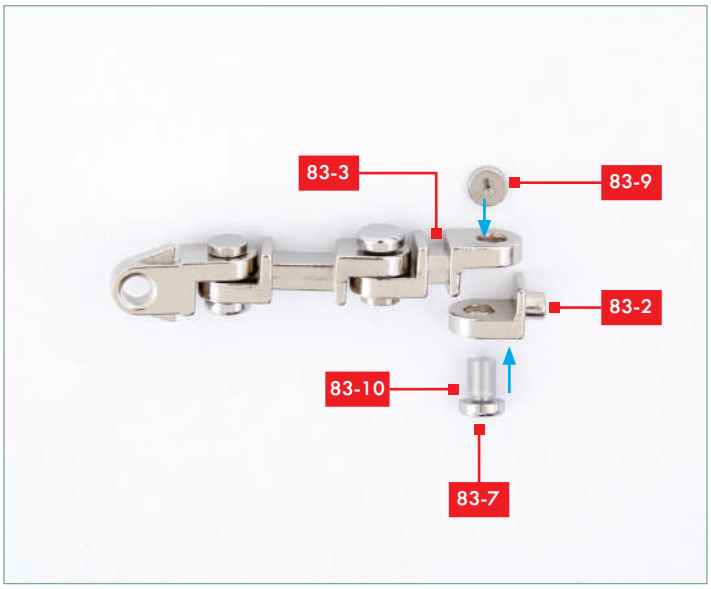
STEP 3

Apply a little superglue to a connector pin **83-9** (inset) and fix in place, to hold the joint connector in place.



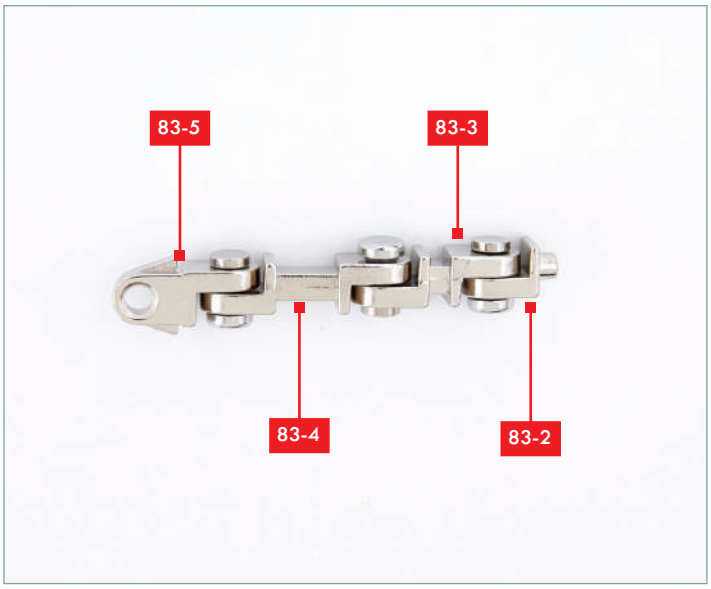
STEP 4

Take the next finger part **83-3** and position it as shown, with one hole aligned with the free hole in part **83-4**. Fit a plastic sleeve **83-10** over the end of a connector **83-7**. Fit the connector down through the free hole in part **83-4** and one of the holes in part **83-3**. Apply a little superglue to a connector pin **83-9** and fix the joint together.



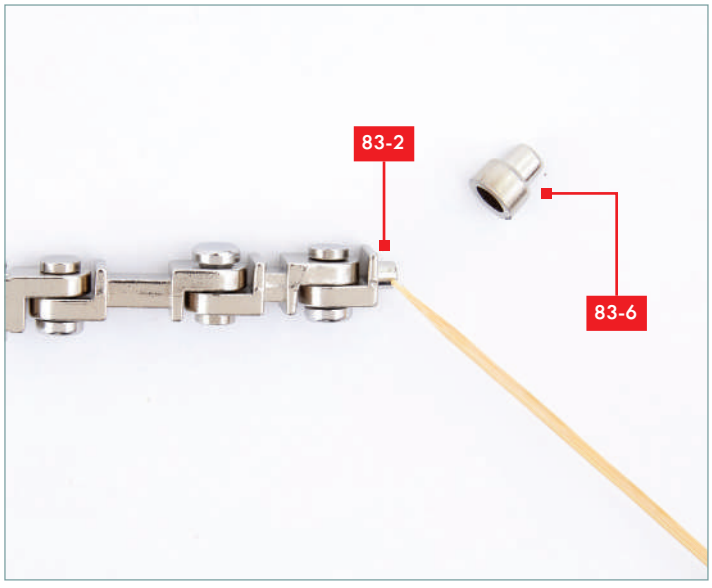
STEP 5

Take the next finger part **83-2** and position it as shown, with the hole aligned with the free hole in part **83-3**. Fit a plastic sleeve **83-10** over the end of a connector **83-7**. Fit the connector up through the hole in part **83-2** and the free hole in part **83-3**. Apply a little superglue to a connector pin **83-9** and fix the joint together.



STEP 6

This shows the finger parts connected.

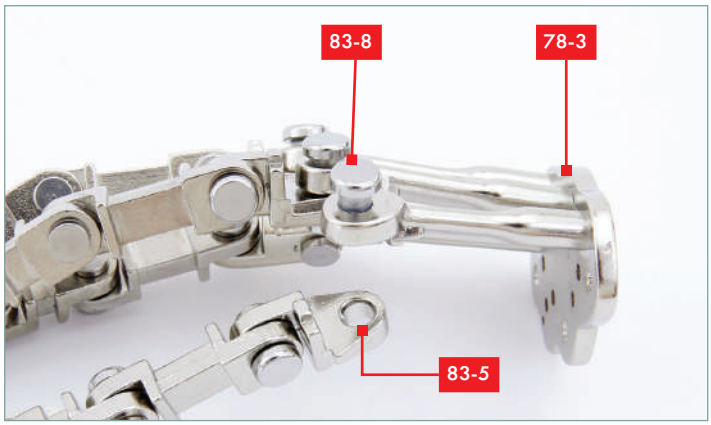


STEP 7

Apply a little superglue to the peg on the end of part **83-2**. Fix the finger tip **83-6** in place on the peg.

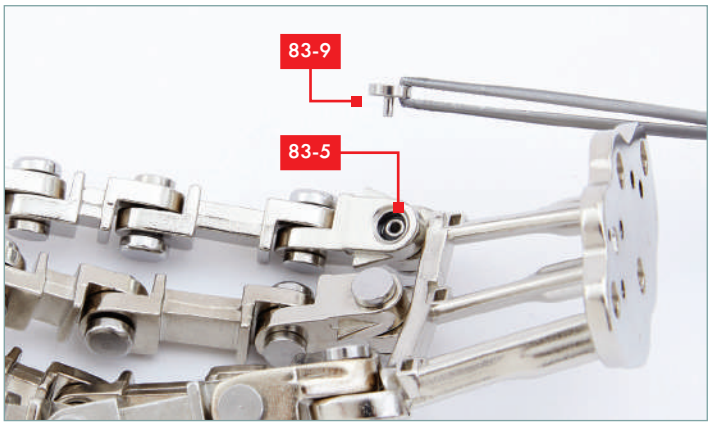
STEP 8

Take the hand assembly from the previous stage. Identify the fixing point on the hand **78-3** for the end of the finger **83-5**, assembled in the previous steps.



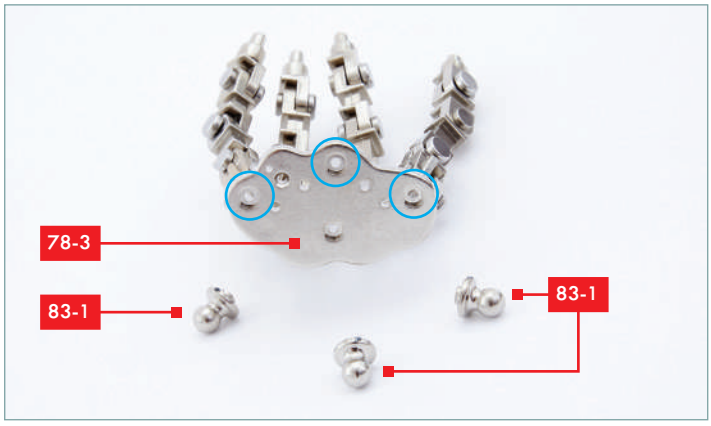
STEP 9

Fit the longer plastic sleeve **83-11** over the longer connector **83-8**. Fit it through the hole in part **78-3** and into the hole in part **83-5**, as indicated.



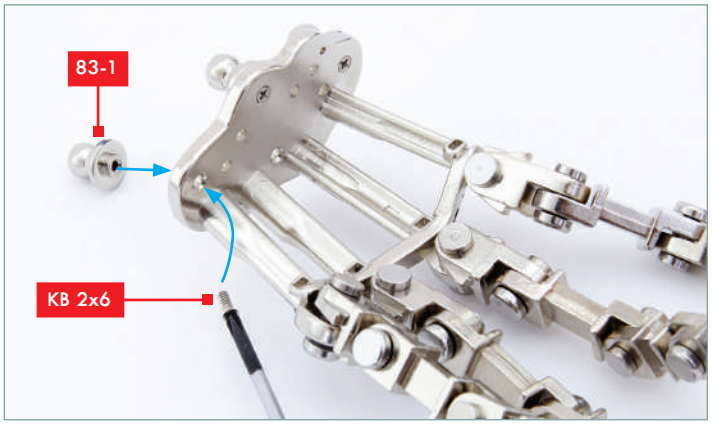
STEP 10

Turn the hand assembly over. Apply a little superglue to the peg on the last connector pin **83-9** and fix in place on the inside of the hand.



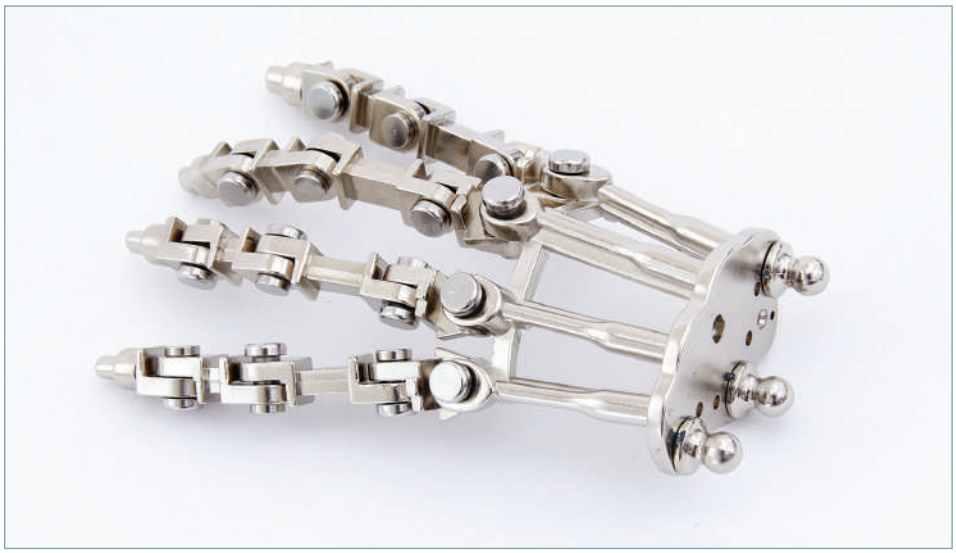
STEP 11

Identify three holes in the base of the hand **78-3** where the three ball joints **83-1** will fit.



STEP 12

Fit the pegs on the ball joints 83-1 into the holes in the hand and fix in place from the top of the hand using three **KB** 2 x 6mm screws.

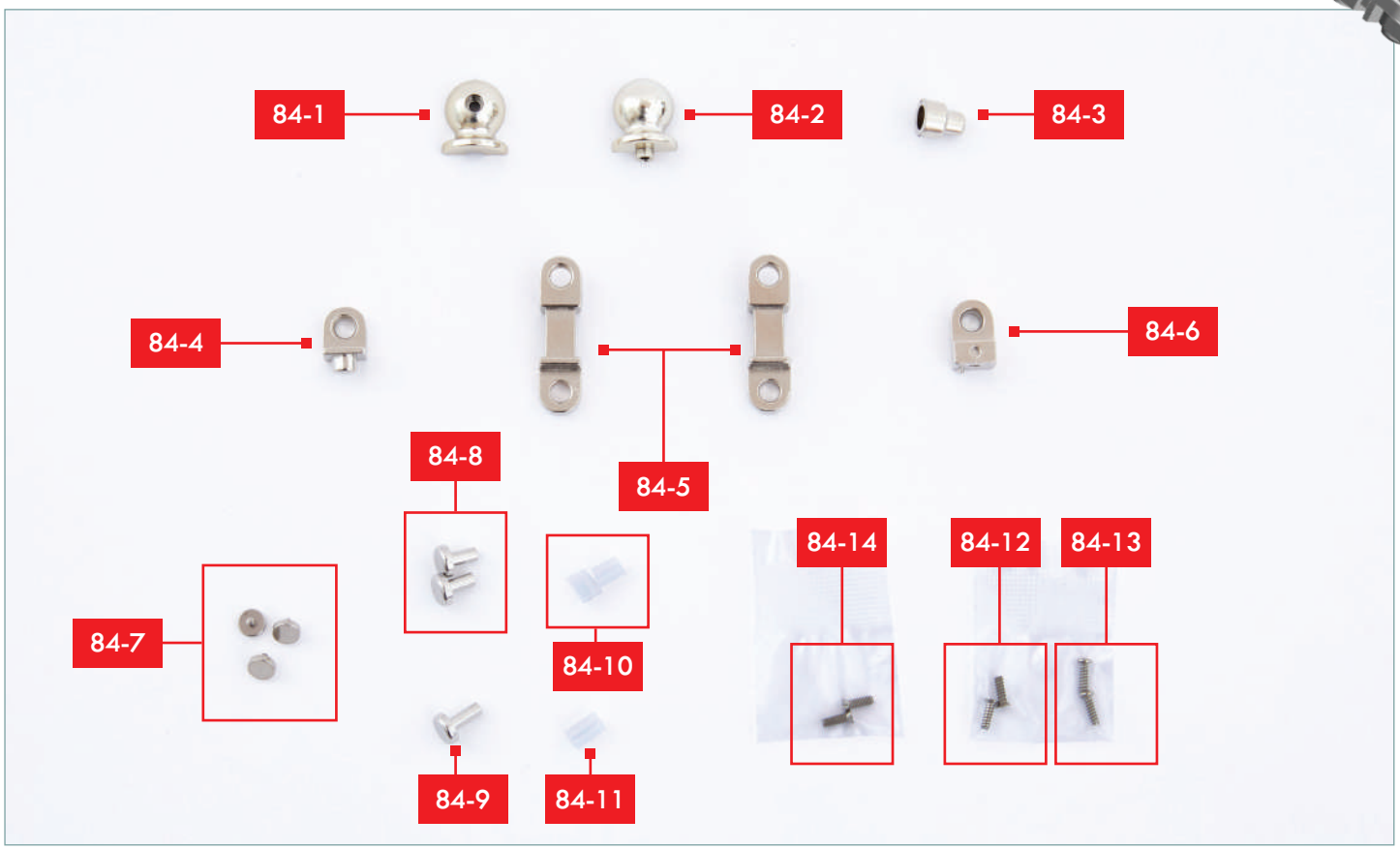


STAGE COMPLETE!

Another finger has been attached to the left hand. Three ball joints have been fitted to the base of the hand.

STAGE 84: CONSTRUCT THE LEFT THUMB

Assemble the thumb and connect it to the hand, and attach a large ball joint to the wrist.



LIST OF PIECES

84-1	Left wrist ball joint
84-2	Left wrist ball joint
84-3	Left thumb tip
84-4	Left thumb part
84-5	Left thumb part (x 2)
84-6	Left thumb part
84-7	Finger joint pin (x 3)
84-8	Finger joint connector (x2)
84-9	Finger joint connector (longer)
84-10	Plastic sleeve for finger joint (x2)
84-11	Plastic sleeve for finger joint (longer)
84-12	KB 2x6mm
84-13	PB 2x6mm
84-14	KM 2x6mm

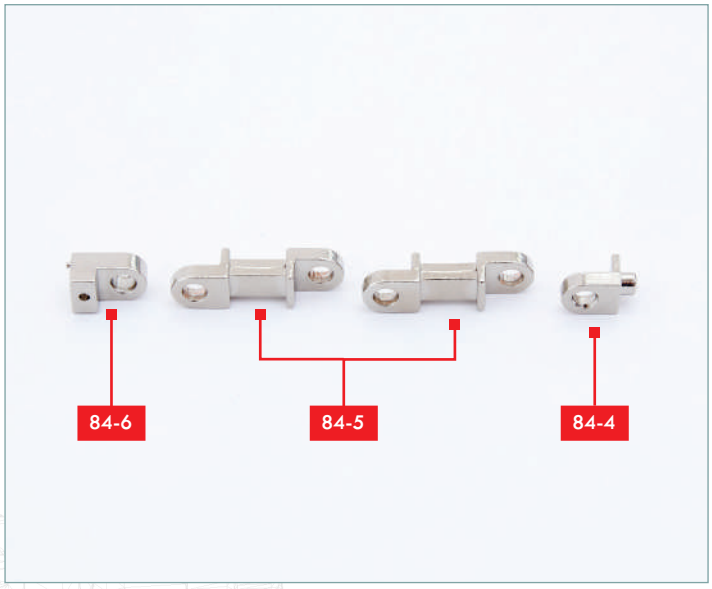
YOU WILL ALSO NEED

Gel-type superglue and a cocktail stick

Tweezers (optional)

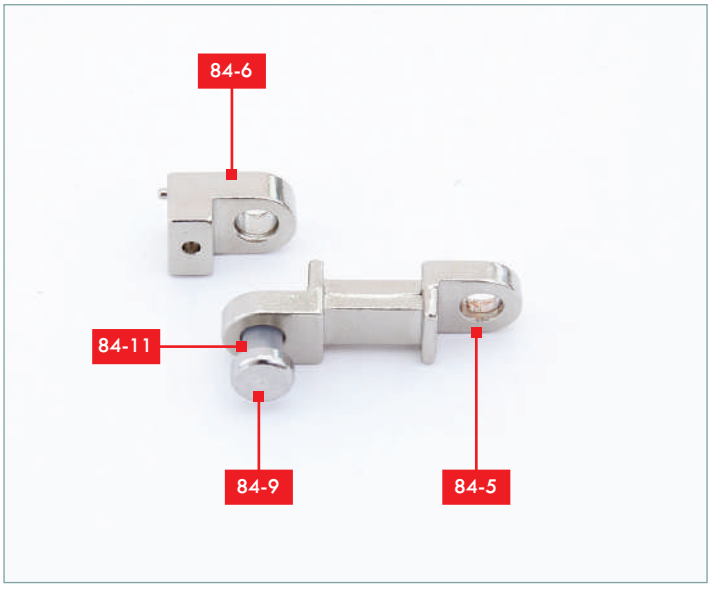
Fine crosshead screwdriver

Finished parts for left hand from stage 83



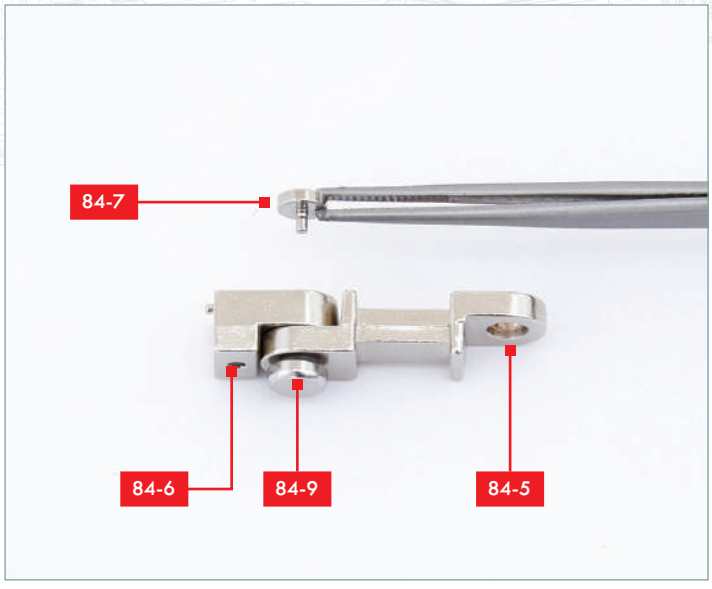
STEP 1

Place the finger parts **84-6, 84-5** and **84-4** in the order they are assembled, as shown.



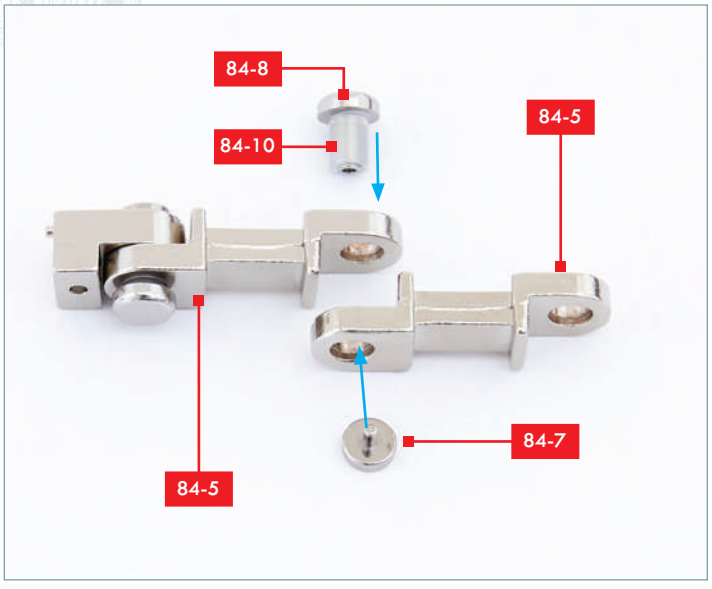
STEP 2

Fit a sleeve **84-11** (the longer one) over a longer finger joint connector **84-9**. Fit the connector up through a hole in one of the finger parts **84-5** and into the hole in part **84-6**.



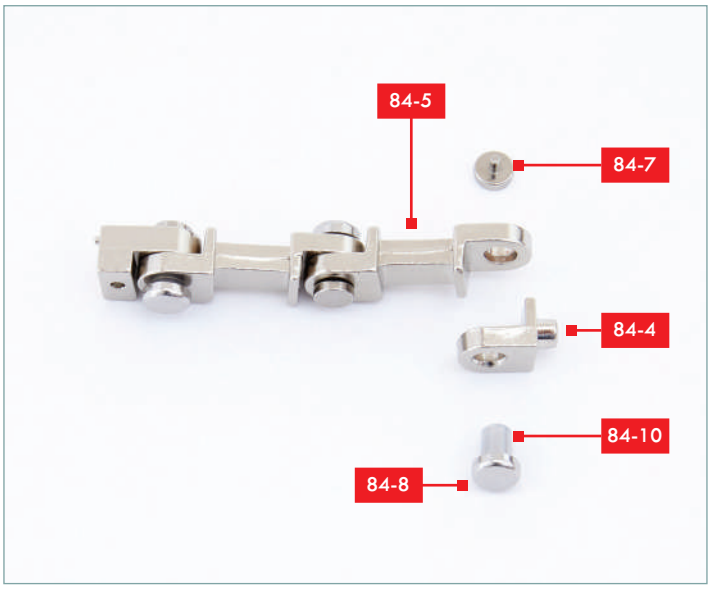
STEP 3

Apply a little superglue to the pin **84-7**. Fix it into the end of the finger connector **84-9** to hold it in place.



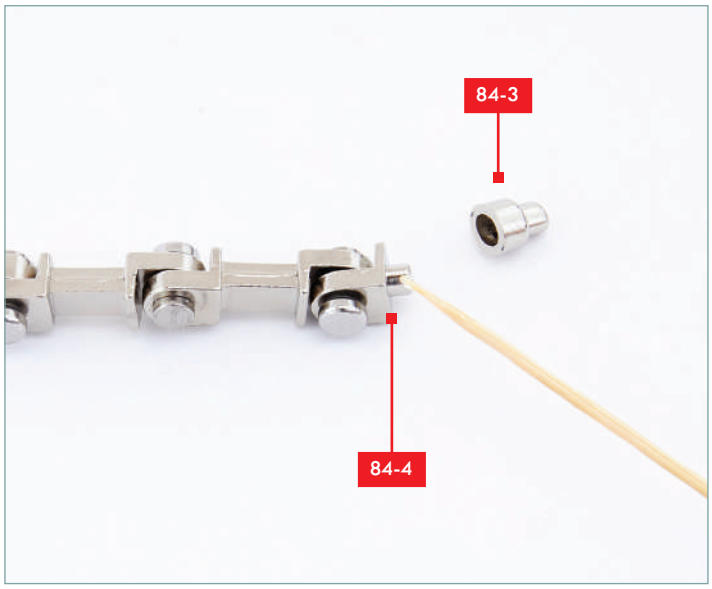
STEP 4

Fit a sleeve **84-10** on to a finger joint connector **84-8**. Fit the connector down through the free hole in part **84-5** (from step 3) and through one of the holes in the second part **84-5**, as shown. Apply a little superglue to a connector pin **84-7** and fix in place.



STEP 5

Fit a sleeve **84-10** on to a finger joint connector **84-8**. Fit the connector up through the hole in part **84-4** and through the free hole in the second part **84-5**, as shown. Apply a little superglue to a connector pin **84-7** and fix in place.



STEP 6

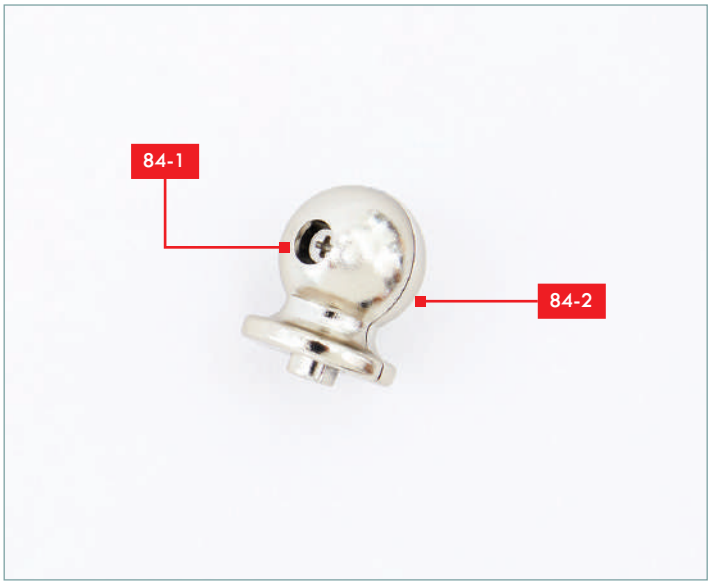
Apply a little superglue to the peg on the end of part **84-4**. Fix the tip of the thumb **84-3** in place on the peg.

STEP 7

Take the two halves of the ball joint **84-2** and **84-1** and a **PB** 2 x 6mm screw (pan head). Check how the parts fit together.

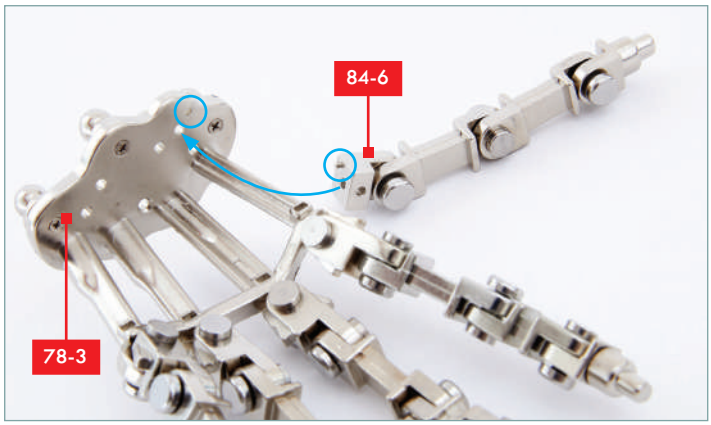
EXPERT TIP!

Take some time to identify the screws correctly. The KM screws have a finer thread than the KB screws (which have a similar thread to the PB screws). The PB screws are pan head screws; the KB and KM screws have countersunk heads.



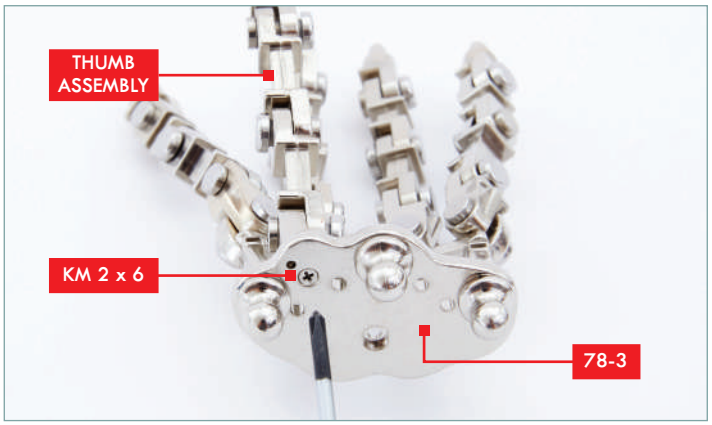
STEP 8

Fix parts **84-2** and **84-1** together with the **PB** 2 x 6mm screw. Ensure it is fully tightened so that a 'ball' is formed.



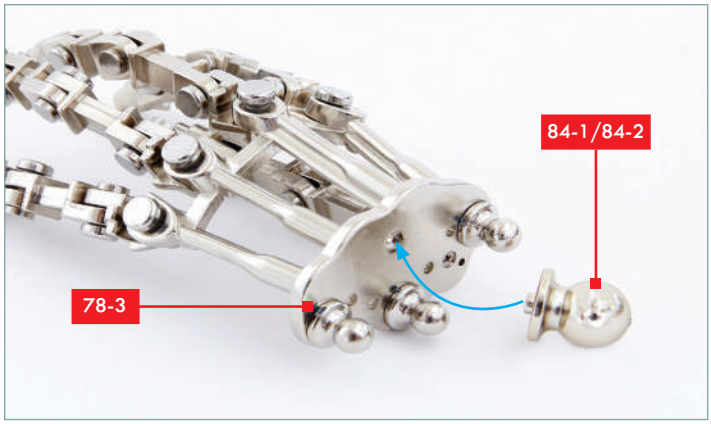
STEP 9

Take the hand assembly from stage 83 and the thumb assembly from steps 1 – 6. Identify the screw holes in the hand and the base of the thumb, which should be aligned (blue arrow). At the same time, a locating peg on the base of the thumb **84-6** fits into a small hole in the hand (blue circles).



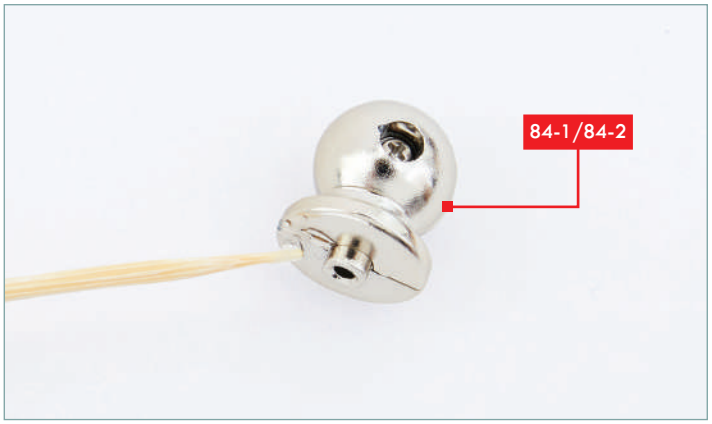
STEP 10

With the thumb positioned correctly, fix it in place with a **KM** 2 x 6mm screw (countersunk head, fine thread for metal).



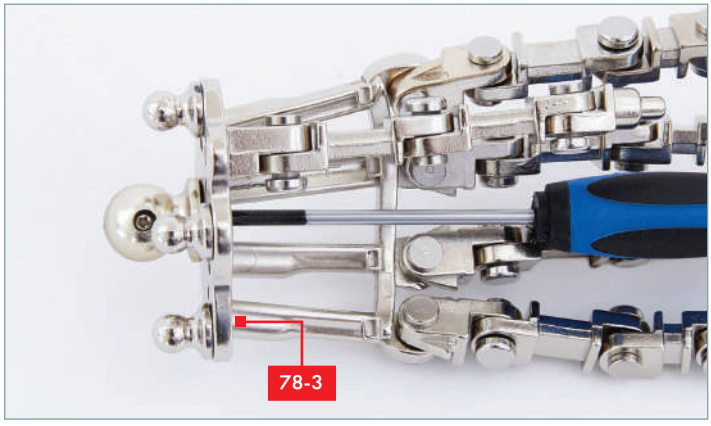
STEP 11

Check the fit of the ball joint **84-1**/**84-2** in the base of the hand **78-3**.



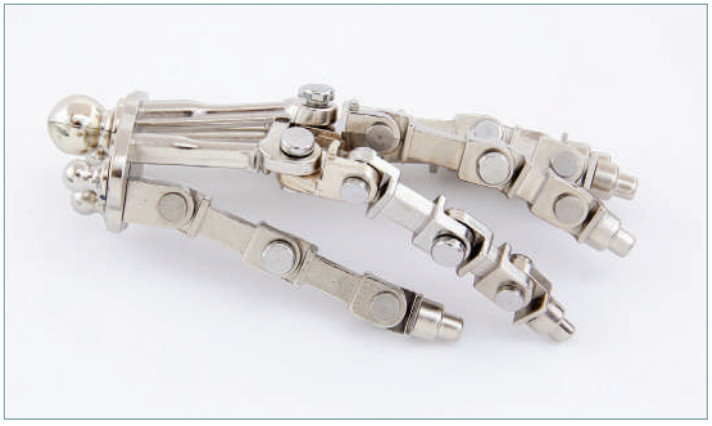
STEP 12

Apply a little superglue to the flat base of the ball assembly **84-1**/**84-2**.



STEP 13

Fit the ball joint into the base of the hand **78-3**, ensuring that the face with the screw is facing inwards. Use a **KB** 2 x 6mm screw (countersunk, for plastic, with wider thread) to firmly fix the ball in place. Ensure that this is a secure joint.

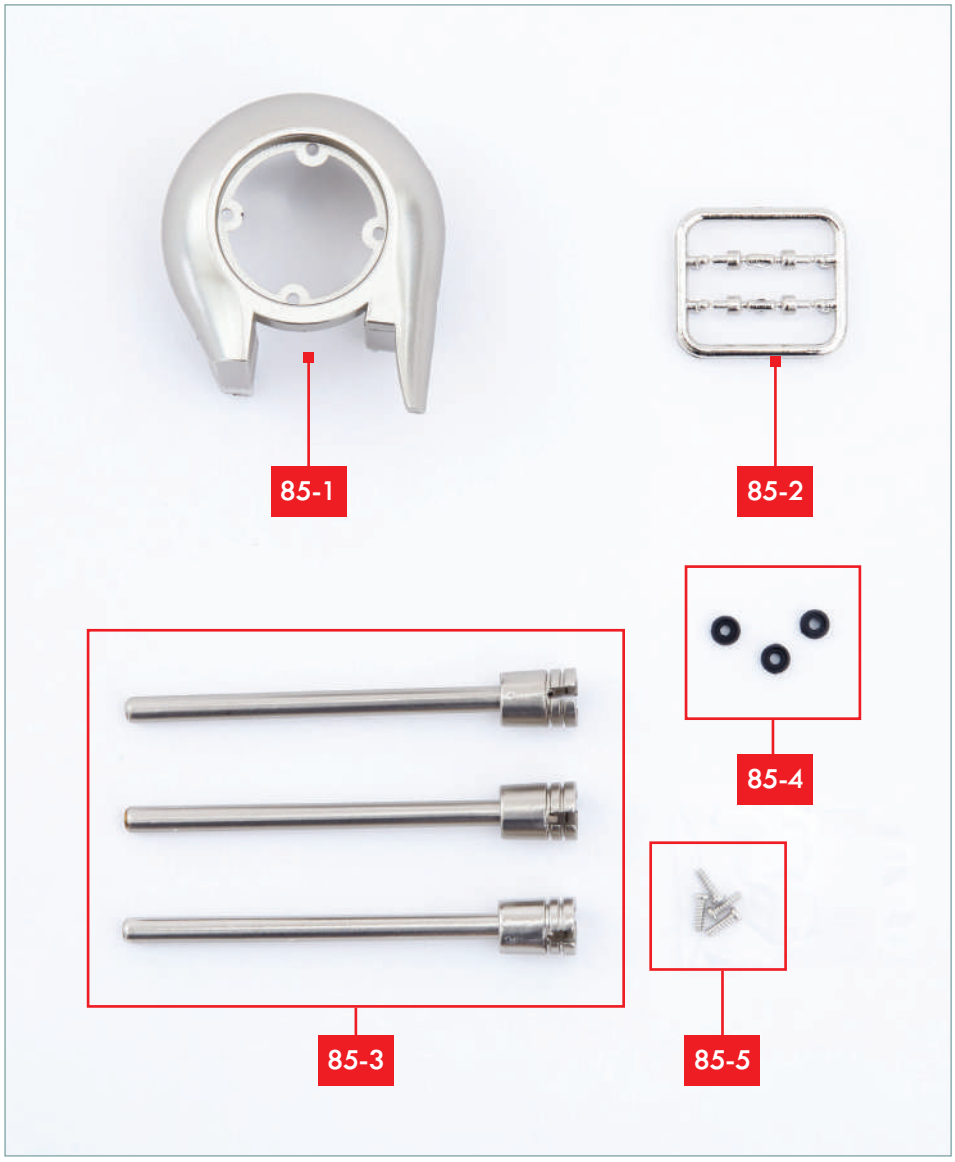


STAGE COMPLETE!

The thumb has been attached to the left hand and a ball joint has been fixed in place.

STAGE 85: EXTEND THE LOWER LEFT ARM, AND CONNECT IT TO THE HAND

Affix the left hand to the lower arm by constructing three arm shafts and four muscle springs.

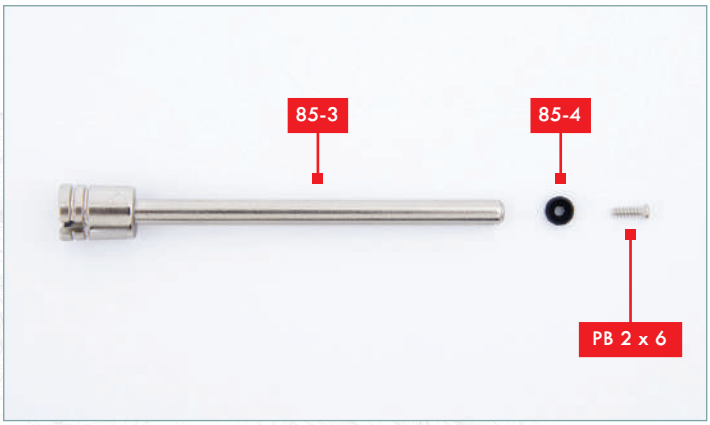


LIST OF PIECES

85-1	Left leg joint section
85-2	Left hand muscle connector (x 4)
85-3	Lower arm shaft (x 3)
85-4	Rubber washers (x 3)
85-5	Four PB 2 x 6mm screws (1 spare)

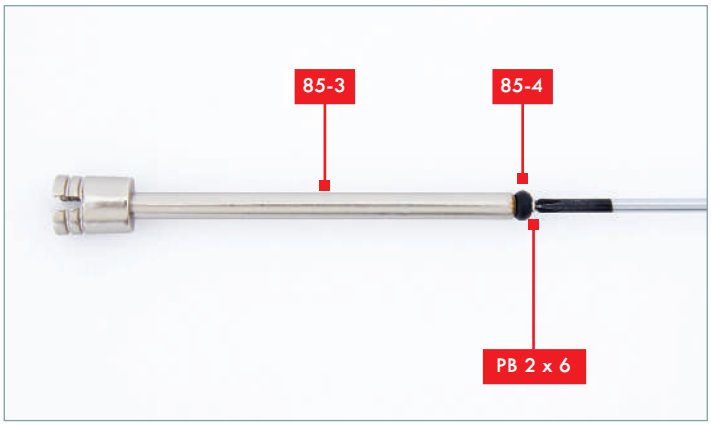
YOU WILL ALSO NEED

- Gel-type superglue and a cocktail stick
- Tweezers (optional)
- Fine crosshead screwdriver
- Hand assembly from stage 84
- Arm assembly from stage 82



STEP 1

Take one of the lower arm shafts **85-3**. Fit a rubber washer **85-4** on to the end of it. Have a **PB** 2 x 6mm screw ready.

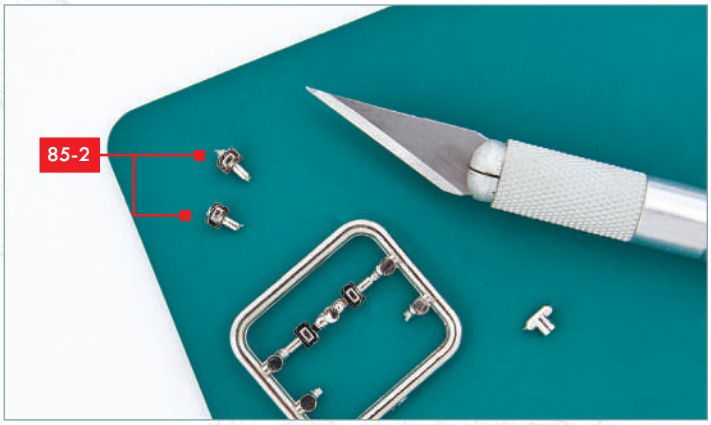


STEP 2

Fix the rubber washer **85-4** in place with a **PB** 2 x 6mm screw. Do not over tighten it – the washer should just about be able to revolve.

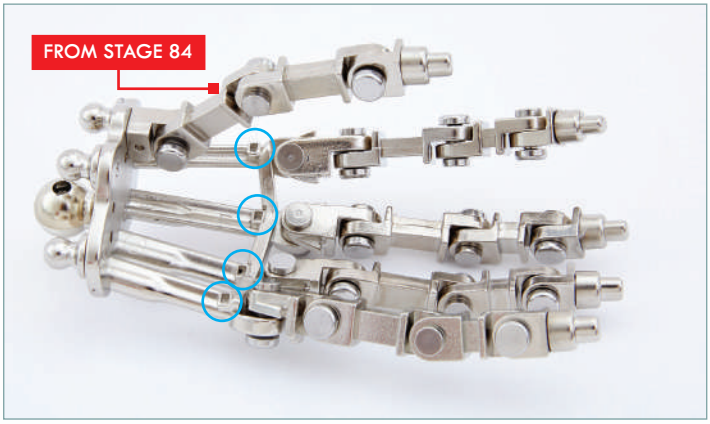
STEP 3

Repeat to fit the remaining two rubber washers **85-4** to the other two lower arm shafts **85-3**.



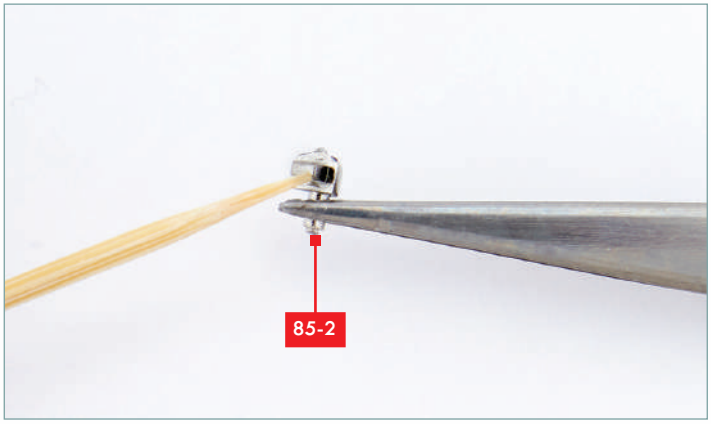
STEP 4

Cut the muscle (spring) connectors **85-2** from the frame.



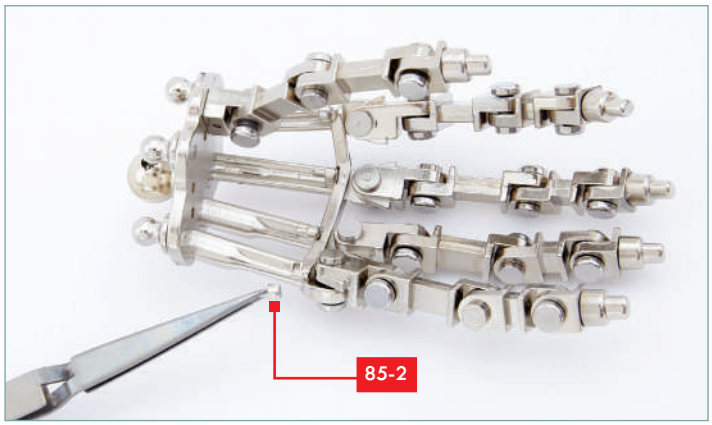
STEP 5

Take the hand assembly from stage 84. Identify four rectangular sockets (circled), one at the base of each finger.



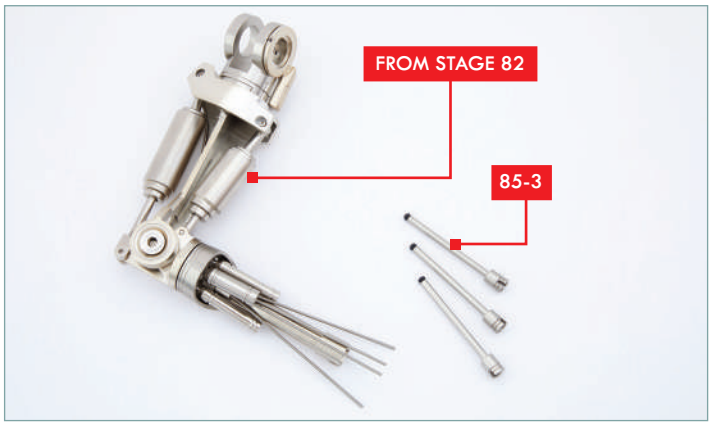
STEP 6

Holding the long, cylindrical 'tail' of the first connector **85-2**, apply a little superglue to the rectangular peg.



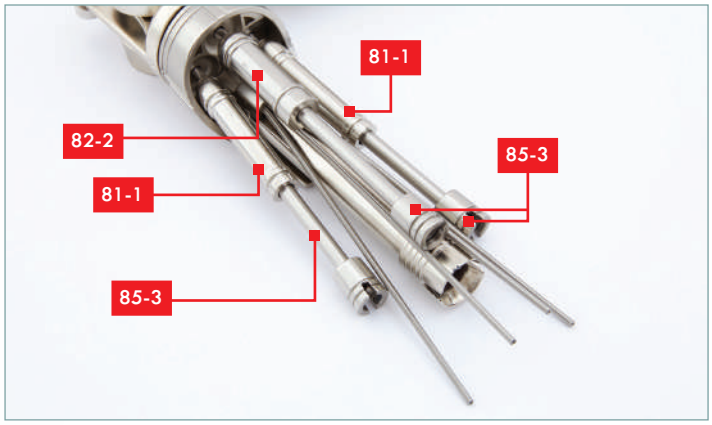
STEP 7

Fit the connector **85-2** into one of the rectangular sockets in the hand. Repeat to fit all four connectors in place.



STEP 8

Take the left arm assembly from stage 82 and the three lower arm shafts (with rubber washers) **85-3**.

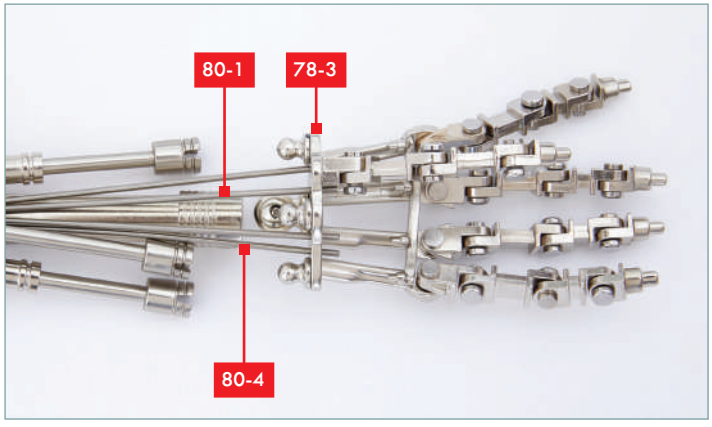


STEP 9

Fit the three shafts **85-3** into the three hollow shafts already fitted to the lower arm (two x **81-1** and one x **82-2**). Insert the ends with rubber washers first.

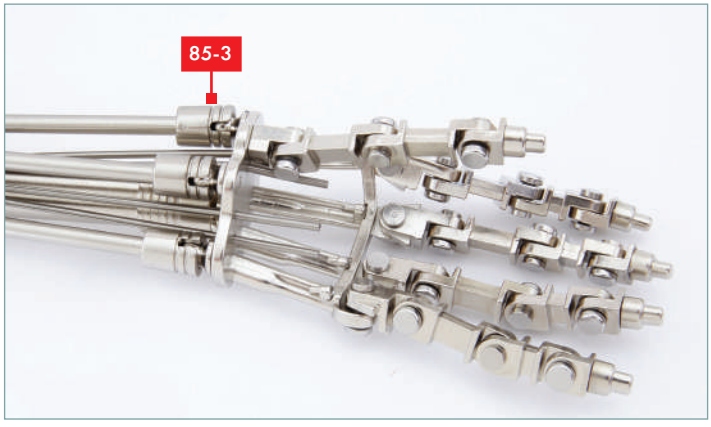
STEP 10

Take the hand assembly from step 7. Check that the larger ball joint is firmly fixed. Identify four holes in the base of the hand **78-3** (circled). The springs will pass through these holes.



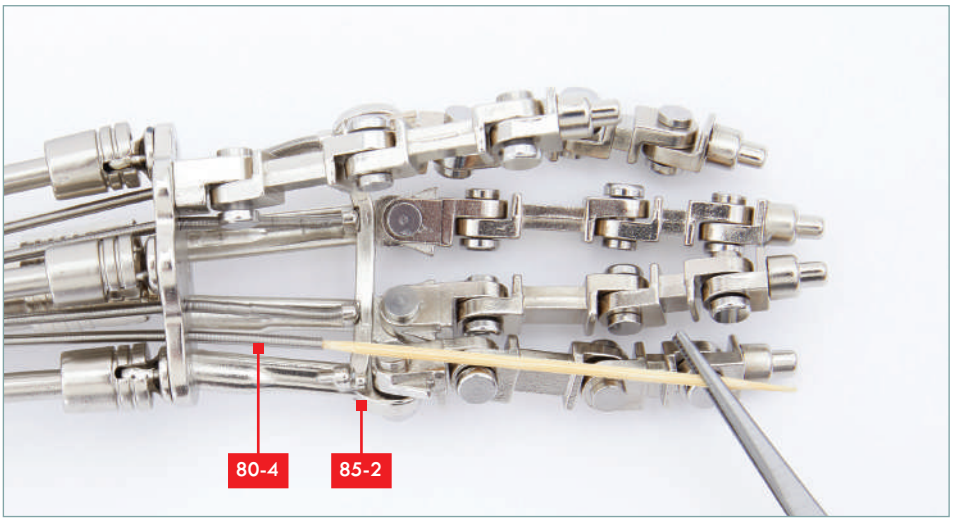
STEP 11

Thread the four muscle springs **80-4** through the corresponding holes in the base of the hand **78-3**. Apply a little lubricant to the large ball joint and check that the socket on part **80-1** is directly aligned with it.



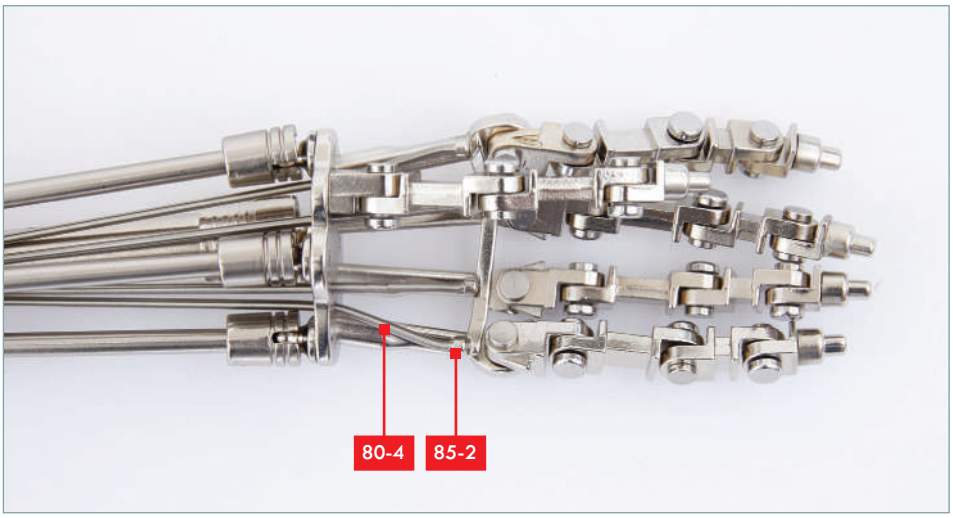
STEP 12

Fit the sockets on the lower arm assembly over the ball joints on the base of the hand. You will need to push the larger socket **80-1** firmly over the larger ball joint until it clicks in place. Take care to apply the pressure without twisting it at an angle. Fit the other three sockets **85-3** over the smaller ball joints.



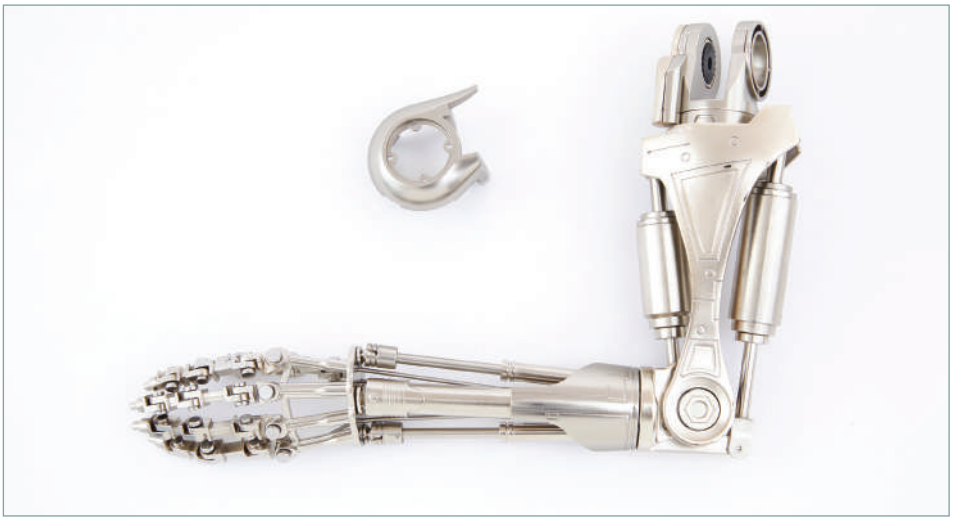
STEP 13

Ensure that the four springs **80-4** are still running through the holes in the base of the hand. Using a cocktail stick, apply a little superglue inside the end of the first spring and fit it onto the tail of the corresponding connector **85-2**. (You may find it easier to twist the springs clockwise as you fit them). Repeat the process for the remaining three springs as shown below.



STEP 14

The photograph shows the four springs **80-4** connected to parts **85-2**.

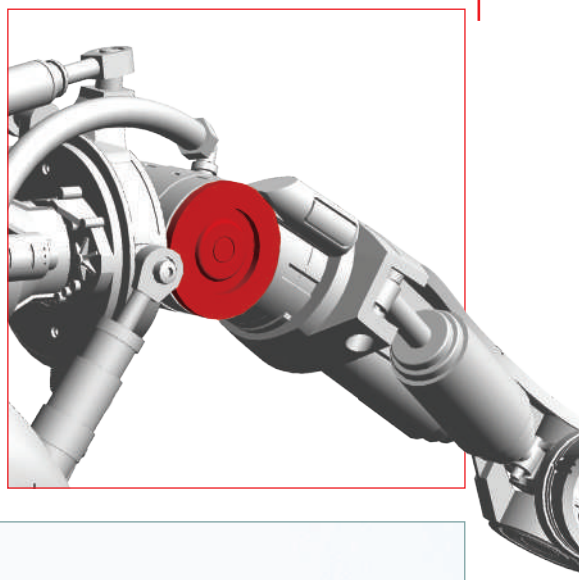


STAGE COMPLETE!

The left hand has been connected to the arm, with spring muscles in place. Part **85-1** will be used in a future stage.

STAGE 86: ASSEMBLE THE SHOULDER, AFFIX THE LEFT ARM TO THE BODY, AND COLLECT A HIP JOINT

Put the shoulder together, and add some symmetry to your T-800 Endoskeleton by connecting the left arm.

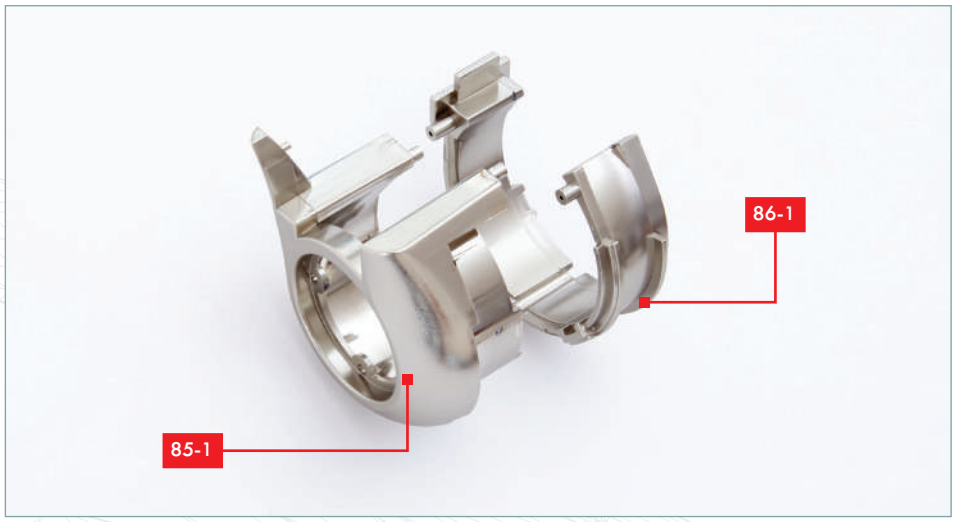


LIST OF PIECES

86-1	Left leg joint section
86-2	Left shoulder pin
86-3	Left shoulder joint cap
86-4	Left shoulder joint connector
86-5	Left shoulder joint washer (the second washer will be used in a later stage)
86-6	2 x PM 3 x 10mm Allen screws (1 spare)

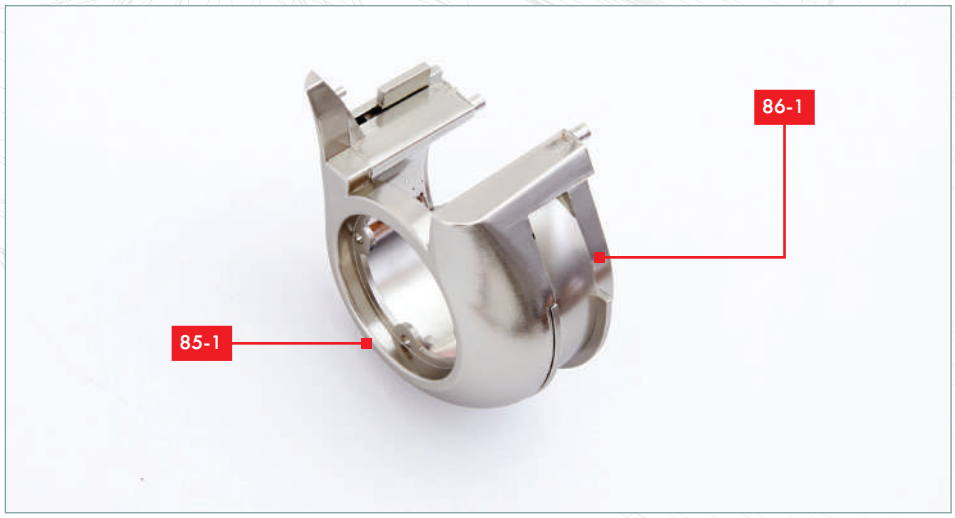
YOU WILL ALSO NEED

- Gel-type superglue and a cocktail stick
- Tweezers (optional)
- Allen key supplied with stage 26
- Arm assembly from stage 85
- Body assembly from stage 71



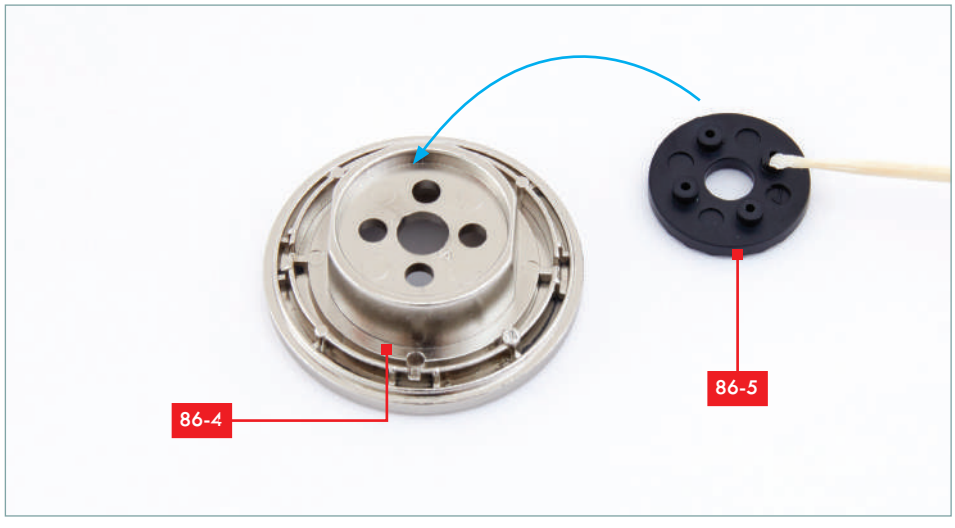
STEP 1

Take the two left shoulder joint sections **85-1** and **86-1** and arrange them as shown.



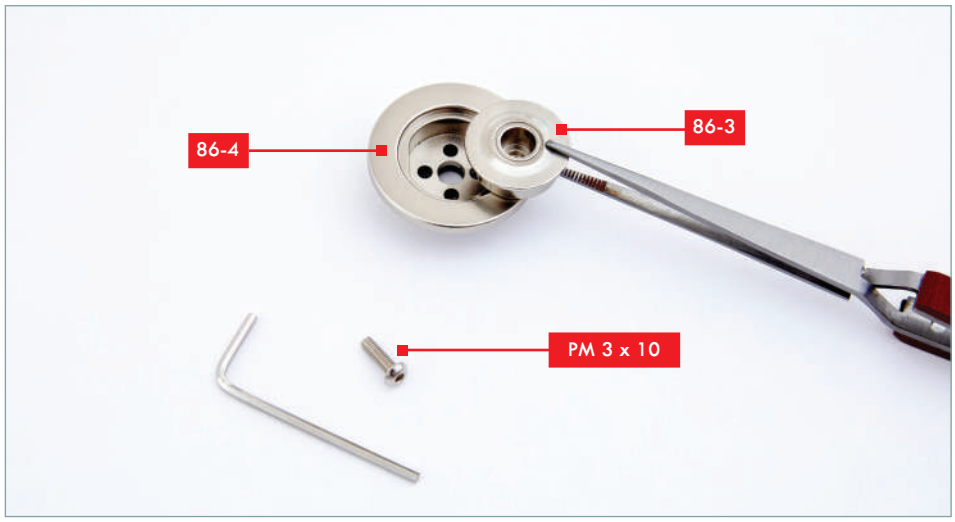
STEP 2

Push the parts together to create a shoulder joint as shown. No glue is needed.



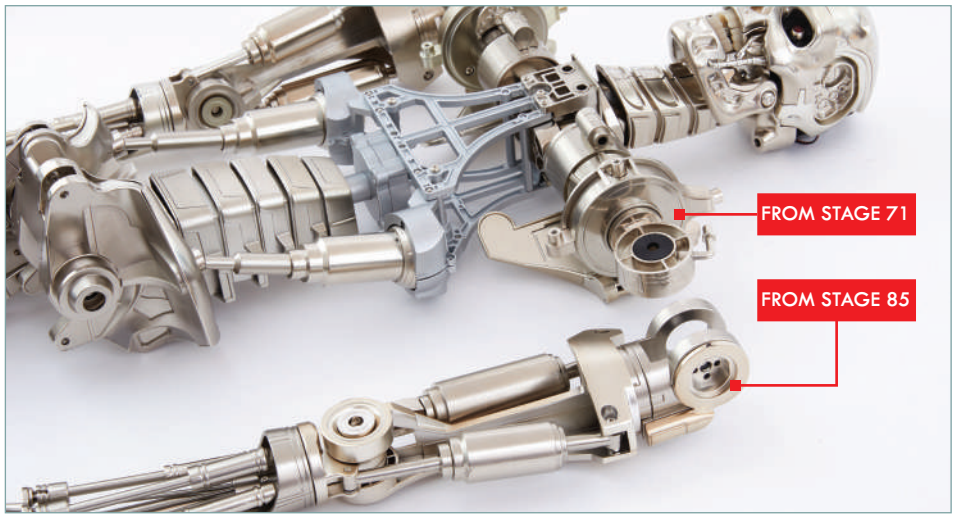
STEP 3

Apply a little superglue to the four pegs on the shoulder joint washer **86-5**. Fit the washer into the recess on part **86-4** as indicated.



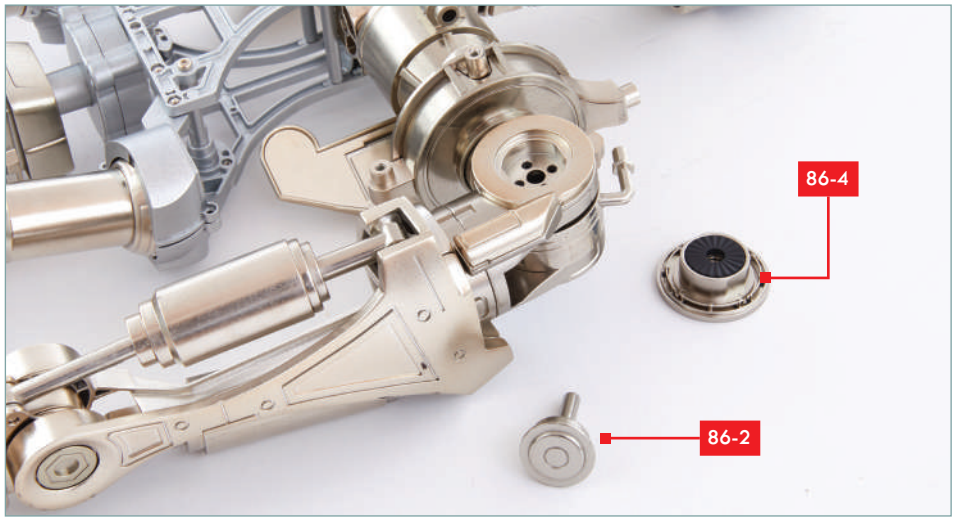
STEP 4

Turn part **86-4** over and fit the shoulder joint cap **86-3** into the recess, as shown. Have a PM 3 x 10mm Allen screw and Allen key ready.



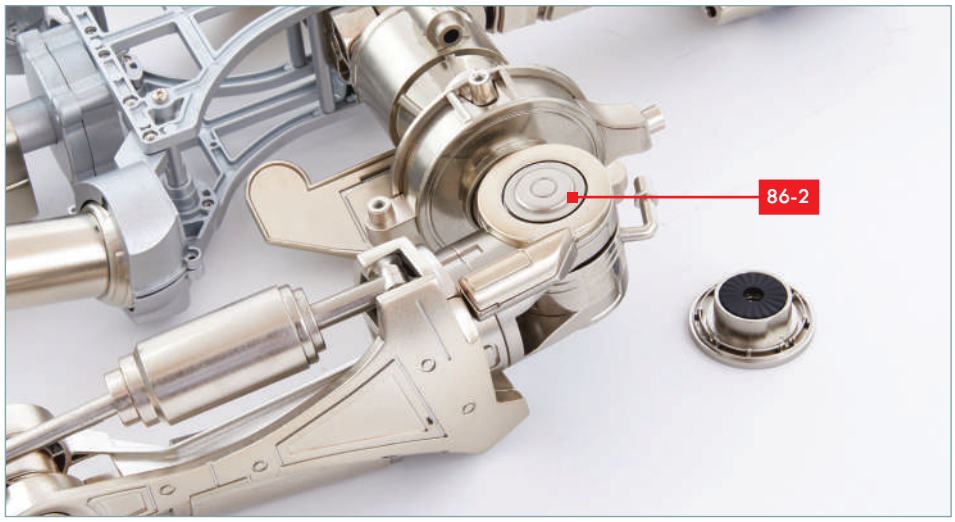
STEP 5

Take the main model assembly from stage 71 and the left arm from stage 85. Lay them on your worktop so that you can access the left shoulder joint.



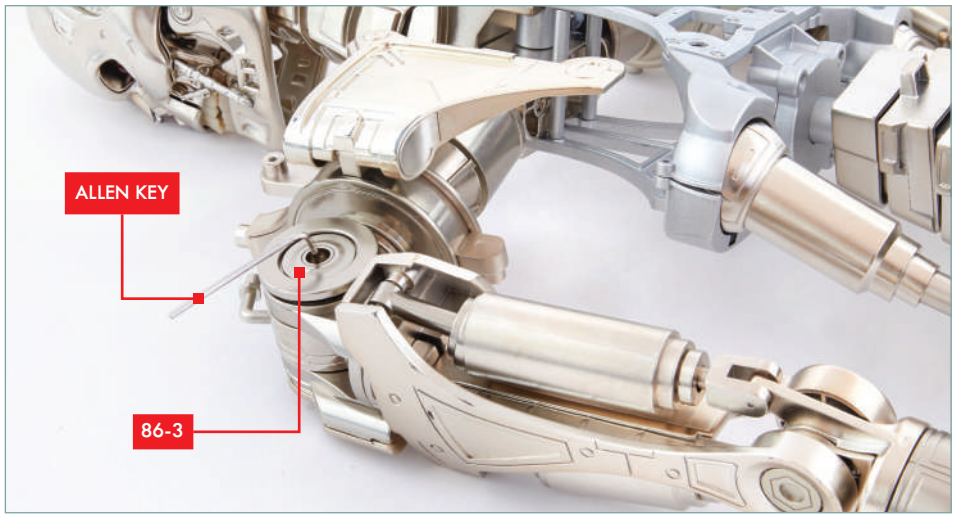
STEP 6

Fit the two parts of the shoulder joint on the top of the left arm over the shoulder joint on the side of the body. Have the shoulder joint pin **86-2** and the other parts of the shoulder joint **86-4**/**86-3**/**86-5** ready.



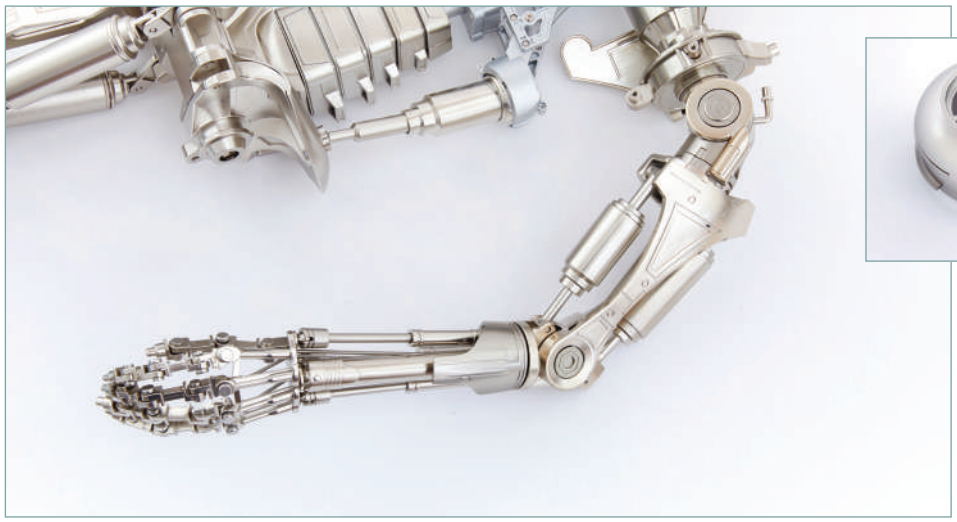
STEP 7

Fit the shoulder joint pin **86-2** into the shoulder joint, inserting it from the front of the model.



STEP 8

Holding the pin **86-2** in place, turn the model over. Fit the assembly **86-4**/**86-3**/**86-5** into the back of the shoulder joint. Fix in place with the hex socket **PM** 3 x 10mm Allen screw.

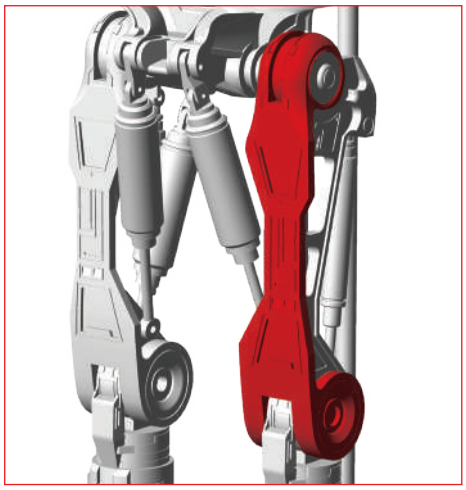


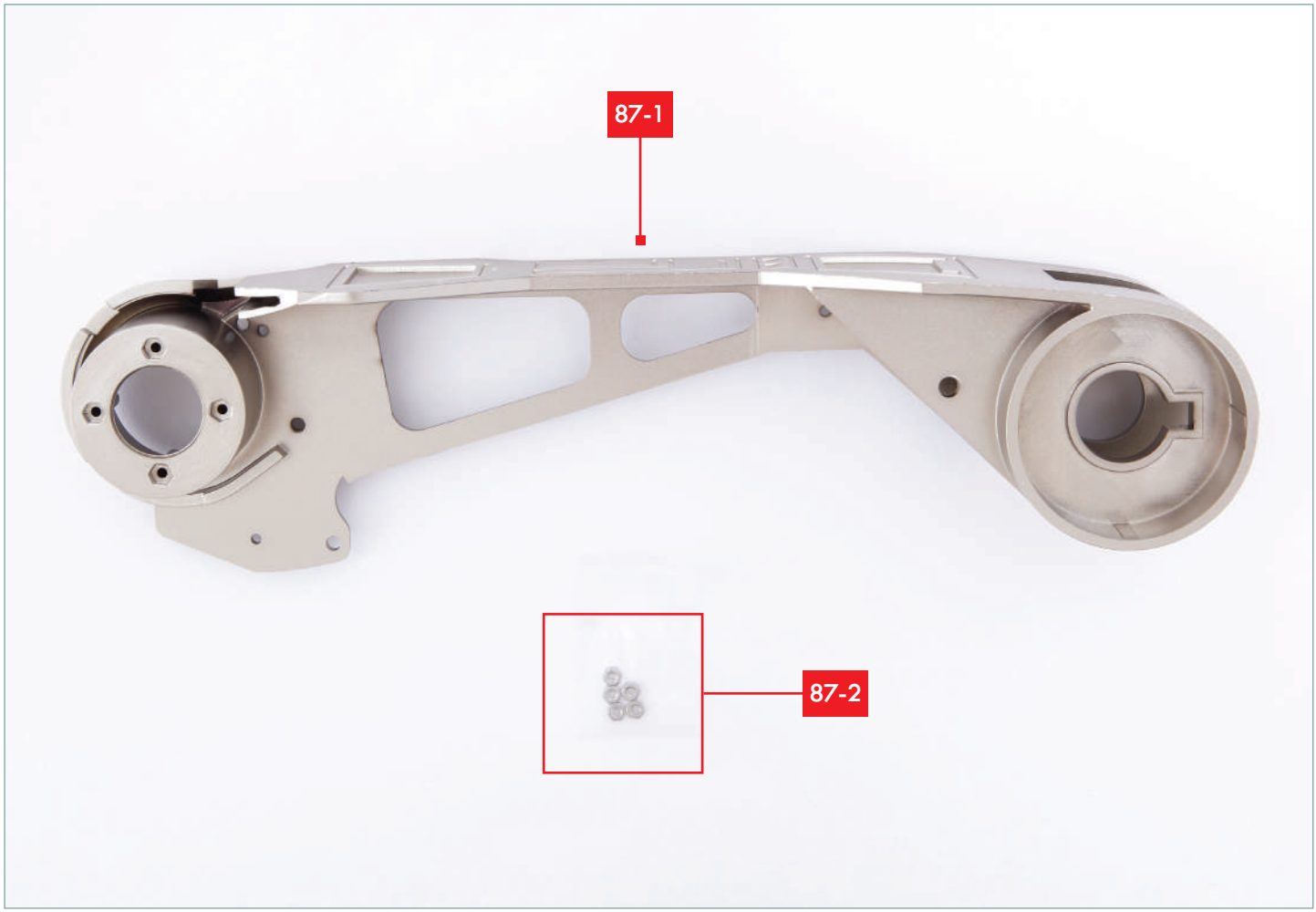
STAGE COMPLETE!

The left arm has been connected to the rest of the model. The hip joint assembly **85-1**/**86-1** and the spare washer, part **86-5**, (above) will be used in a future stage so store them carefully.

STAGE 87: FITTING A JOINT MECHANISM TO THE LEFT THIGH

Combine a left leg joint assembly with the new thigh component.





LIST OF PIECES

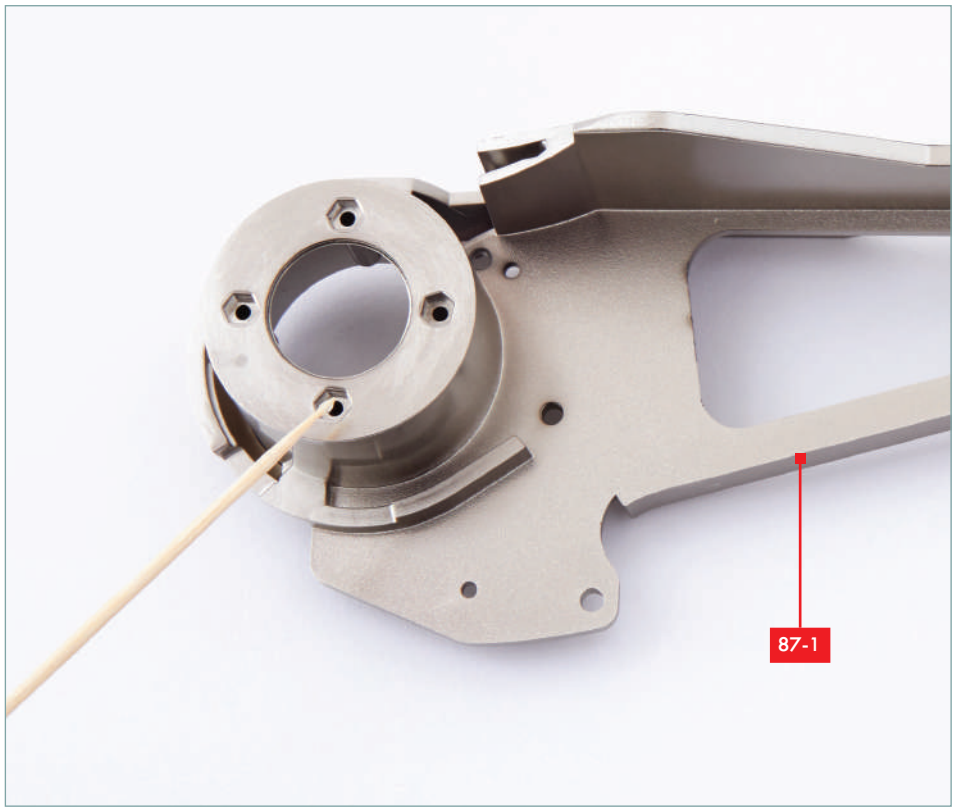
87-1	Left thigh
87-2	5 x M2 nuts (1 spare)

YOU WILL ALSO NEED

Tweezers (optional).

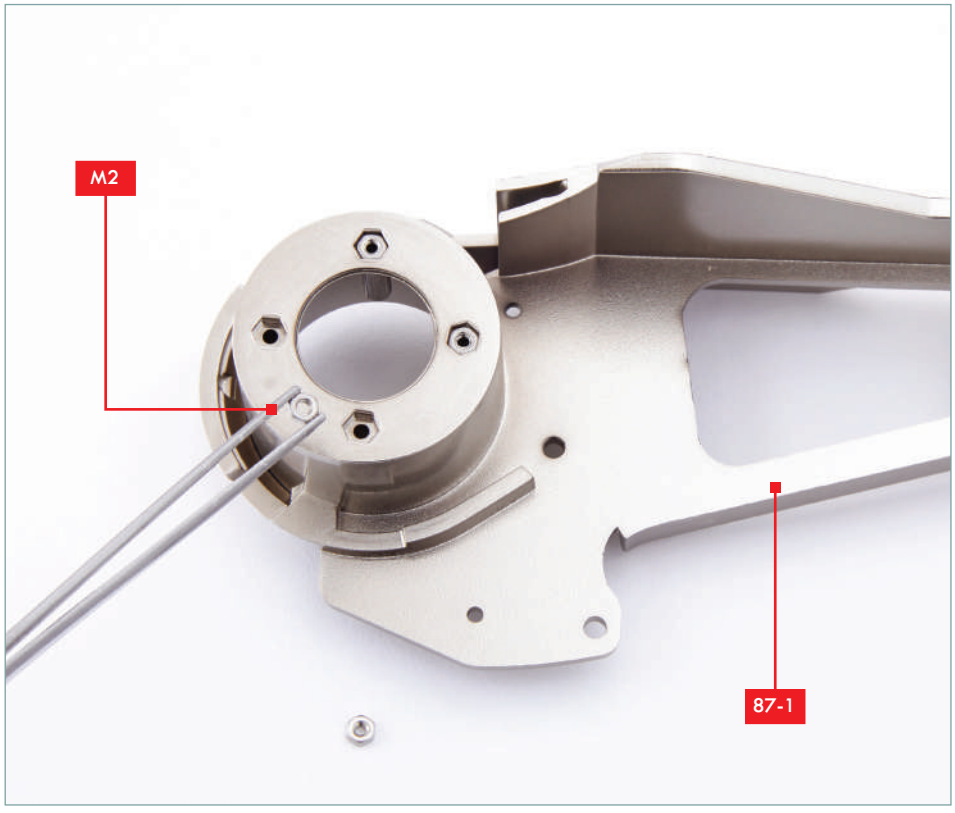
Leg joint assembly from stage 86.

Superglue and a cocktail stick.



STEP 1

Take the left thigh, part **87-1**. One at a time, apply a little superglue in the hexagonal recesses in the 'hip' end of the thigh.

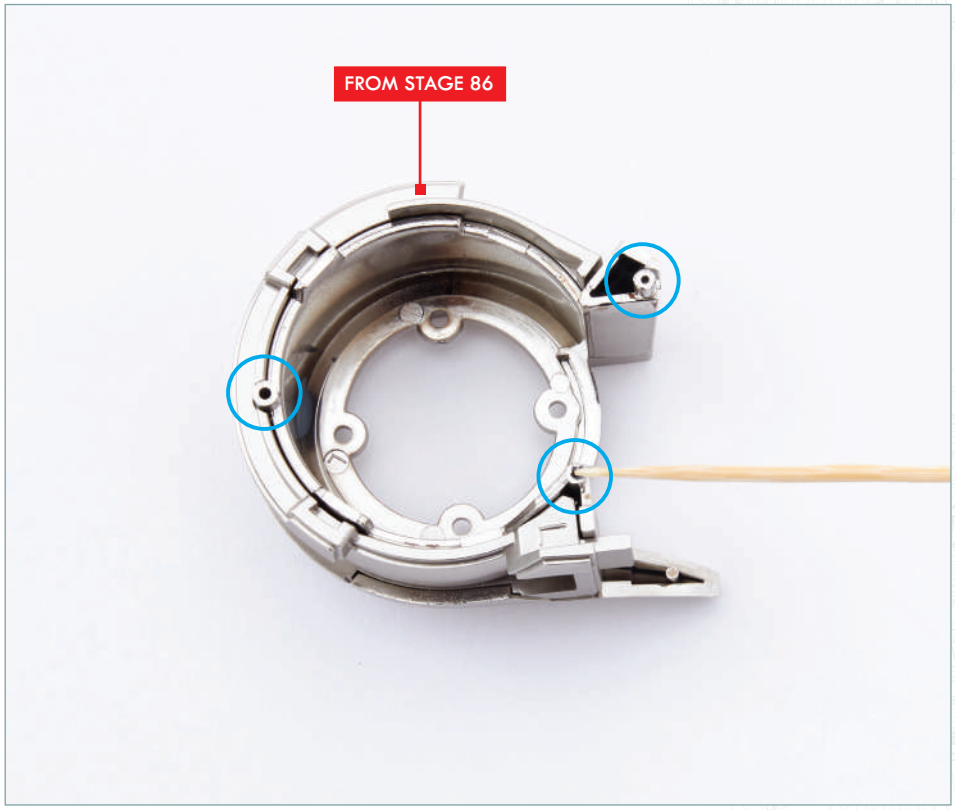


STEP 2

After applying glue to a recess, fit an **M2** nut in place, ensuring the nuts sit flat in the recesses.

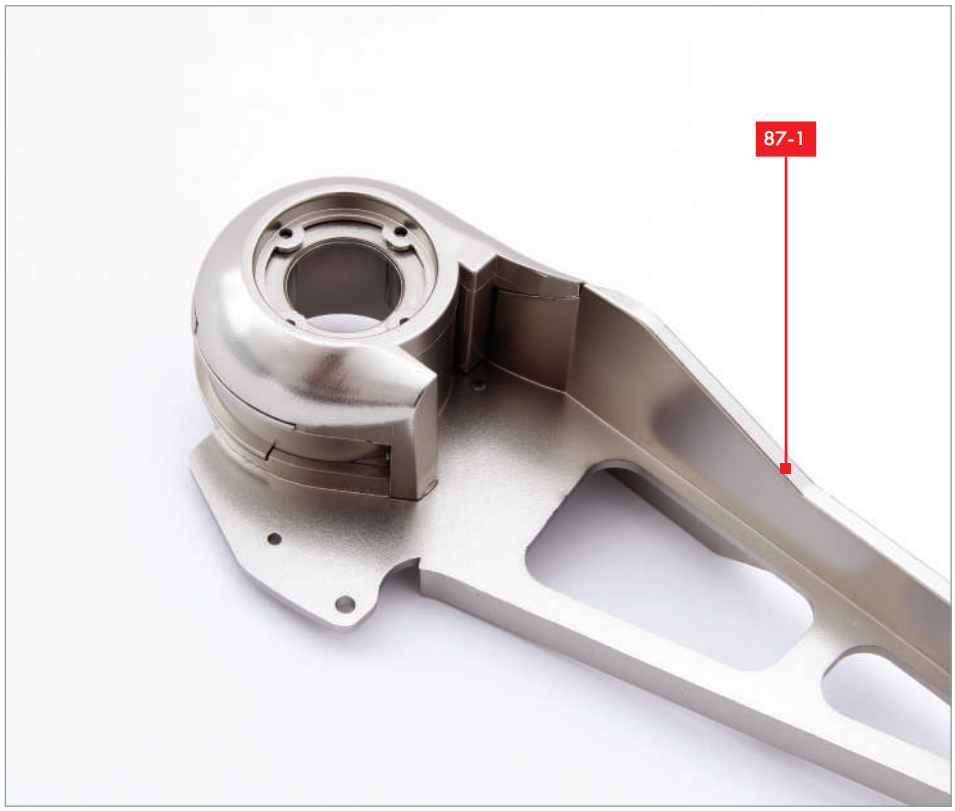
STEP 3

With all four **M2** nuts in place, take the leg joint assembly from stage 86. Check how it fits over the end of the thigh **87-1**.



STEP 4

Turn the joint assembly from stage 86 so that you can access the inside. Apply a little superglue to the three raised pegs (circled).



STEP 5

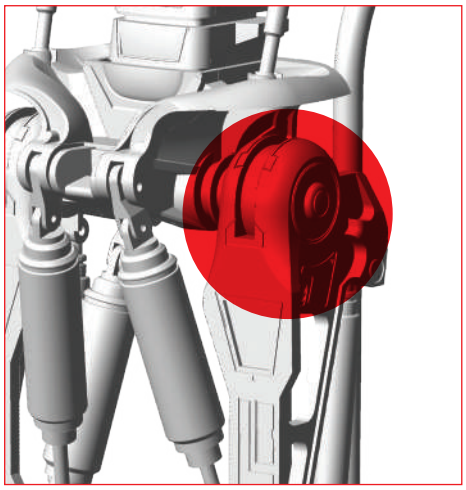
Fit the leg joint assembly in place on the end of the thigh.

STAGE COMPLETE!

A joint has been fitted to the top of the left thigh.

STAGE 88: ASSEMBLING THE LEFT HIP JOINT

Attach the left hip to the pelvis after constructing the interior joint.



LIST OF PIECES

88-1	Hip joint	**88-5**	Outer cap for hip joint
88-2	Inner casing for hip joint	**88-6**	5 x PM 2 x 18mm screws (1 spare)
88-3	Outer casing for hip joint	**88-7**	2 x PM 3 x 8mm screws (1 spare)
88-4	Domed cap for hip joint		

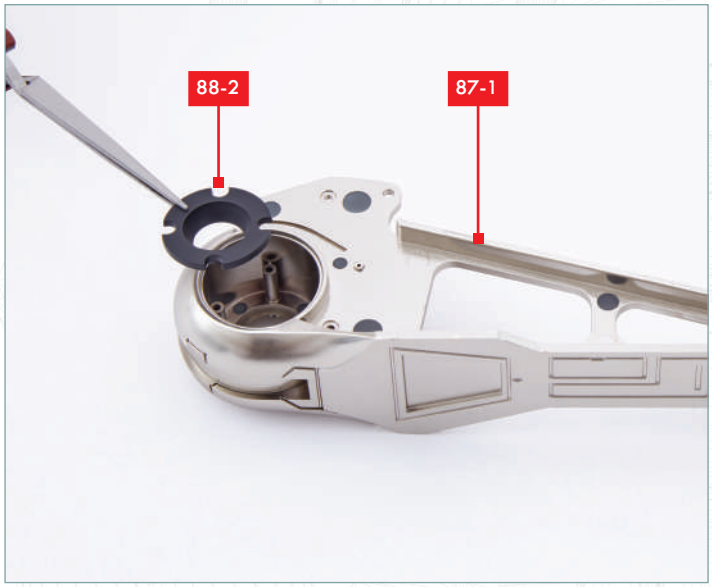
YOU WILL ALSO NEED

Tweezers (optional)

The thigh assembly and model assembly from previous issues

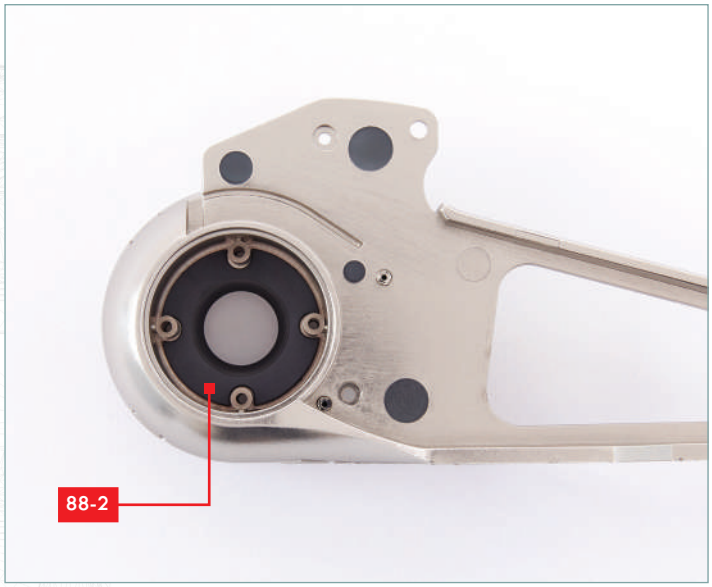
A fine cross-head screwdriver

Superglue and a cocktail stick



STEP 1

Take the thigh from stage 87 and place it in the orientation shown. Fit the inner hip joint casing **88-2** into the opening for the hip joint. The flat surface of part **88-2** is upwards, as shown.

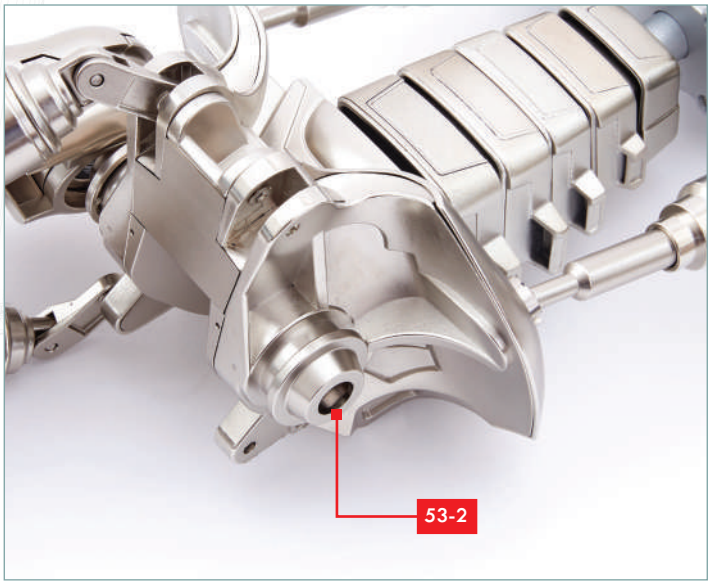


STEP 2

Ensure that the recesses in part **88-2** fit around the screw sockets inside the joint.

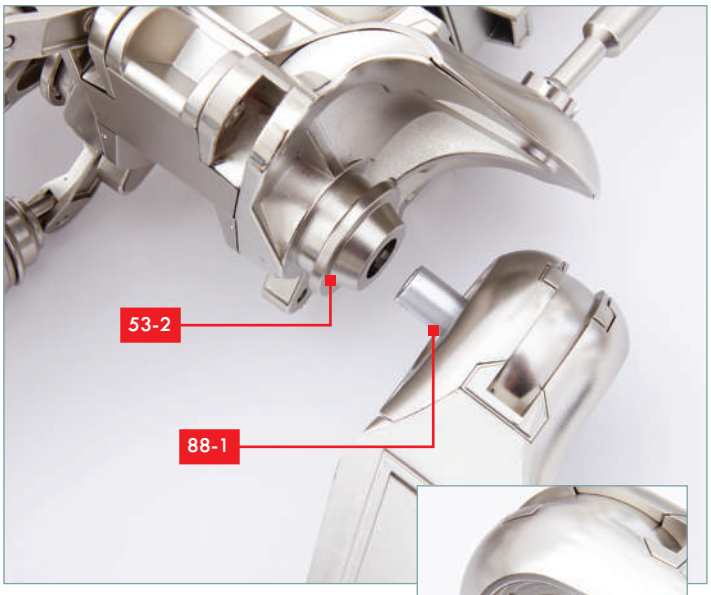
STEP 3

Fit the hip joint **88-1** inside the joint opening so that it sits in the inner joint casing **88-2**.



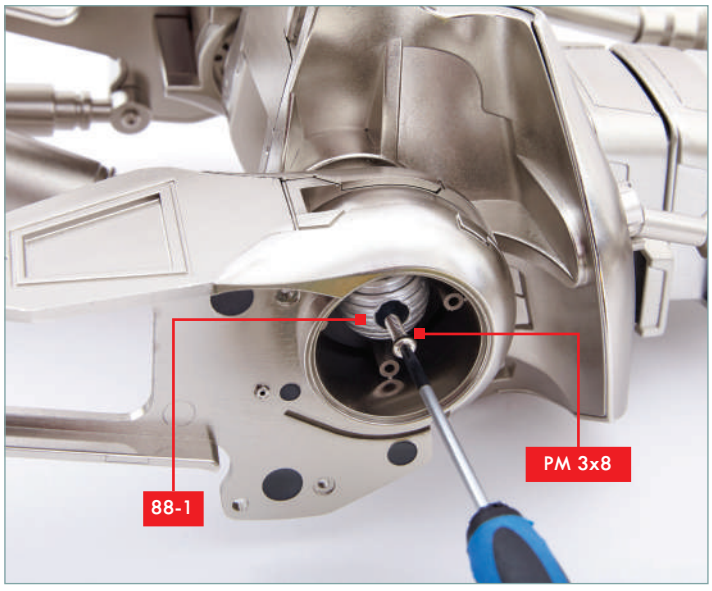
STEP 4

Take the model assembly and identify the hip socket **53-2**.



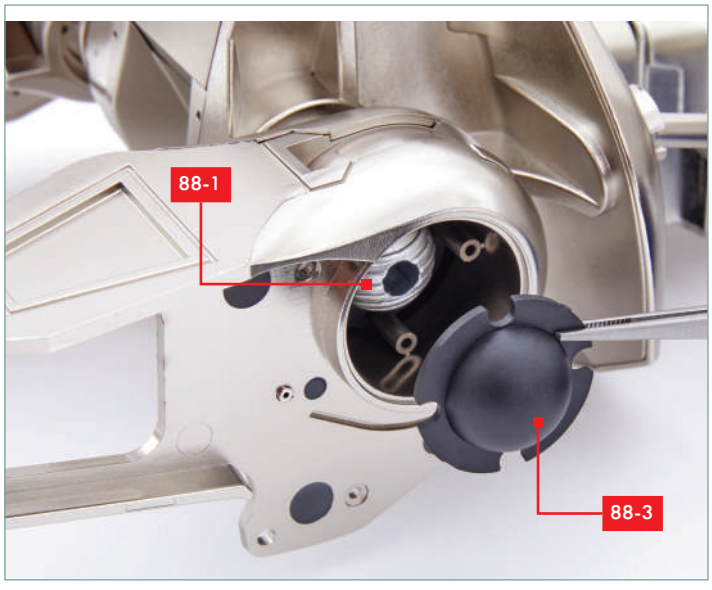
STEP 5

Fit the stem of the hip joint **88-1** into the hip socket **53-2**. Note that there are two notches on the hip socket **88-1** that have to be fitted over raised bars inside the hip socket (see arrows on inset).



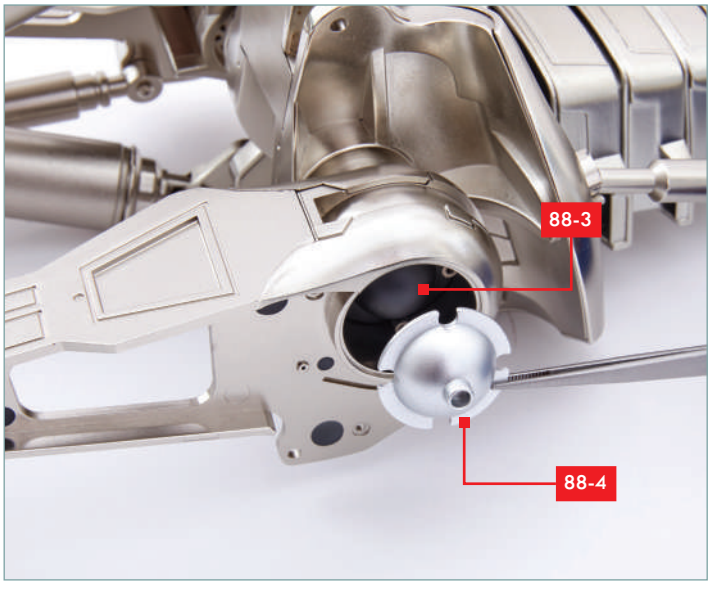
STEP 6

Fix part **88-1** in place with a **PM** 3 x 8mm screw. At this stage, the joint will be quite loose.



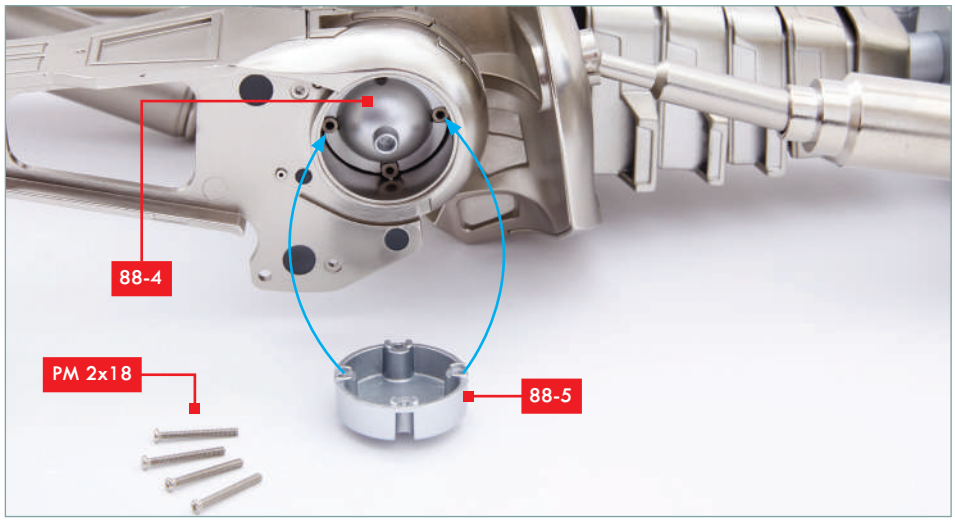
STEP 7

Fit the outer hip joint casing **88-3** over the ball of the hip joint **88-1** so that the notches round the edge of part **88-3** fit around the raised screw sockets on the inside of the hip joint.



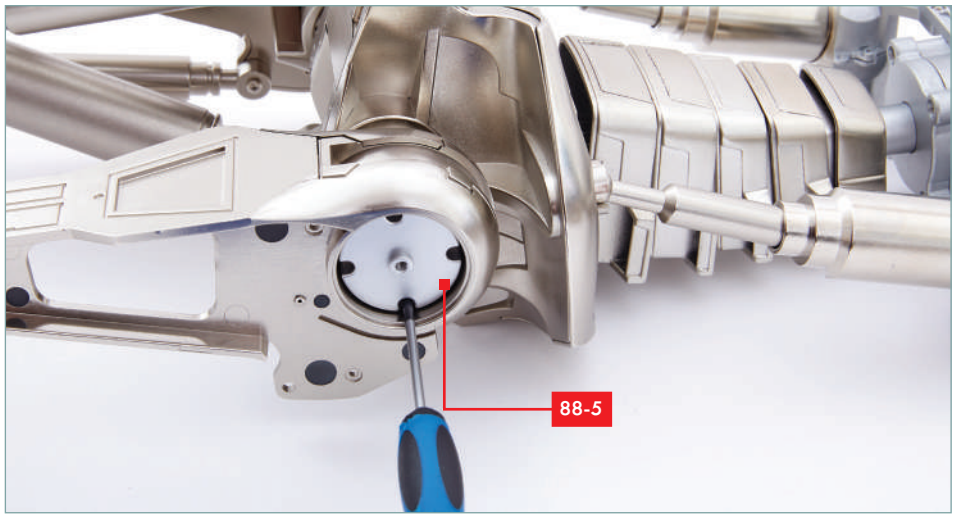
STEP 8

Fit the metal domed hip joint cap **88-4** over the casing **88-3**. Again, the notches in part **88-4** fit around the raised screw sockets.



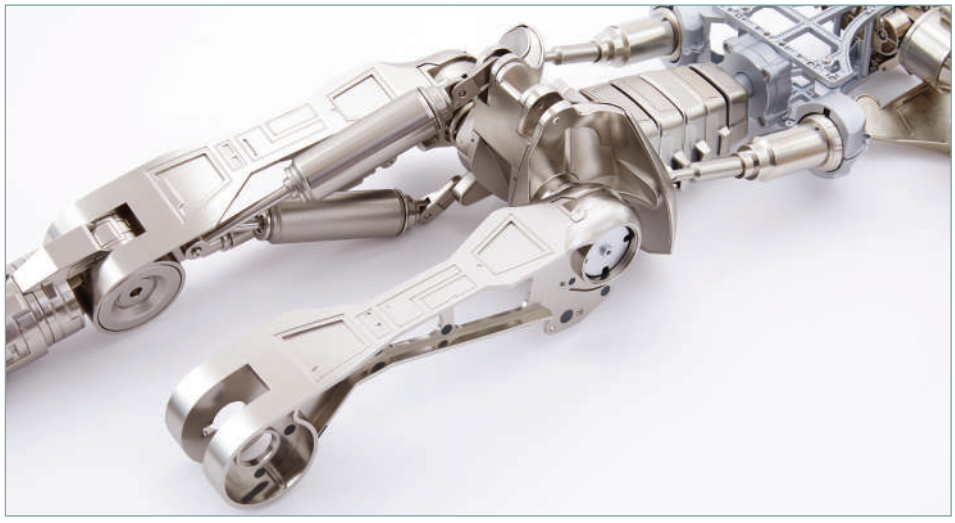
STEP 9

Take the outer cap for the hip joint **88-5** and note that there are slightly raised parts on either side of the screw holes. These will fit around the raised screw sockets on the inside of the hip joint, as indicated by the arrows. For the next step, you will need four **PM** 2 x 18mm screws.



STEP 10

Fit the outer cap **88-5** over part **88-4** so that the screw holes are aligned. Fix in place with four **PM** 2 x 18mm screws.

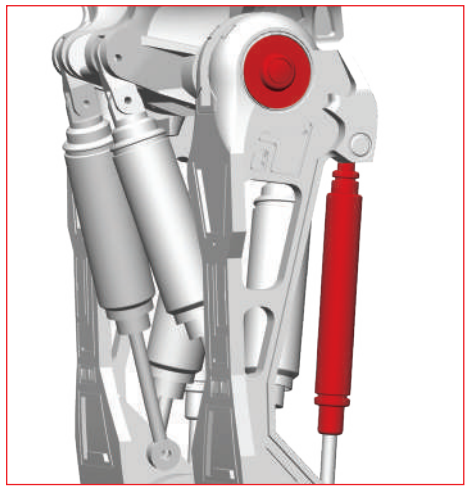


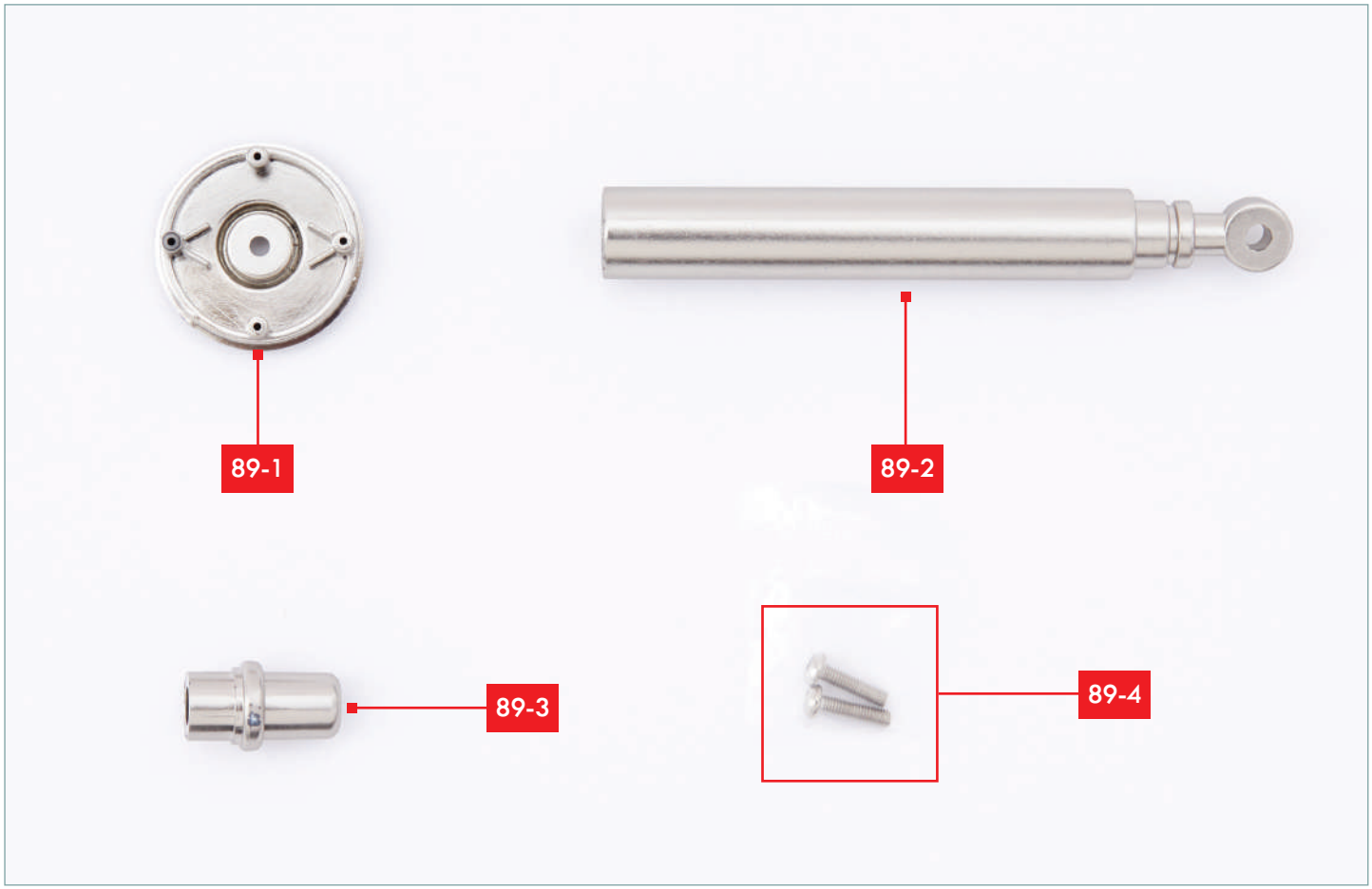
STAGE COMPLETE!

The left thigh has been attached to the pelvis.

STAGE 89: FINISHING THE LEFT HIP JOINT AND ASSEMBLING A LEG PART

Attach a hip plate to the left hip, and construct a piston-like bone for the left leg.





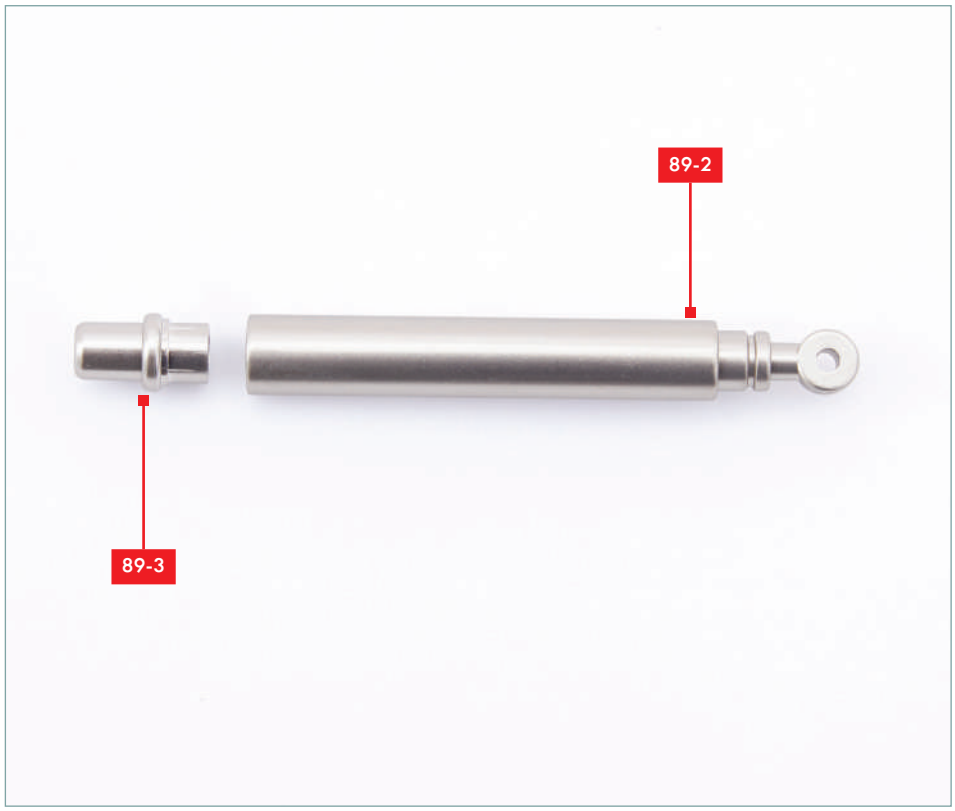
LIST OF PIECES

89-1	Hip plate
89-2	Left leg part
89-3	Left leg part insert
89-4	2 x PM 3 x 12mm Allen screws (1 spare)

YOU WILL ALSO NEED

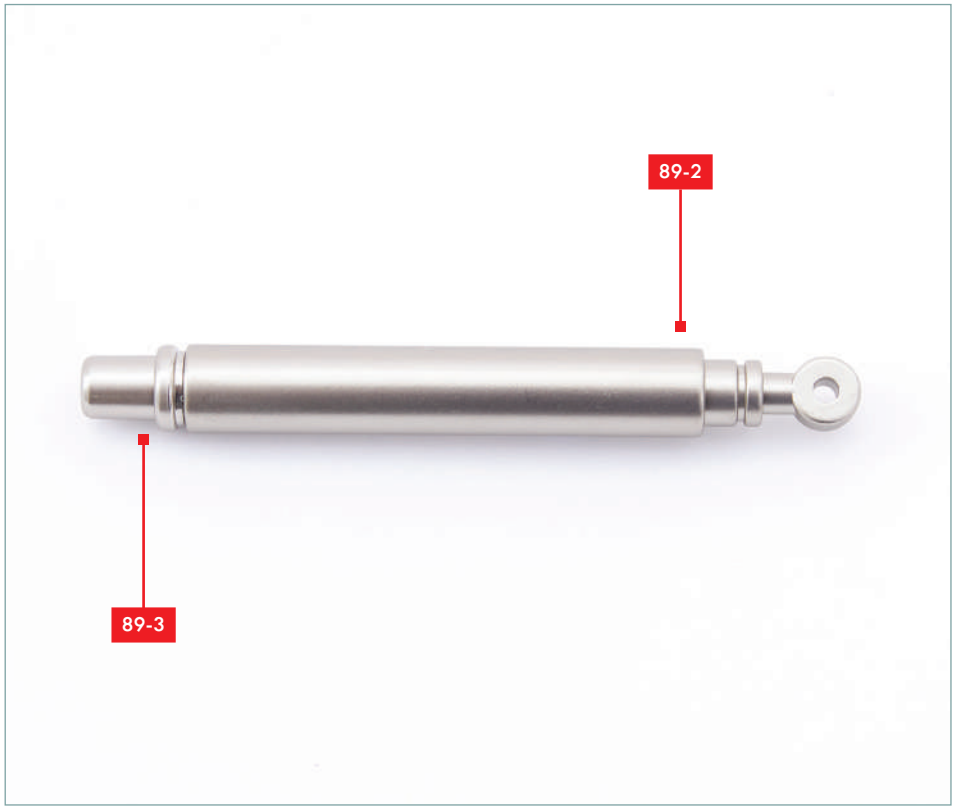
The model assembly from the previous stage.

Allen key supplied with stage 26.



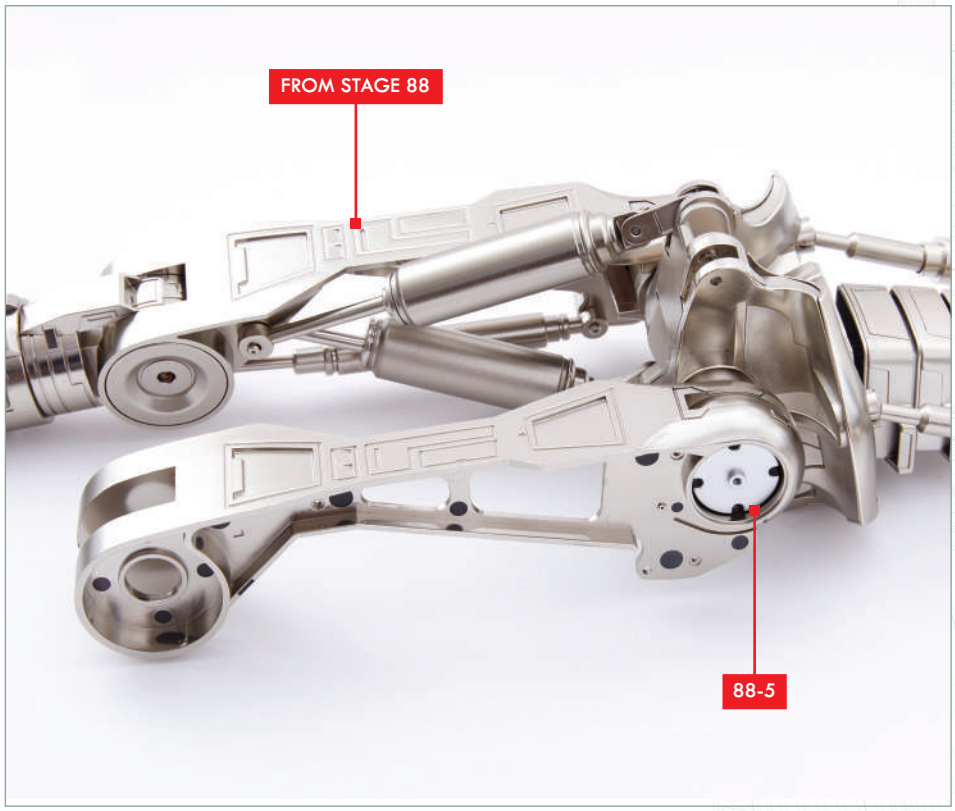
STEP 1

Take the leg part **89-2** and the insert **89-3**.



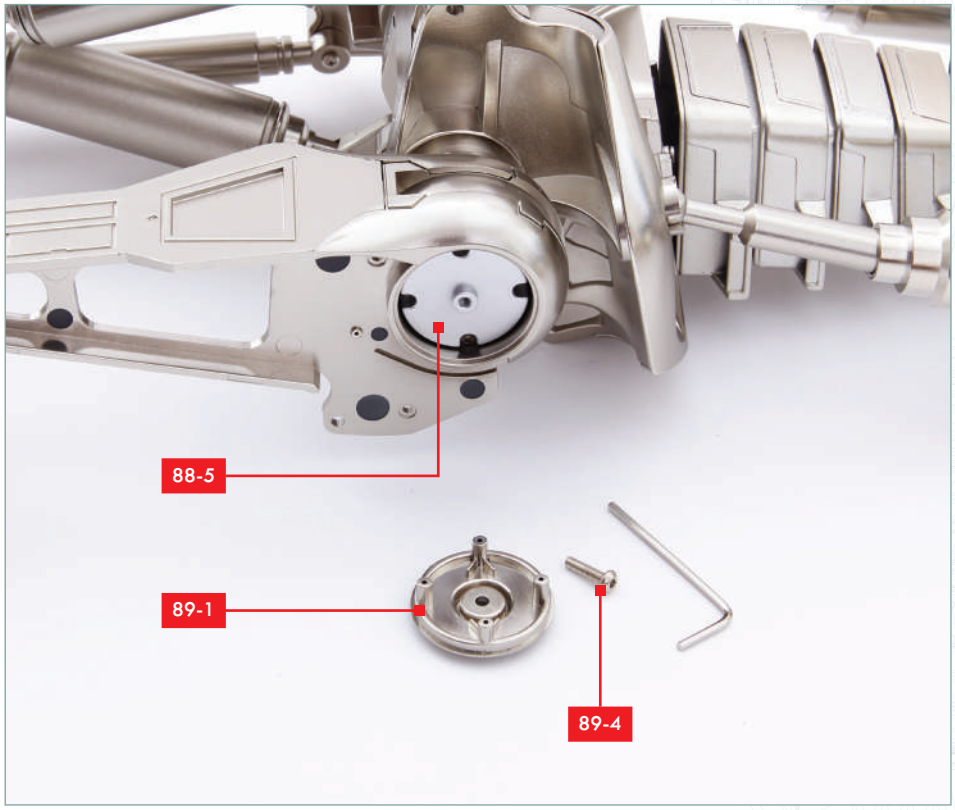
STEP 2

Fit the insert **89-3** into the open end of part **89-2**. It is a tight fit, so no glue is needed.



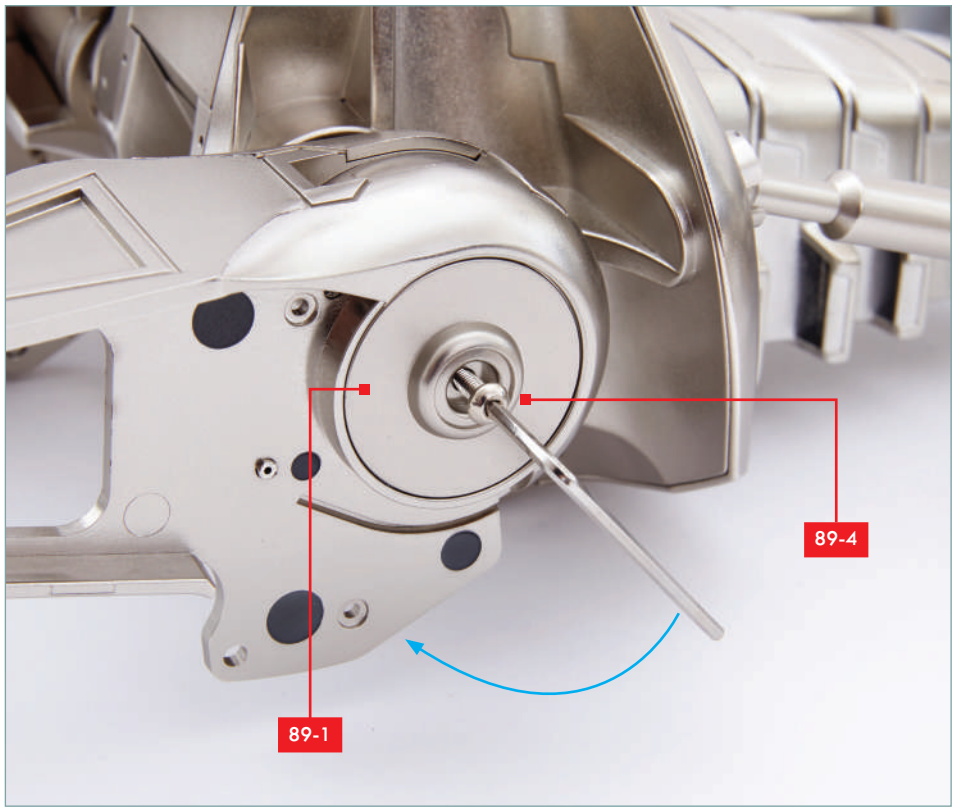
STEP 3

Lay the model on your work surface as shown so that you can access the hip joint and hip cap **88-5**.



STEP 4

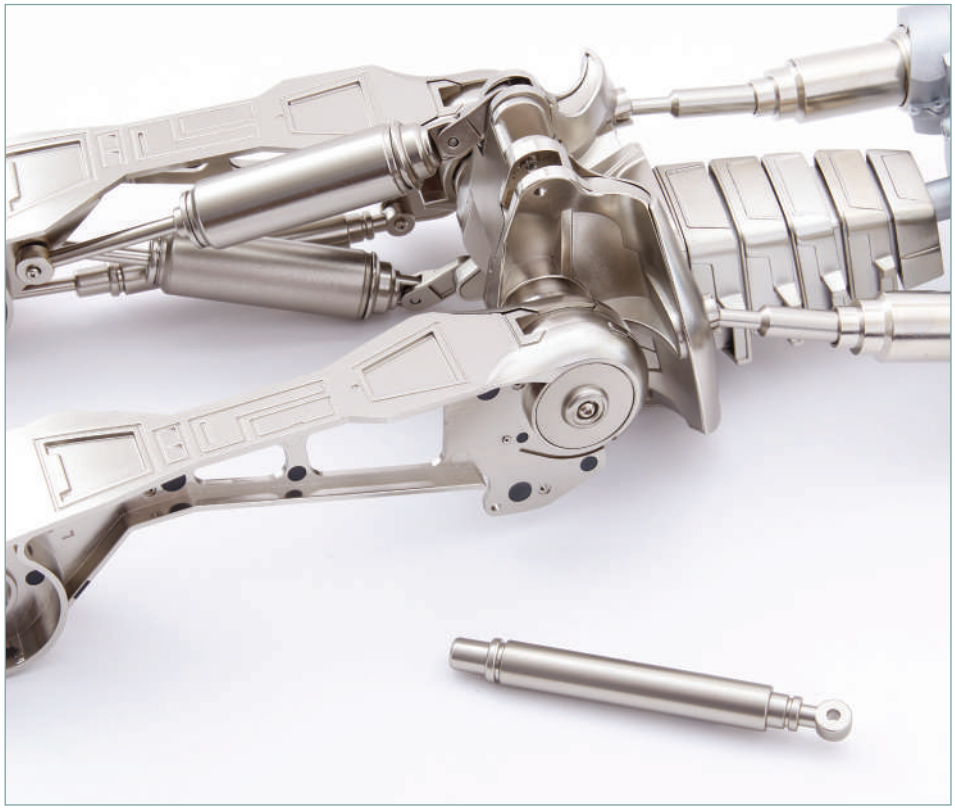
Take the hip plate **89-1** and the PM 3 x 12mm Allen screw **89-4**. Note there are four pegs on the inside of part **89-1**. These will fit into the four sockets in the hip cap **88-5**.



STEP 5

Position the hip cap **89-1** over the hip joint opening so that the pegs are located in the holes in part **88-5**. Fit the **PM** 3 x 12mm Allen screw **89-4** into the screw hole and tighten it with an Allen key.

Do not overtighten: there should be movement in the joint. The thigh section can move backwards and forwards (as if walking) and also move slightly out to the side.

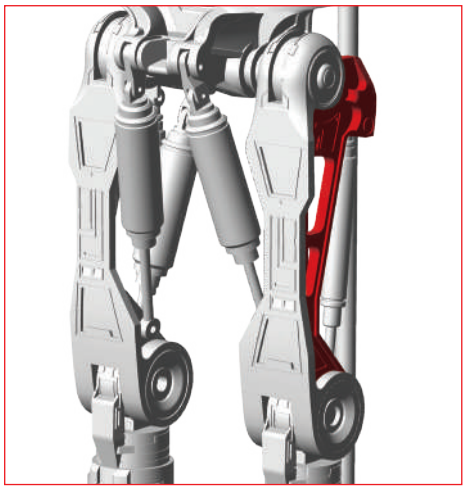


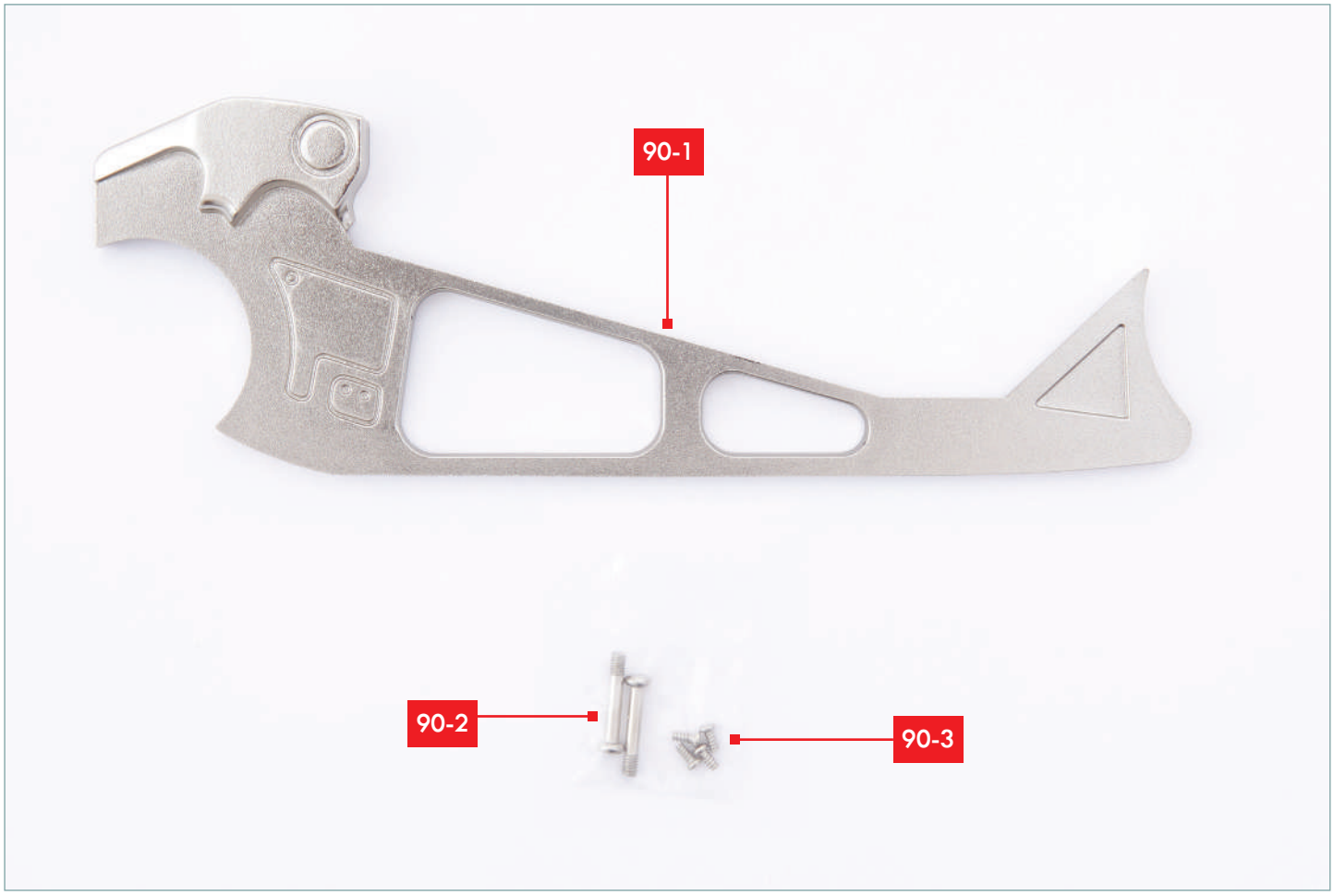
STAGE COMPLETE!

A plate has been fitted to the outside of the left hip and a leg part has been assembled. Keep the assembly **89-2**/**89-3** safely aside until it is needed in the next stage.

STAGE 90: FITTING PARTS TO THE LEFT THIGH

Attach a leg plate to the upper left thigh, and connect a leg bone to the resulting assembly.





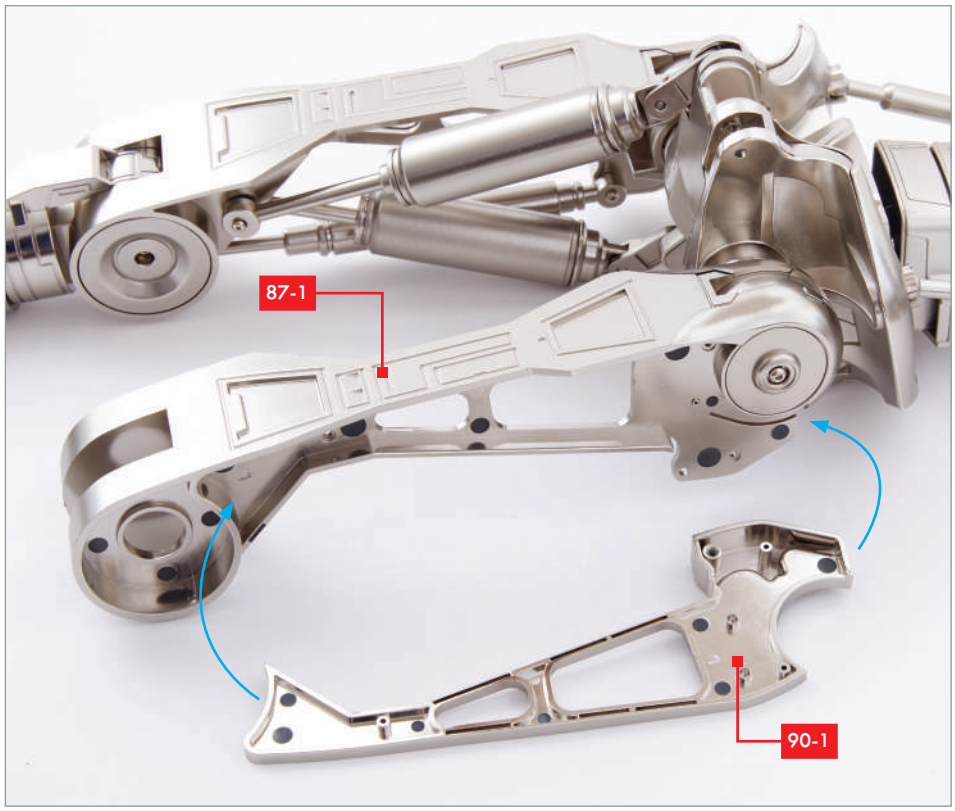
LIST OF PIECES

90-1	Left leg plate
90-2	2 x PM 3 x 16mm screw (1 spare)
90-3	4 x PB 2 x 4mm screws (1 spare)

YOU WILL ALSO NEED

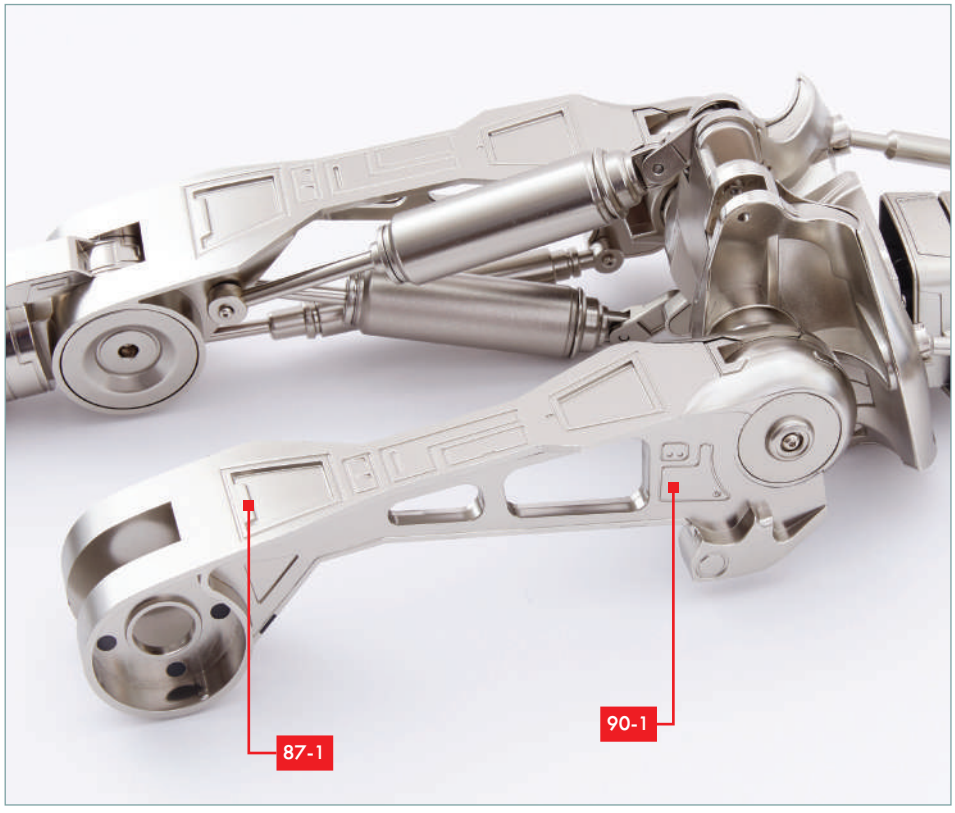
The model assembly from the previous stage.

A fine cross-head screwdriver.



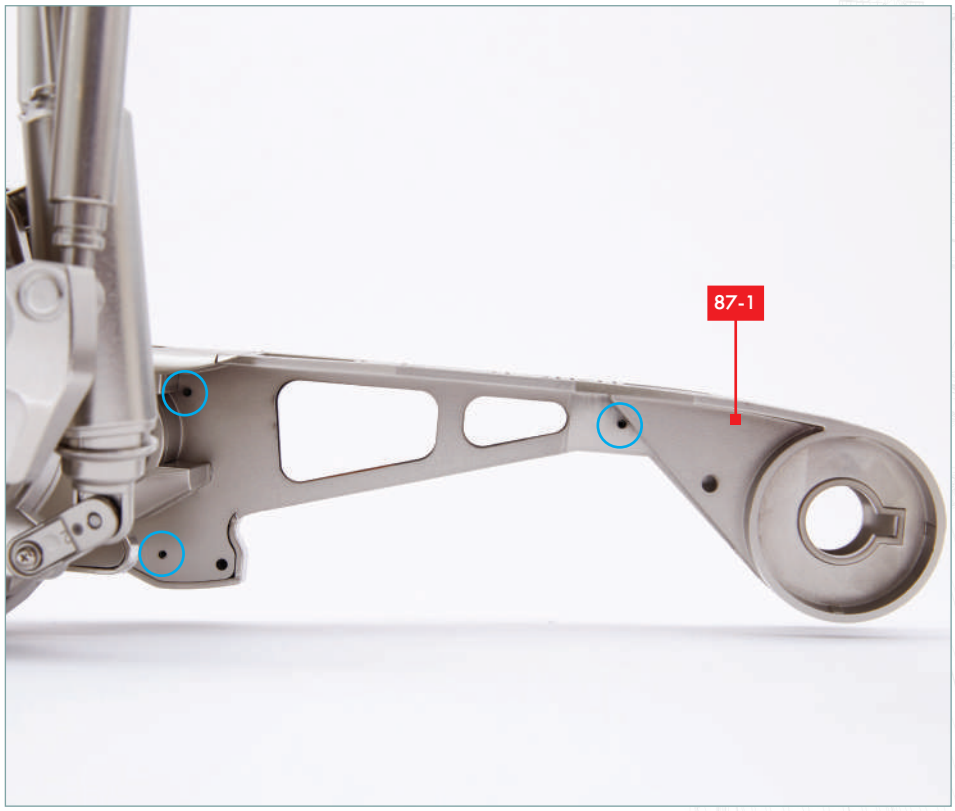
STEP 1

Lay the model on your work surface as shown so that you can acces the outer face of the left thigh **87-1**. Position the leg plate **90-1** in front of the model assembly in the orientation shown. The arrows indicate how the leg plate **90-1** fits into the thigh **87-1**.



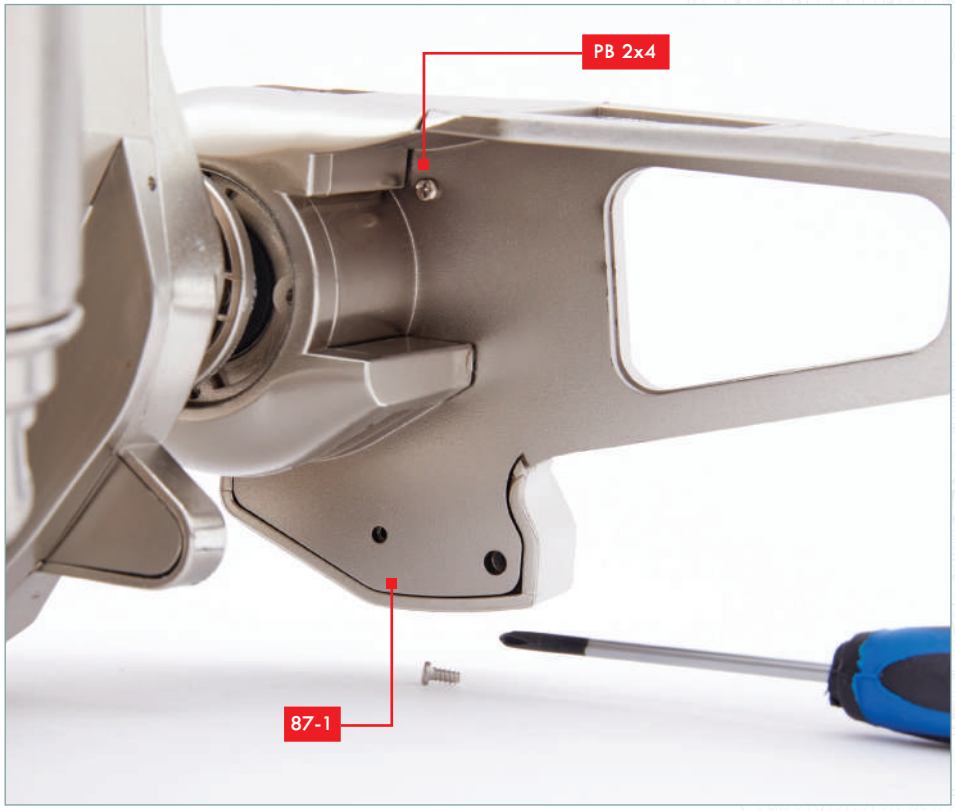
STEP 2

Fit the leg plate **90-1** into the recessed area in the thigh **87-1**.



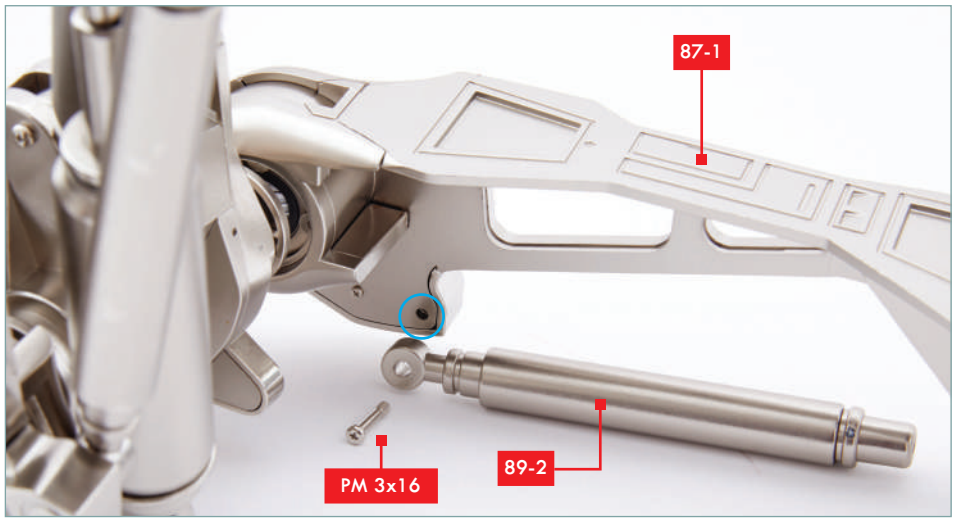
STEP 3

Holding the leg plate **90-1** in place, turn the model around and lift the right leg out of the way so that you can access the inside of the thigh **87-1**. Identify the three small screw holes in part **87-1** (circled in blue)



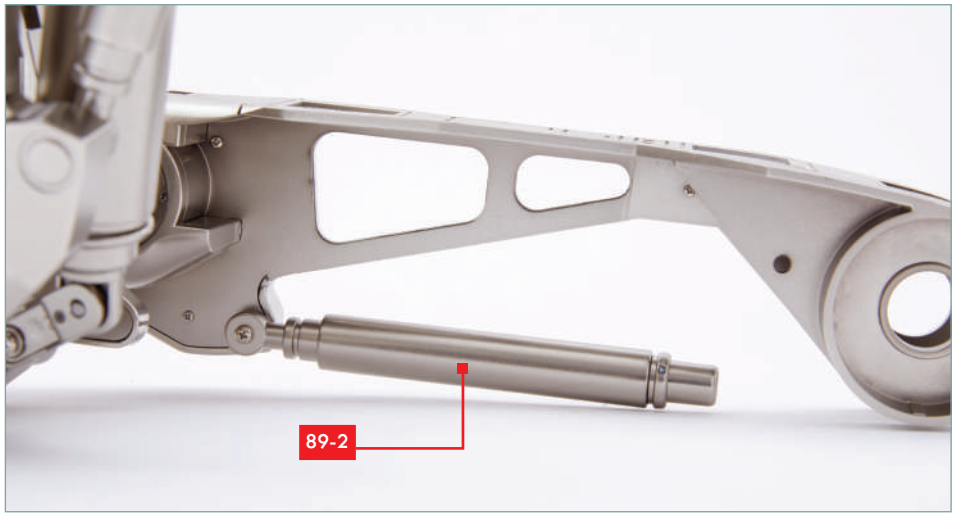
STEP 4

Fix part **90-1** in place using three **PB** 2 x 4 mm screws.



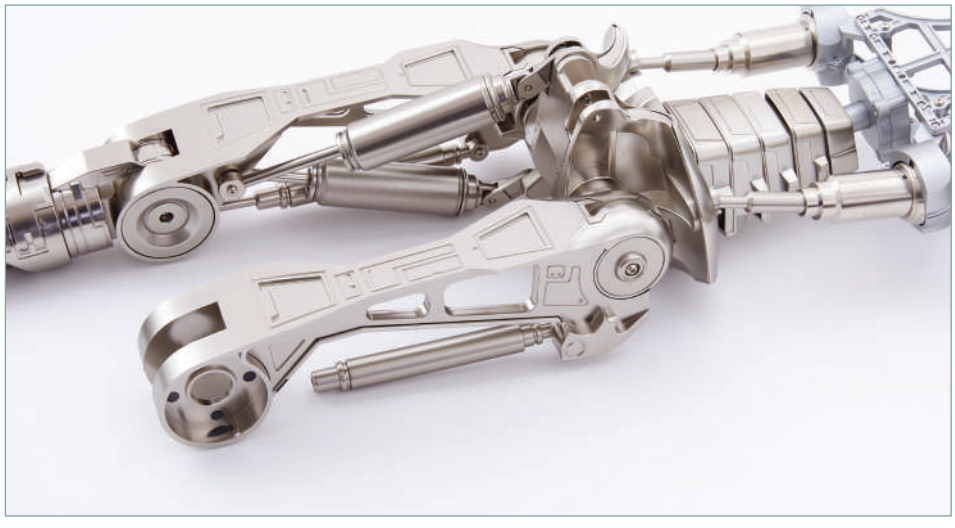
STEP 5

The loop on the leg part **89-2** is attached to the thigh **87-1** using a **PM** 3 x 16mm screw. Align the loop with the screw socket in part **87-1**, circled in blue.



STEP 6

Fix the leg part **89-2** in place, as shown.



STAGE COMPLETE!

A plate has been fitted to the outside of the left thigh and a leg part has been attached.

SPIDER-MAN 2

Sam Raimi and Tobey Maguire's take on the webhead returns, this time to be menaced by the exoskeleton-wielding master of mechanical engineering, Doctor Otto Octavius.

Having established Spider-Man's origin in the first film in 2002, *Spider-Man 2* allowed Sam Raimi and his collaborators to spread their wings and perfect their brand of wallcrawling heroics, producing a film that remains beloved by many fans, fifteen years later.

It certainly balanced Raimi's multiple creative impulses — broad comedy, soap operatic romance, bloody and horrific violence, a golden-hour vision of an idealized New York City that never was — better than either of the other two films in his webslinging trilogy.

In fact, the film was initially even more expansive, featuring the Black Cat, the Lizard, and Harry Osborn as the new Green Goblin, as well as Doc Ock, before script consultant and writer Michael Chabon convinced the powers that be to narrow their focus, spinning Octavius into both a mentor that Peter can look up to, and a good man corrupted by his own technology and poor approach to risk assessment.

Chabon also pushed for a much-younger Otto Octavius who would be in a love triangle with Mary Jane — a strand that, while nixed, may explain astronaut John Jameson's rather limpid presence in the final narrative. A younger Octavius can currently be seen in the Marvel Comics series *Superior Spider-Man*.

Unlike the first film's Green Goblin, which saw cut-throat businessman and military industrial contractor Norman Osborn give in to his superficial worst impulses when exposed to an untested serum, the second film is more interested in exposing those elements of personality that are buried deep. For Peter Parker, that's his many crushing insecurities, which, though masked by his powers, lead to him psychosomatically losing those abilities, doubting both that he's worthy enough to wield them, and whether they're a benefit, or ruining his life. For Otto Octavius, the accident that grafts the arms to him permanently and which shatters the inhibitor chip that separates his mind from the arms' AI shatters his own inhibitions in the process. Otto is still a good man, underneath it all, but he's a man driven to glorify

ABOVE: Spider-Man and Doc Ock catch some fresh air, shortly before Spidey is forced to catch a speeding train. (Photo: Moviestore collection Ltd / Alamy Stock Photo)

ABOVE: Peter Parker feels the heat as Ock's deadly cybernetic tentacles threaten to crush his super-strong body. [Photo: United Archives GmbH / Alamy Stock Photo]

FILM DATABLAST

Director: Sam Raimi
Screenplay: Alfred Gough & Miles Millar & Michael Chabon & Alvin Sargent
Producers: Avi Arad, Joseph M. Caracciolo, Grant Curtis, Kevin Feige, Stan Lee, Lorne Orleans, Laura Ziskin
Composer: Danny Elfman
Director of Photography: Bill Pope
Editor: Bob Murawski
Cast: Tobey Maguire (*Peter Parker/Spider-Man*), Kirsten Dunst (*Mary Jane Watson*), James Franco (*Harry Osborn*), Alfred Molina (*Otto Octavius / Doctor Ocopus*), Rosemary Harris (*May Parker*), J.K. Simmons (*J. Jonah Jameson*), Donna Murphy (*Rosalie Octavius*), Daniel Gillies (*John Jameson*), Dylan Baker (*Dr. Curt Connors*), Bill Nunn (*Joseph 'Robbie' Robertson*), Willem Dafoe (*Green Goblin / Norman Osborn*), Cliff Robertson (*Ben Parker*), Ted Raimi (*Hoffman*)
Year: 2004
Duration: 127min / 135min (extended cut)
Aspect Ratio: 1.85:1 (35mm), 2.39:1 (70mm IMAX)
Country of Origin: USA

his own genius — at first gently, and then, once the arms begin to whisper unrestricted to his basal ganglia, with the unselfconscious righteousness of a supervillain. Reduced to 'financing' his experiments with bank robberies, fist-fighting with a superhero atop a speeding train, building his new lab in a crumbling pier, Octavius is as 'freed' by his new persona as Peter is by his Spider-Man mask: superficially set loose from the constraints of society and 'normal' behavior, only to find himself locked into a new role, and a new fight, by virtue of his actions.

At the end of the film, it is only by casting the mask of Spider-Man aside, and appealing to the Otto Octavius buried deep within the Doc Ock persona, that Peter Parker is able to triumph. In essence, Peter chooses to *change the genre* in which the final battle occurs — and by doing so, both Peter and Otto are freed from the constraints of the superpowered slugfest that would do nothing to stop the gravimetric distortions created by Otto's experiment. Though the film still ends with the death of Octavius, it's by his own design, balancing the scales by sacrificing himself before his deadly arms can wrest back control.

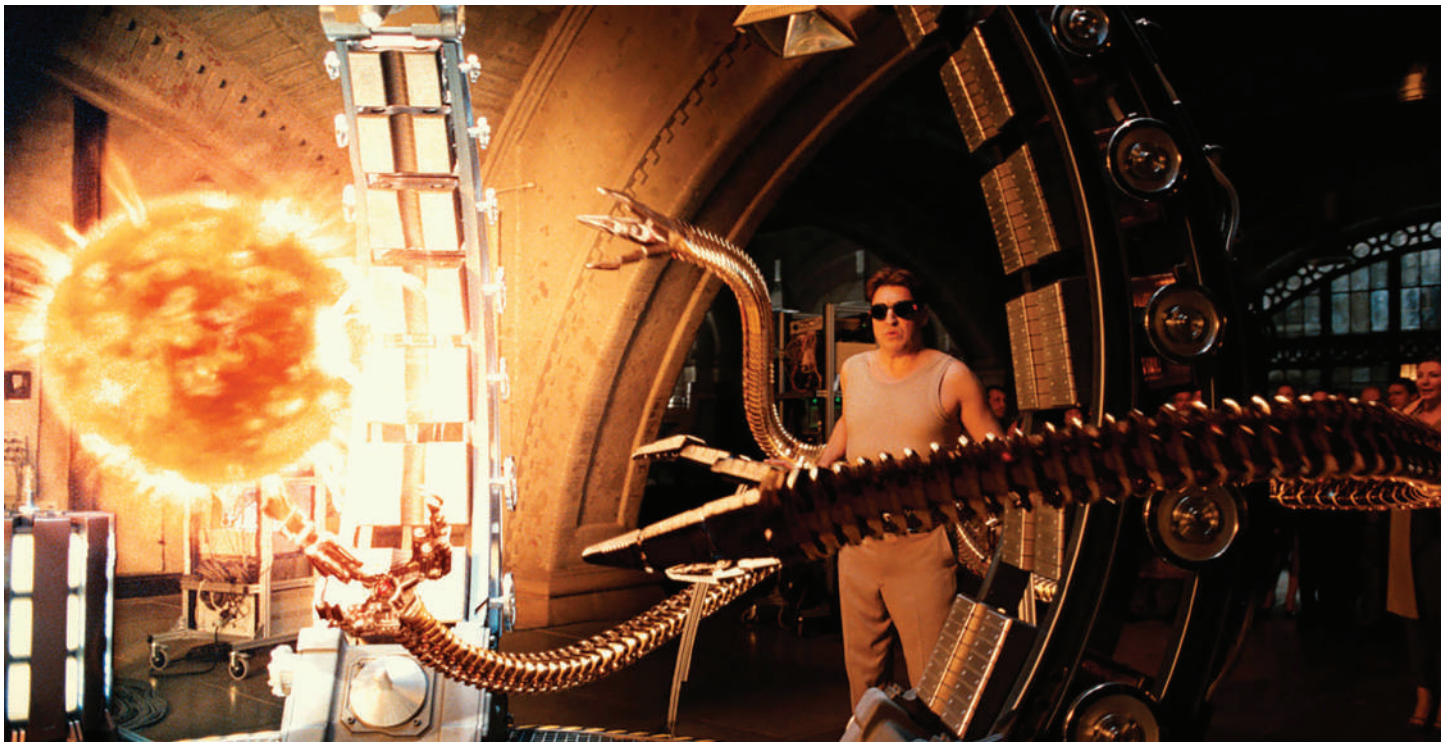
AN EARLY GRAVE

It's interesting to note that in this era of superhero films, 'victory' is still achieved by the metric of 80s action movies, namely, the villain is dead by the end credits. Compare the one-and-done appearance of Otto Octavius, Norman Osborn, etc., with the instances of character death in the Marvel Cinematic Universe.

In the MCU, the death of a character, even a villain, is a major event, and even then, it may not be the end — look to the surprising reappearances of certain characters in 2018's *Infinity War*, for instance, or the complicated saga of Loki in the *Thor* films. When you're building a franchise that could run to forty interwoven films or more, closing off future stories with a character death is as much of a creative risk as it is in the churn of monthly serialized comic book storytelling — alive and imprisoned, that character may still have more to say, even in a different series of movies, and you never know when inspiration may strike. Dead, and with a visible corpse, their race is run.

Killing off characters is also bad for repeat business, especially in the superhero film market, and in an era where profits are made in home entertainment and streaming, the producer of a superhero adventure ideally wants a fan to watch it multiple times — it's why the overall preponderance of the genre has been towards a triumphal grace note and a push towards the next film.

It's a lesson that's been hard-won in the *Spider-Man*



franchise, with the Andrew Garfield/Emma Stone pair of films marking a particularly egregious cul-de-sac. One of the many reasons the second *Amazing Spider-Man* film floundered at the box office was its lack of repeat business — however entertaining the web-slinging may be, however charming the cast, if you kill off your female lead solely because it was done in a comic book in the 1970s, you're murdering your repeat business alongside her — and much of the desire on the part of your audience to follow that story and cast into another film. *Spider-Man: Homecoming*, by contrast, take Tom Holland's Spidey beyond both Maguire and Garfield to show a hero who will push himself beyond his limits to save *everyone*, up to and including the Vulture-winged thief who recently attempted to bury him under a warehouse and throw him off a plane.

"Superheroes don't kill" has proven a malleable concept at the best of times, especially when applied to the movies (Iron Man and Captain America have both seen off terrorists and Hydra soldiers in their dozens, if not hundreds — themselves heirs to the trigger-happy 80s action movie tradition), but it's interesting to note how and when it applies to villains, when both writers and the agents of actors start looking beyond the current film and to what may come next. It'll be intriguing to see whether this 'plot armor' and incarceration-over-killing continues into the next wave of superhero franchise pictures.

A CALL TO ARMS

Dubbed Larry, Harry, Flo, and Moe by Molina on set, Doc Ock's four articulated arms are a mixture of puppetry (with each arm puppeteered by a different operator) and Computer Generated Imagery, with every scene featuring a live action Molina being shot with the puppet arms first, before defaulting to computer effects — as the latter were considerably more expensive.

"NOW... TELL ME HOW TO STOP IT!" — PETER PARKER

"IT CAN'T BE STOPPED. IT'S SELF-SUSTAINING NOW. UNLESS... THE RIVER! DROWN IT!" — DOC OCK

Obviously, a great deal of the shots featuring Spider-Man and Ock fighting, from the iconic raised subway train fight sequence to the fist-fight up the wall after Ock's bank heist, consist of entirely CG combatants. At the time, the digital double of Molina was the most advanced ever seen — the final shot of Octavius sinking into the depths of the water, beneath the pier, is entirely digital, and a great risk: digital duplicates had not been subject to such close-up scrutiny before this film.

While the concept of the inhibitor chip is still in the realm of science fiction, mind-controlled exoskeletons and articulated arms are rapidly entering the realms of science fact, and the majority of powered exoskeletons are technically already using limited artificial intelligence and intelligent learning — but to assist their users in reclaiming active lives, rather than inducing them into a life of crime.

The Otto Octaviuses of *our* universe are restoring mobility to thousands of paralyzed people and helping workers to avoid injury on the job. It's less operatic, but also less terrifying — and long may it stay that way! ■

ABOVE: Dr. Otto Octavius attempts to create a self-sustaining fusion reaction, using his magnificent arms to manipulate the containment field. (Photo: United Archives GmbH / Alamy Stock Photo)

HUMAN EXOSKELETONS

A Terminator's 'endoskeleton' is so named because the skeleton is underneath the Terminator's coating of artificial flesh. But what of those assistive robotic skeletons worn outside the body? We take a look at some exoskeletons that are in use or in development.

ABOVE: Assistive suits like the ReWalk apparatus offer hope and mobility to those with lower-body paralysis. (Photo: Shutterstock)

COMBATING PARALYSIS

Scientists and engineers have two main goals in mind when developing exoskeletons. The first is therapeutic; the use of exoskeletal limbs to give movement back to those paralyzed by accidents or illnesses.

In 2012, a woman named Claire Lomas became the first paralyzed person to complete a marathon in a bionic exoskeleton. It was a gruelling trek, taking 16 days to complete the full marathon course, but she crossed the finish line in an early model of the ReWalk suit, designed by the Israeli entrepreneur Amit Goffer; a $70,000 (£52,000) system that replicates the paralyzed person's ability to stand, walk, and climb stairs, using motion sensors to detect minute shifts in balance that indicate the user wishes to take a step.

Lomas was originally paralysed from the chest down in a fall from a horse in 2007. She walked the London Marathon at a pace of just over two miles a day, accompanied by her husband and daughter.

"There were times when I questioned whether I would make it when I was training," she said, though that hasn't stopped her continuing to push herself in the years since. She lit the Paralympic Cauldron wearing the exoskeleton in August 2012, took on a 400-mile handbike challenge between Nottingham and London the following year, and walked the Manchester Marathon in 2018 in 9 days. She also rode a charity lap of honor at Brands Hatch on a hand-controlled motorcycle.

In 2018, Norfolk father-of-three Simon Kindleysides followed in her pioneering footsteps to become the first paralyzed man to walk the London Marathon, also in a ReWalk rig — now augmented by controls on a smartwatch. Paralyzed by a glioma brain tumour in 2013, the 33-year

old man completed the course in just 36 hours, crossing the finishing line at 11pm on the day after the running race.

The ReWalk device is currently an assistive device rather than a true exoskeleton — although Lomas, Kindleysides and many others have benefited from the ability to walk again, the device is still cumbersome, slow, and relies a lot on the user's arms for support and progress: as Kindleysides noted to the Eastern Daily Press, shortly after finishing: "I am in a lot of pain and my hands are sore from putting my weight on them."

There's still a long way to go before such exoskeletons can be both miniaturized and strong enough to freely support the user — to say nothing of reducing the cost, which remains out of the reach of all but the most fortunate. Most public appearances of the ReWalk are as loans from charities, generating publicity for these very good causes through their use in high-profile sporting events — but developments are occurring rapidly. Three young exoskeleton-wearing paraplegics were trained to use a mind-controlled interface to kick a ball during the opening ceremony of the 2014 World Cup, for instance, and similar developments — such as the Atalante lower body exoskeleton, being designed by French start-up Wandercraft, and envisioned to be a completely autonomous walking device — are taking place all the time.

MILITARY INDUSTRIAL STRENGTH

The other goal for exoskeleton development is augmentative — taking the human body and pushing the limits of what's possible in terms of lifting strength and capacity, speed, and endurance. Warehouse managers thrill to the idea of staff becoming human forklifts, combining the lifting reach of a truck with the facility and nous of a human operator — not to mention the ability to pack those cavernous warehouses ever-more tightly with shelving, once you take a forklift's turning circle out of the equation.

In reality, tests are still ongoing of a variety of forms. US hardware chain Lowe's tested a non-powered exoskeleton harness at the tail end of 2017. Using a system of flexible carbon rods, the suit stores potential energy when a user bends down, and then returning that energy to the user's legs and back as they stand up — giving them more lifting power and avoiding workplace strains.

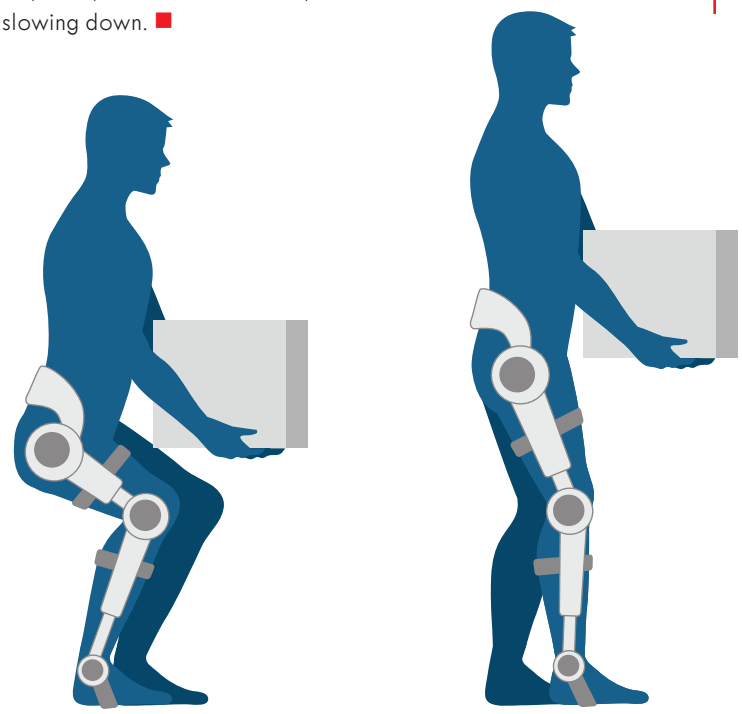
Panasonic has been investing heavily in its Panasonic Assist Suits, which are powered versions of the same, reducing strain and increasing carrying capacity and speed. The AWN-03 powered exoskeleton has been mass-produced and sold, though primarily for evaluation and development purposes. Their 'Ninja' leg augmentations are designed to increase speed and stability when walking and running, and for difficult hiking and climbing trails.

Scientists are usually eager to fold in inspiration from science fiction, too, so it should be no surprise that Panasonic and ActiveLink's Power Loader looks like it should be piloted by Ellen Ripley in ***Aliens***. Designed for construction and disaster relief, it's a bulky but flexible extension of the pilot's own body, and — once fully developed — should be able to get into places that wheeled or tracked vehicles can't. It's only a matter of time before it's starring in its own anime.

"IN 2012, CLAIRE LOMAS BECAME THE FIRST PARALYZED WOMAN TO COMPLETE THE LONDON MARATHON, IN 16 DAYS."

ABOVE: Warehouse staff of the future may be equipped with exoskeletons allowing them to lift and carry more without risk of injury. (Photo: Shutterstock)

The military, too, are eager to invest in exoskeleton research. It's not just the dream of a real-life Iron Man that they're chasing (though the US military began developing the TALOS system — Tactical Assault Light Operator Suit — during the Obama administration), but also the idea that a single soldier could become their own support network, able to carry heavy loads of arms, armor, tents, food, medicines and more, and all without tiring or slowing down. ■



BELOW: Non-powered exoskeletons like these capture potential energy as the user bends down, transferring it back to their legs and hips as they stand, to support their lifting stance. (Photo: Shutterstock)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