

Illustrated Construction Manual: The Copernican Orrery

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Freshly unpacked. Building instructions, printed cardboard bridges and bridges with stiffening parts made of grey cardboard as well as small parts and drive belts.



Before starting to build, the parts of the grey cardboard boxes must first be labelled according to the sketches on the back of the building instructions. The packaging of the kit proves to be useful for storing the utensils that are always needed during construction.

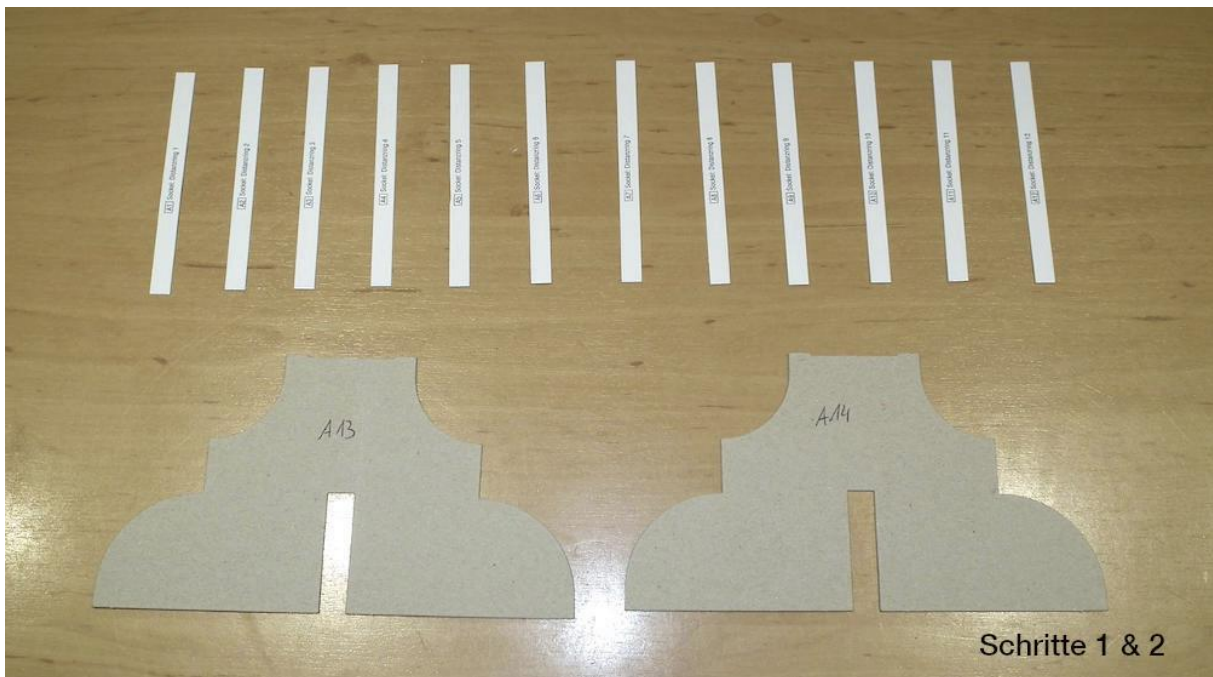


Adhesives, tools and paints used.



Other useful but not absolutely necessary utensils. Wooden parts should be treated with a furniture care oil before oiling with machine oil, which hardens as a protective layer 1-2 hours after application. Teflon spray can be used as a sliding aid on the inner radii of the bearing washers.

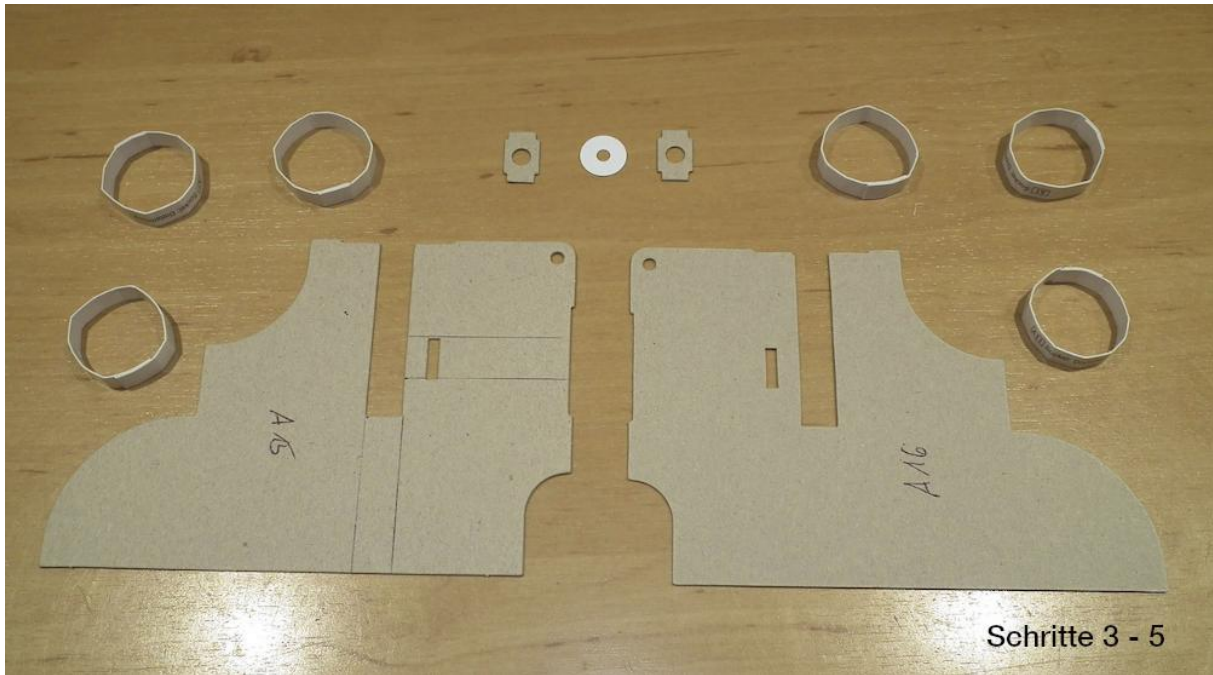
The pedestal frame



The parts needed for steps 1 & 2. The strips A1 to A12 are glued together to form rings. This is made easier if the strips are pulled over the edge of a table beforehand. Six of the rings are used in step 2, the remaining 6 rings are used in step 4.



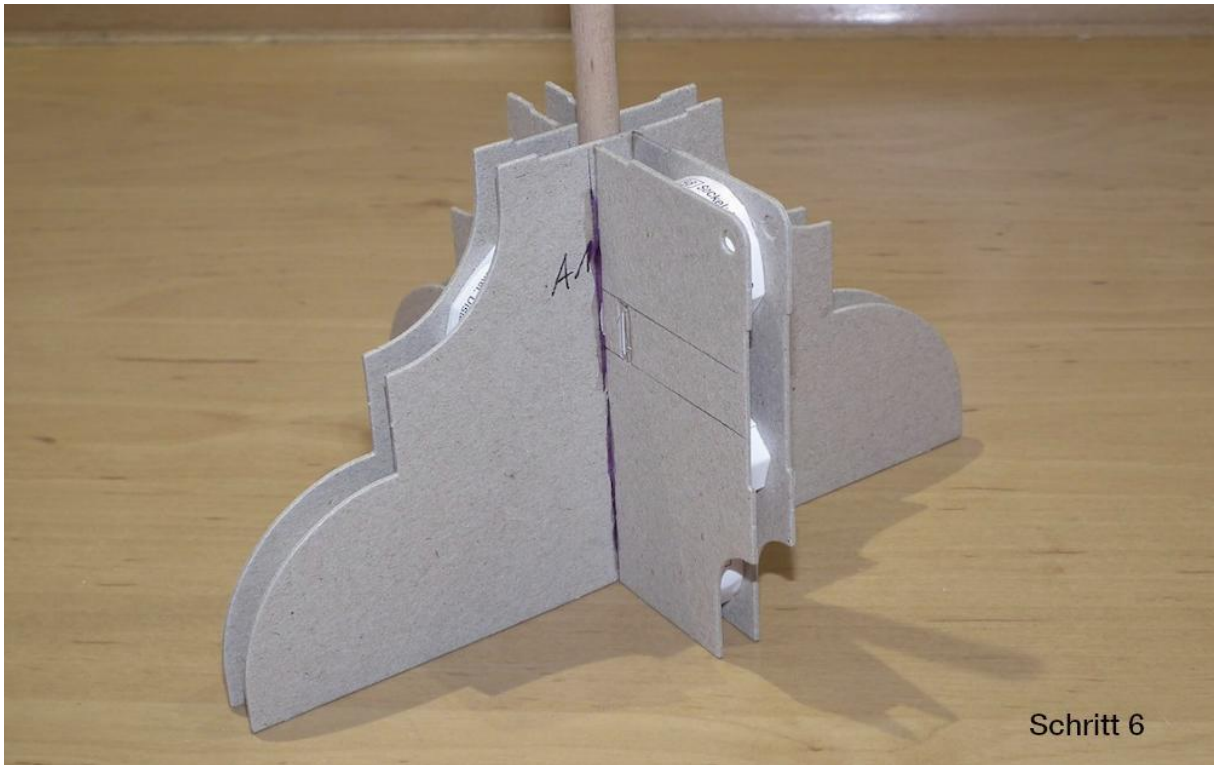
Step 2: The spacer rings glued between plinth wall 1 and 2, weighted down with a book.



Parts for steps 3 to 5.



Steps 3 - 5: The small picture detail shows the inner bearing of the crankshaft created in step 3. In steps 4 and 5, the remaining base walls and spacer rings are glued and pressed together.



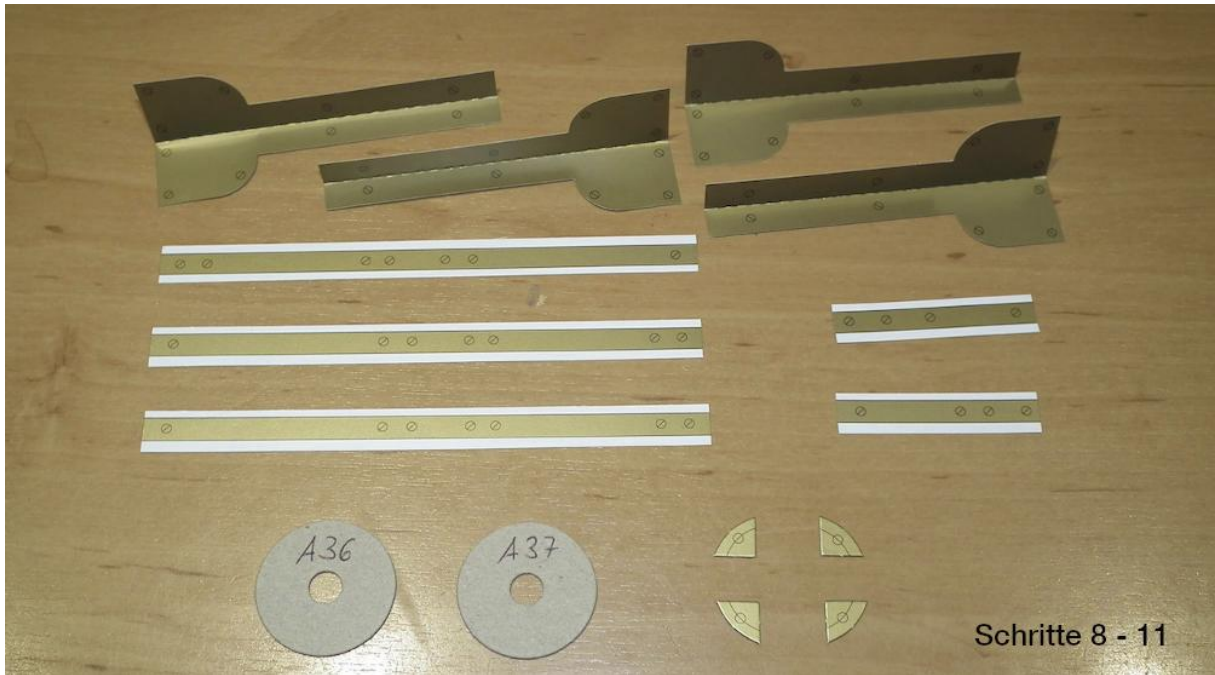
Schritt 6

Step 6: The two halves of the base are glued together and the central axis is inserted - without gluing it in.



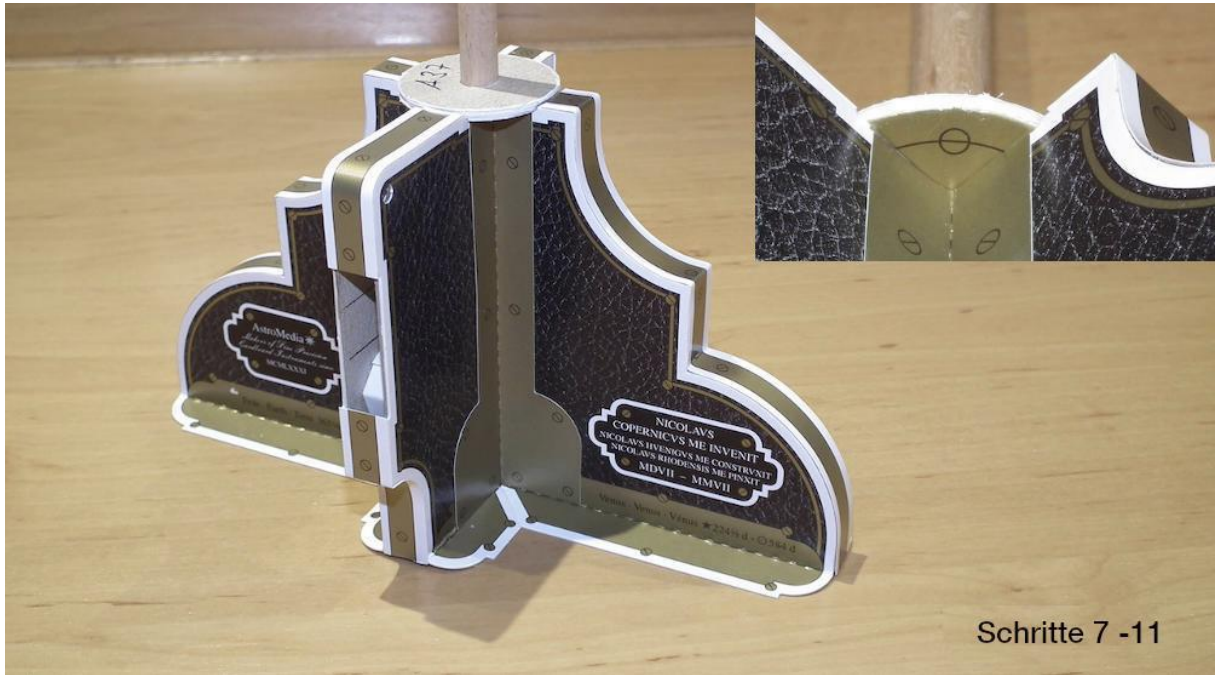
Schritt 7

The wall panels used in step 7, are already pre-folded.



Schritte 8 - 11

Parts of steps 8 to 11.



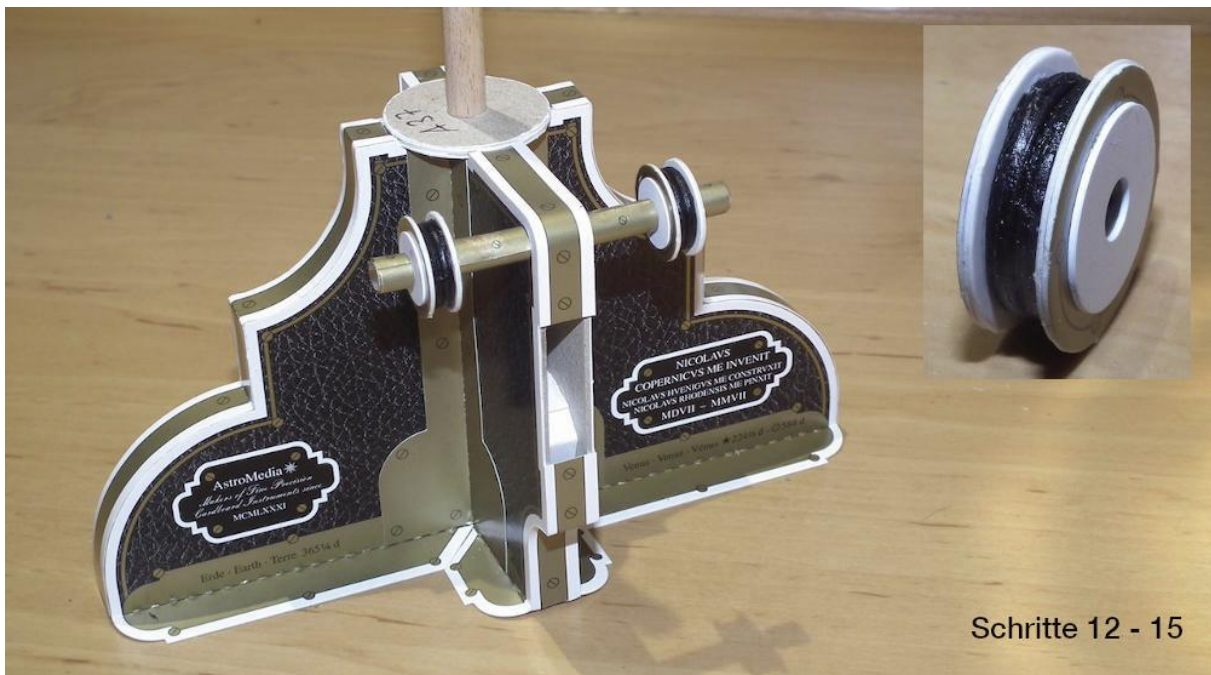
Schritte 7 - 11

Steps 7 - 11: The base is fitted with wall, edge and corner panels and the central shaft bearing is panelled from below.

The crank drive



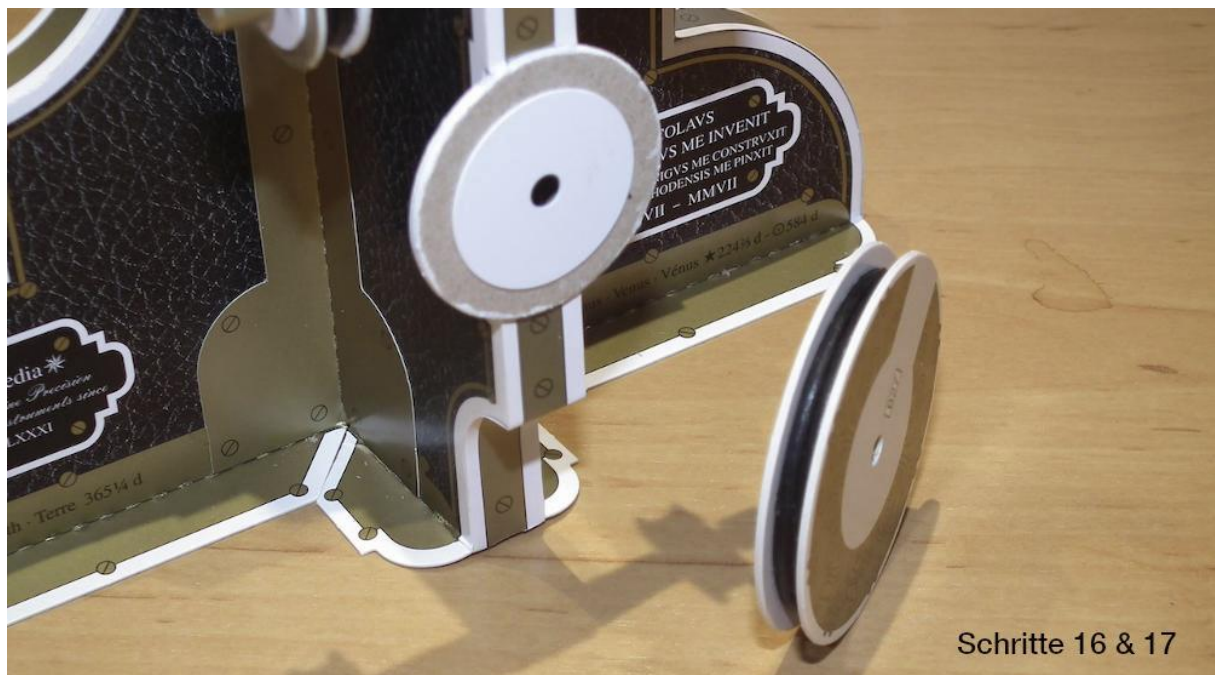
The parts needed in steps 12 to 15 for the pulleys and their axle.



Steps 12 - 15: The axle with the pulleys of the crank drive were installed in the base according to the instruction steps 12 to 15. The small section of the picture shows the layered assembly of the pulleys (step 14).



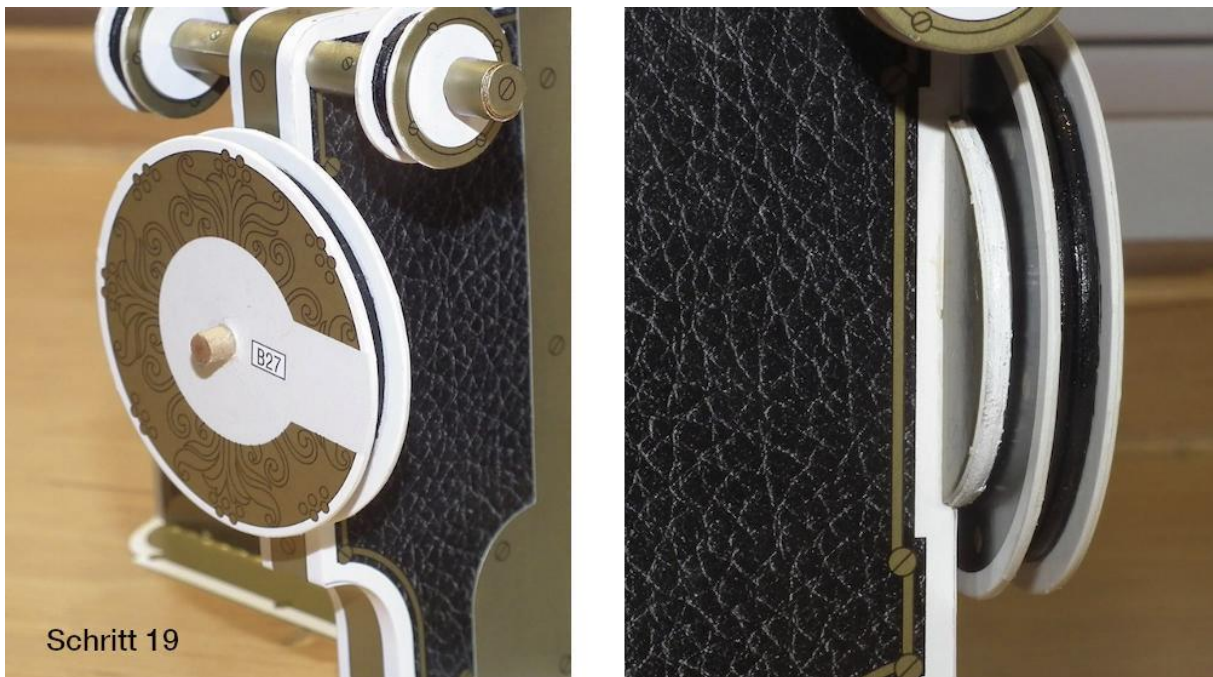
Individual parts of the crankshaft outer bearing, the drive gear and the crankshaft ready for steps 16 to 19.



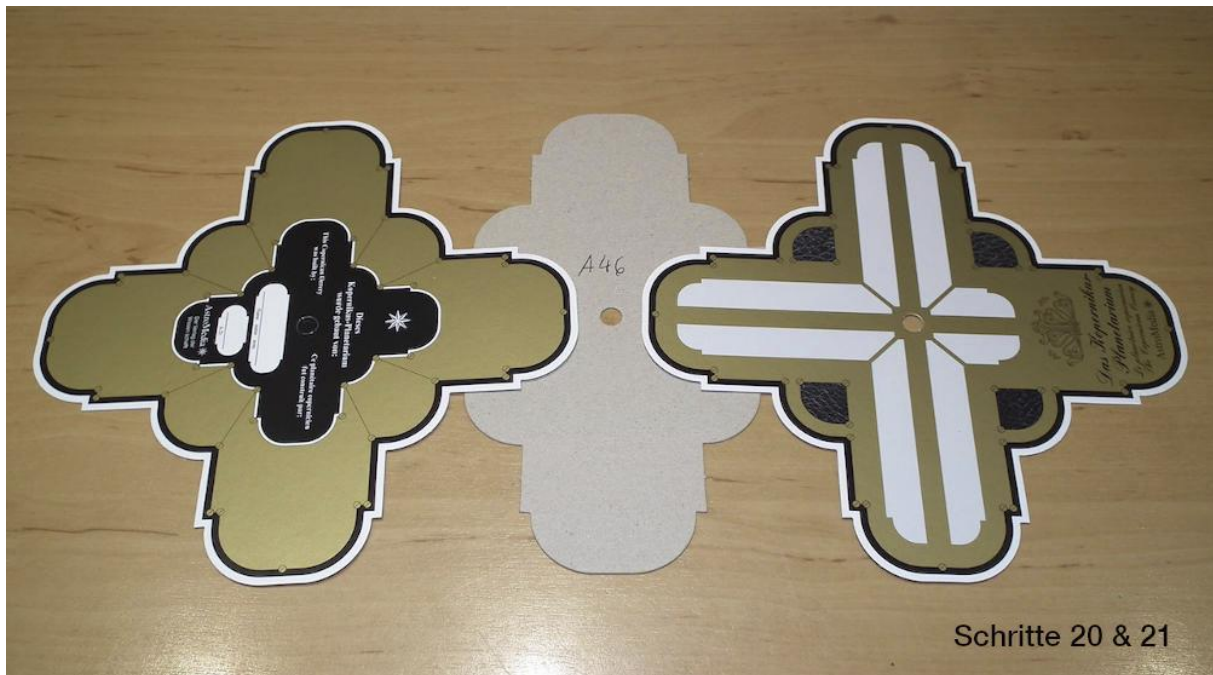
Steps 16 & 17: Crankshaft outer bearing and driving wheel after completion of steps 16 and 17. The bearing is not glued here yet, it was only clamped for testing.



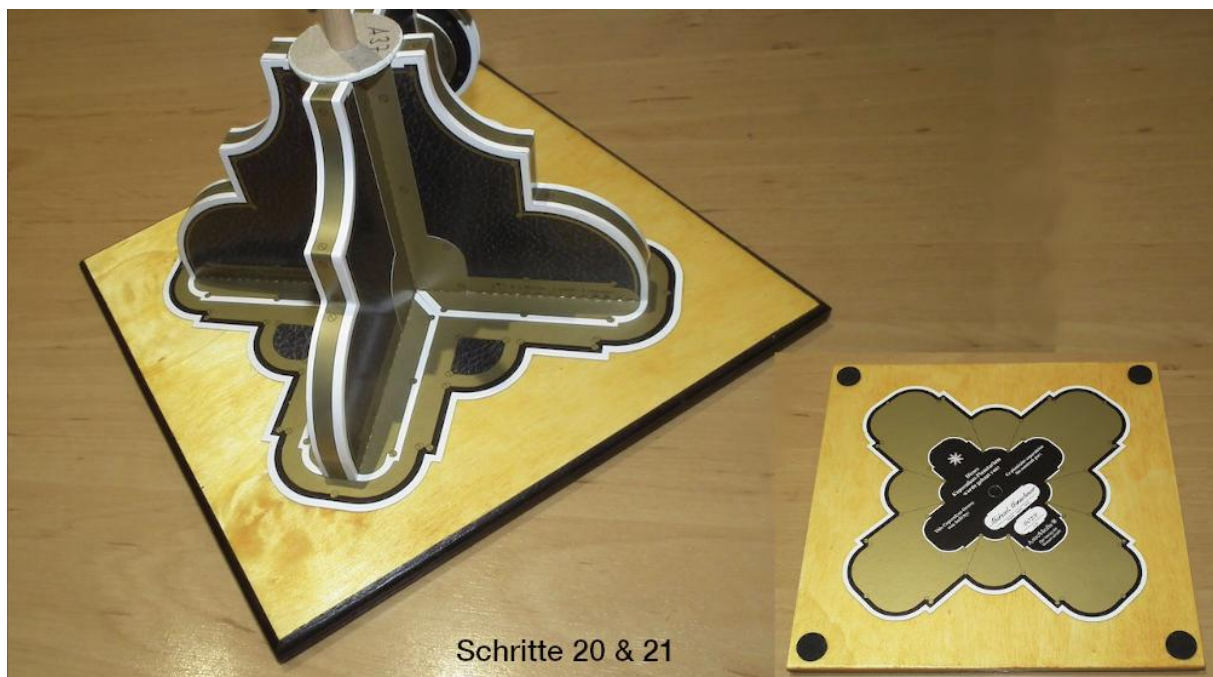
Step 18: Driving wheel with bearing and crankshaft, created according to step 18.



Step 19: The assembly created in step 18 is assembled in the base in step 19. The crankshaft outer bearing is glued to the base using a 2-component adhesive. The left half of the picture shows the front view of the drive wheel, the right half shows the rear view.



Steps 20 & 21: The three parts of the base plate, which should be glued together according to the instructions. Since there was a piece of plywood in the leftover box, I deviated from the instructions here:



Steps 20 & 21: The middle section of grey cardboard was replaced by a plywood board (21 x 21 x 1cm), the edges of which were chamfered and painted black. The surface was treated with shellac (blond). The base was assembled according to step 21.



Schritt 22

Step 22: The sun globe holder is rolled and glued (not to the central axis) according to step 22 using the central axis.



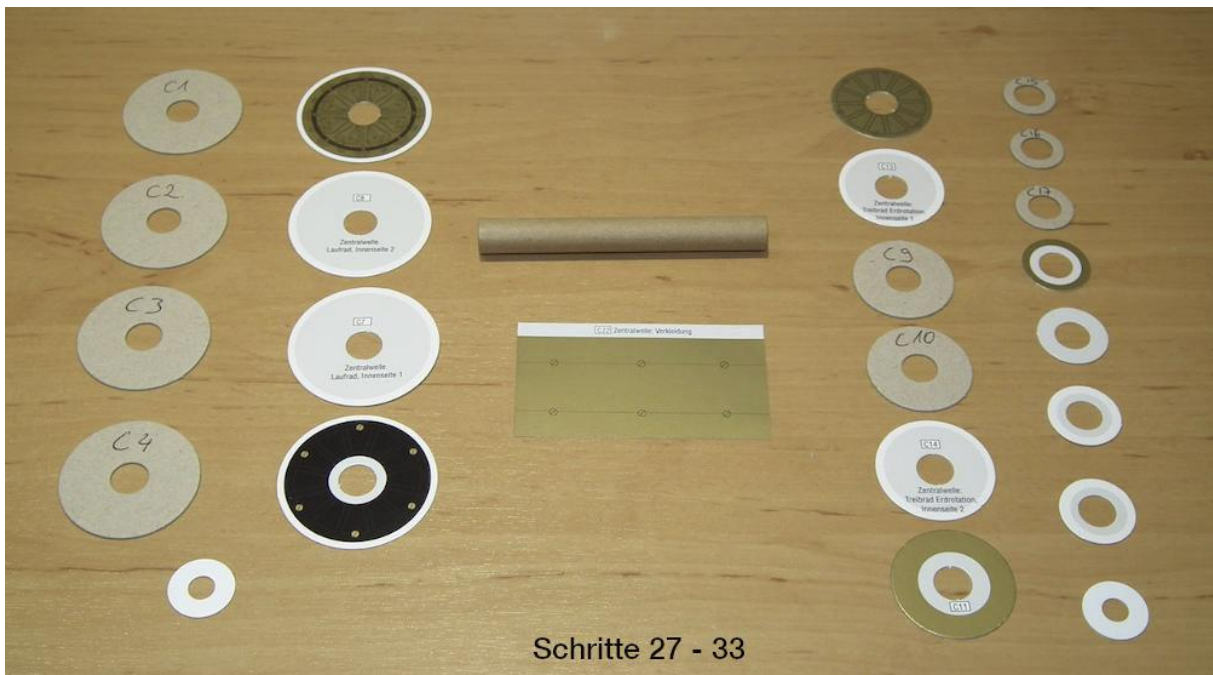
Schritte 23 - 26

The parts of the crank arm for usage in steps 23 to 26.



Step 26: In this step, the previously created crank arm is glued onto the driving wheel and the hole with the axle is provided with a cover.

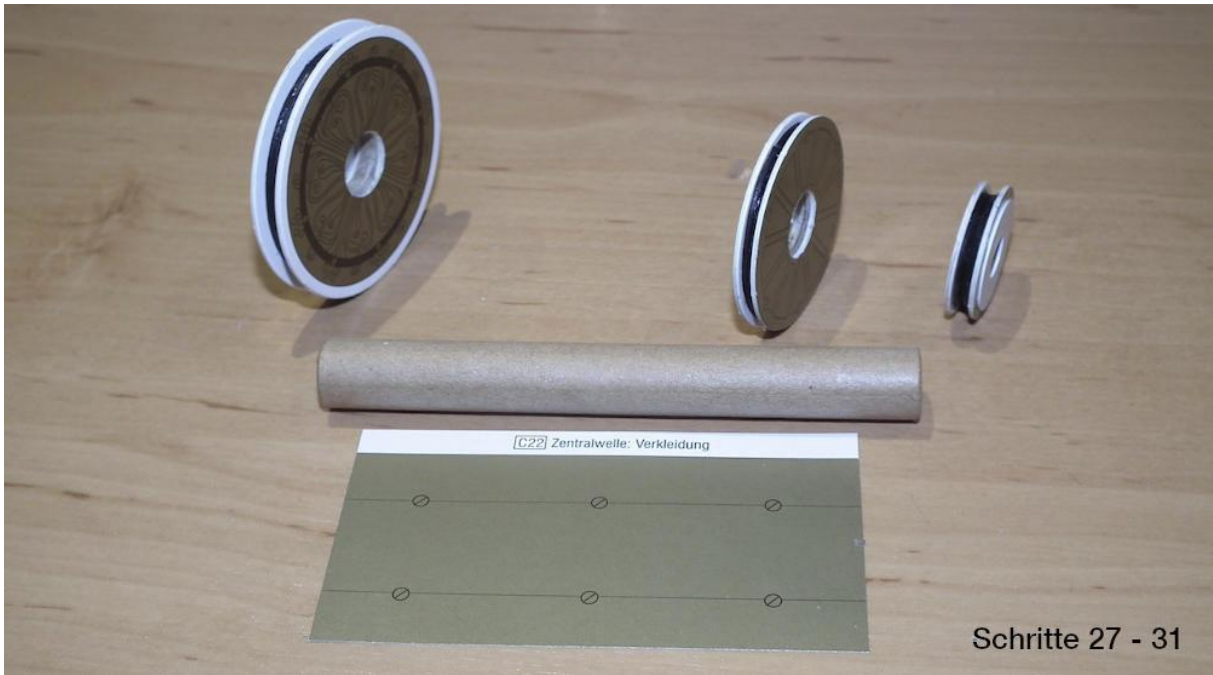
The central shaft



In steps 27 to 33, the central shaft is created from these 25 parts.



Steps 27, 30 & 31: The edges of the centre parts of the running and driving wheels of the central shaft are painted black.

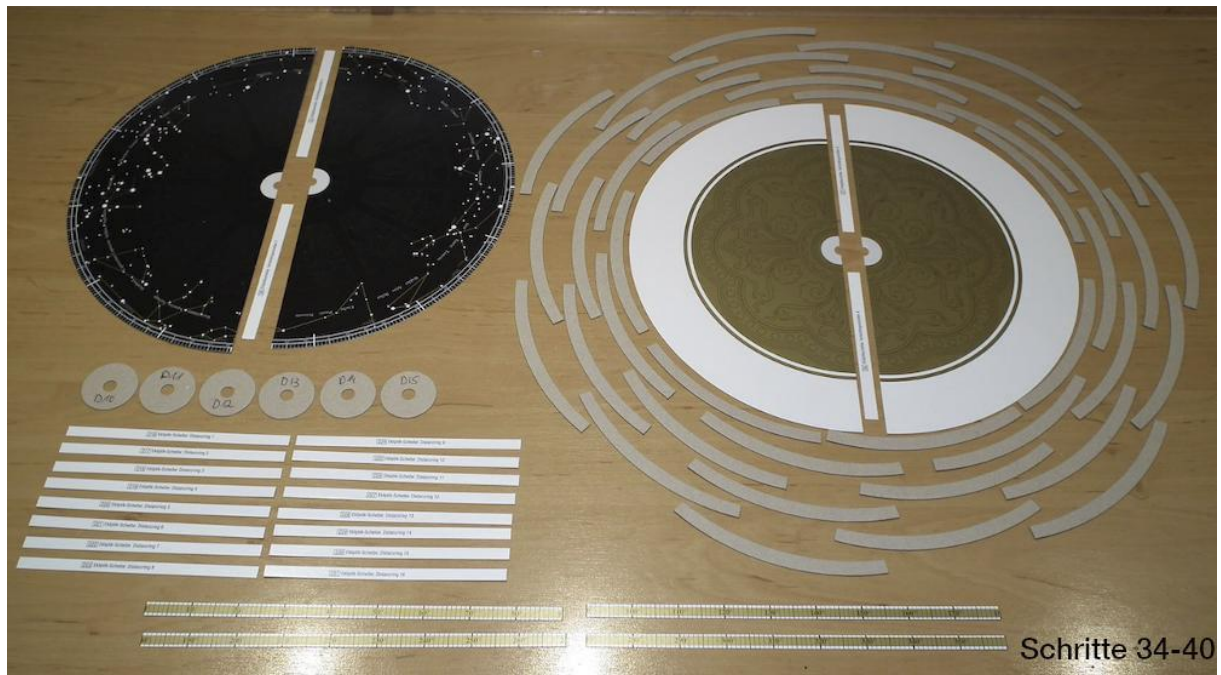


Steps 27 - 31: The impellers and drive wheels made according to steps 27 to 31 and the shaft and its casing required in steps 32 and 33.

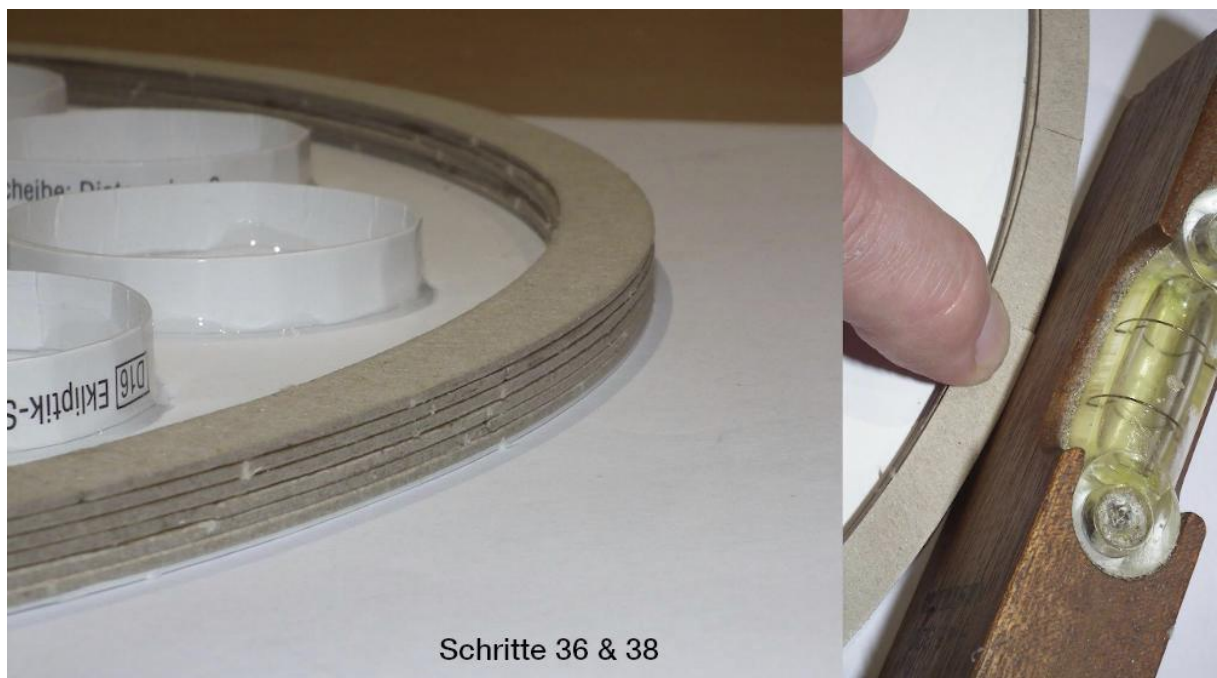


Steps 32 & 33: The completed central shaft.

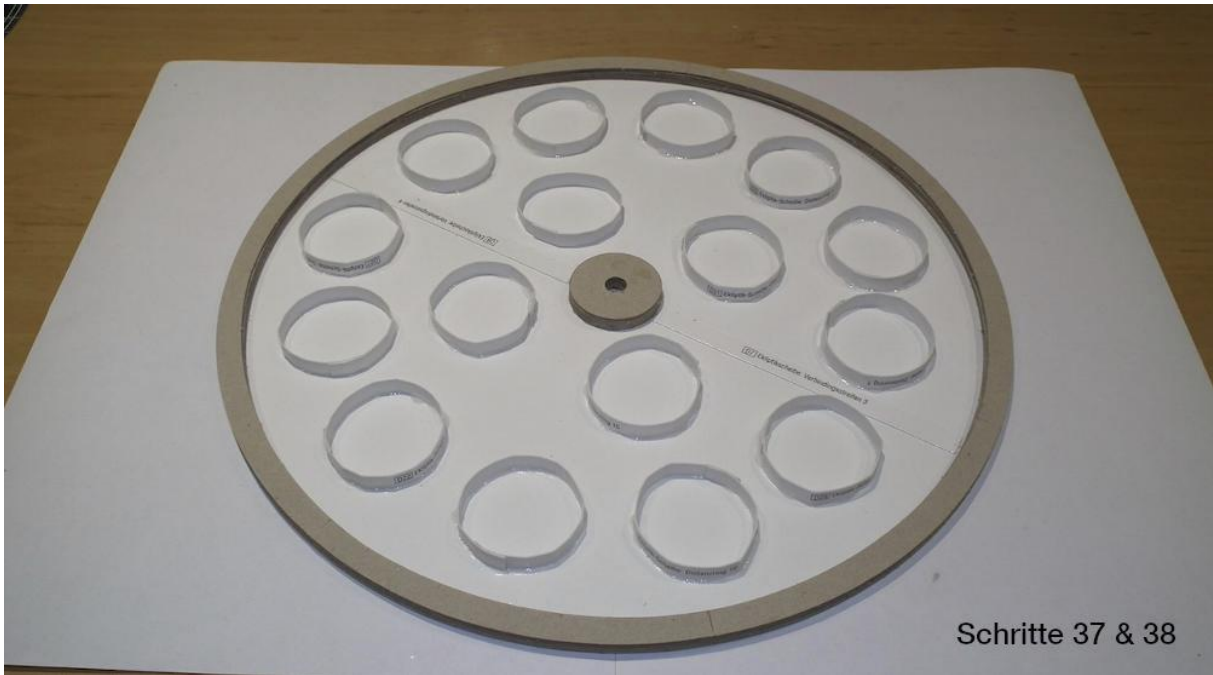
The ecliptic disc



The ecliptic disc is created from these 76 parts in steps 34 to 40.



Steps 36 & 38: In step 36, make sure to build up the edge reinforcement exactly square to the underside of the pane. An appropriate tool (see right part of the picture), with which you can move along the edge, is helpful here.



Schritte 37 & 38

Steps 37 & 38: Assembly of the inner axle fixation and the spacer rings.



Schritte 39 & 40

Steps 39 & 40: The finished ecliptic disc.



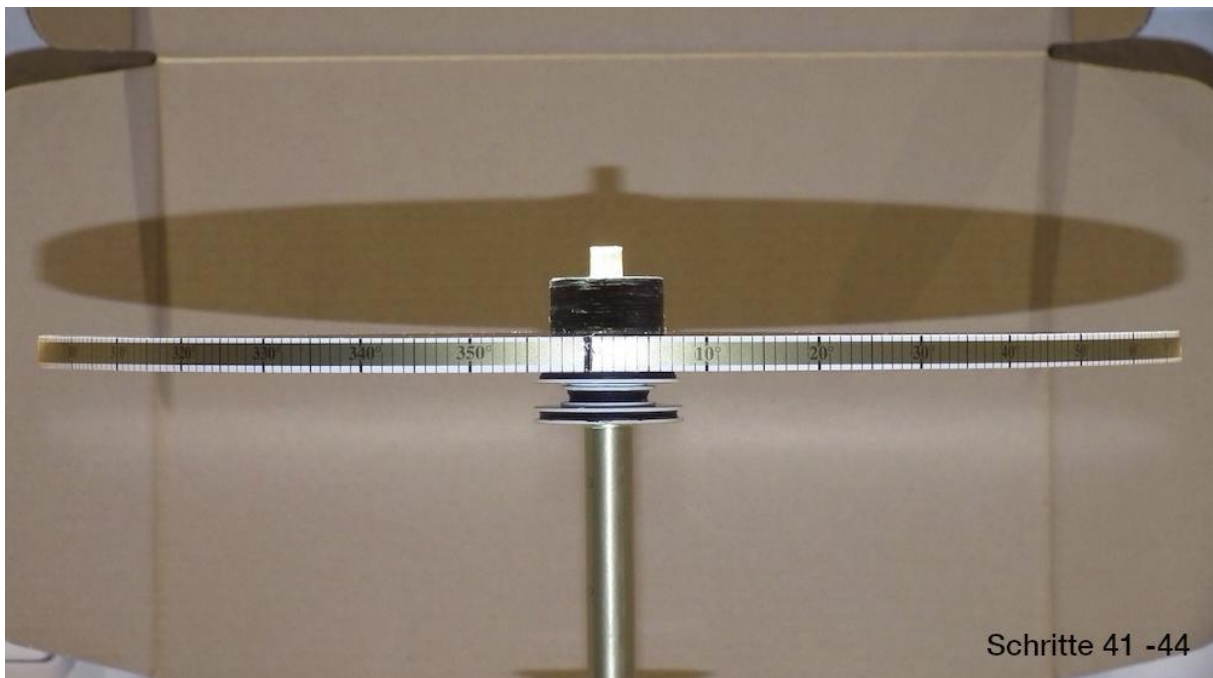
The parts required to complete steps 41 to 44.



Step 41: Create the earth tilt drive wheel according to step 41 and mount it on the underside of the ecliptic disc.



Step 44: The cylindrical block mounted on the top of the ecliptic disc consisting of 14 discs "D43".



Steps 41 – 44: Side view of the ecliptic disc after completing the work described in steps 41 to 44.

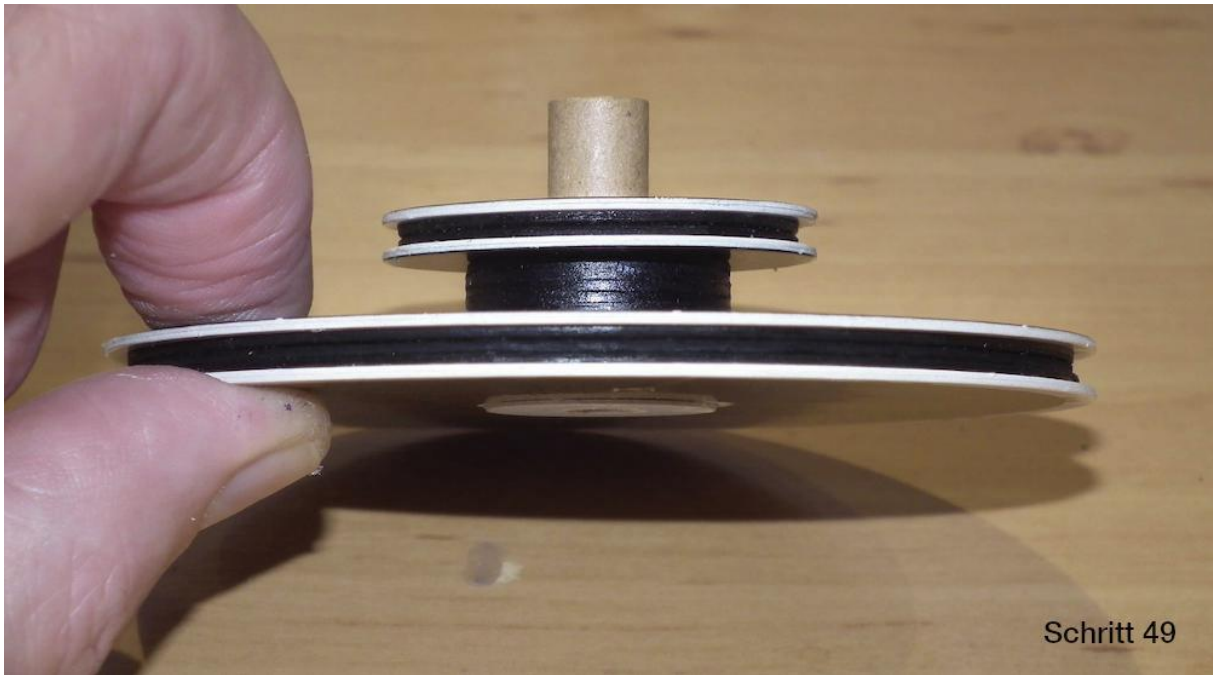
The planetary gear



Steps 45 – 49: The parts for the lower part of the planetary gear, which wraps around the ecliptic disk.

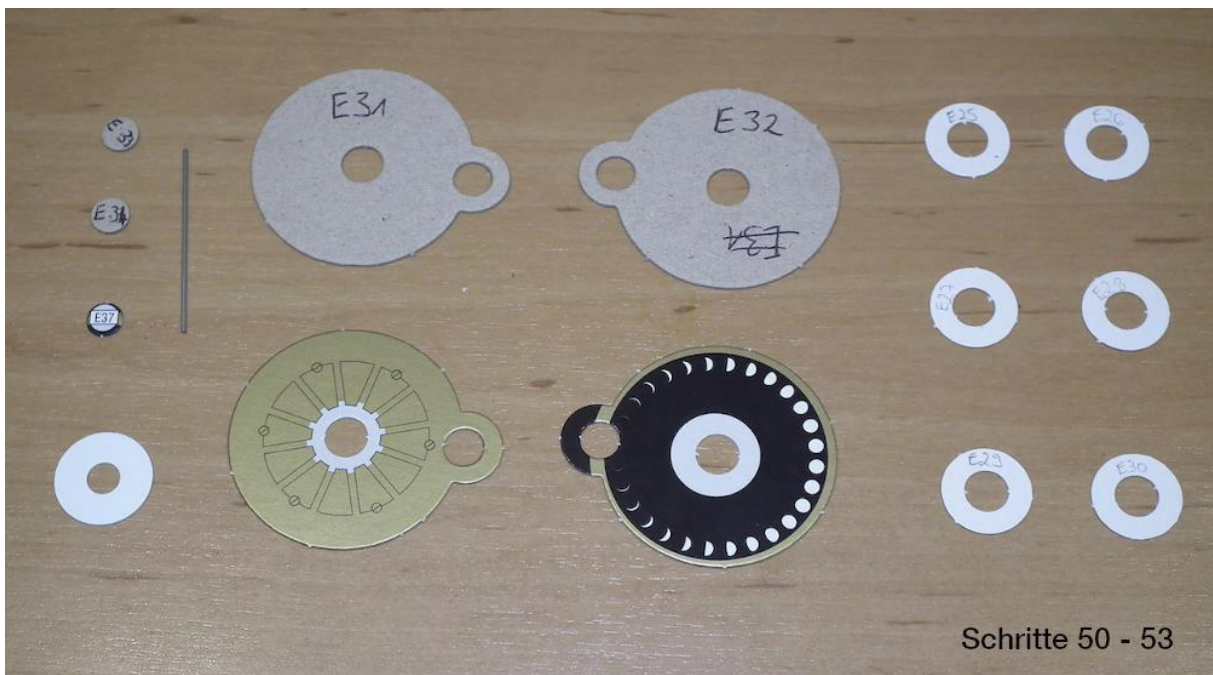


Steps 45 – 49: Here we deviated a little from the building instructions. Building the roller as a separate part next to the impeller (right) and the Mercury driving wheel (left) makes it easier to colour and smooth the surface of the roller.



Schritt 49

Step 49: The part of the planetary gear that rolls around the ecliptic disc after completing step 49. Now check whether the gear part can be rolled around the ecliptic disc without any problems. It may be necessary to use discs E21-E27, sheet 19, to ensure that the gear can be rolled around the ecliptic disc without resistance.

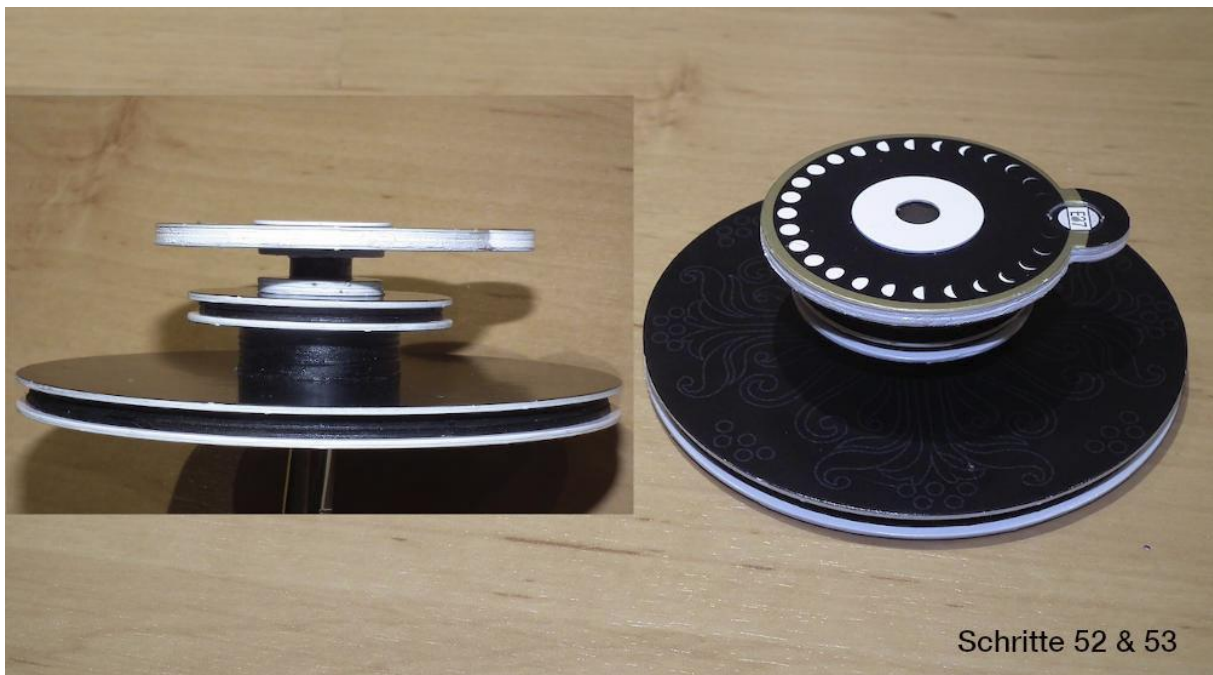


Schritte 50 - 53

Steps 50 – 53: Parts for Venus driving wheel and moon orbit disc.

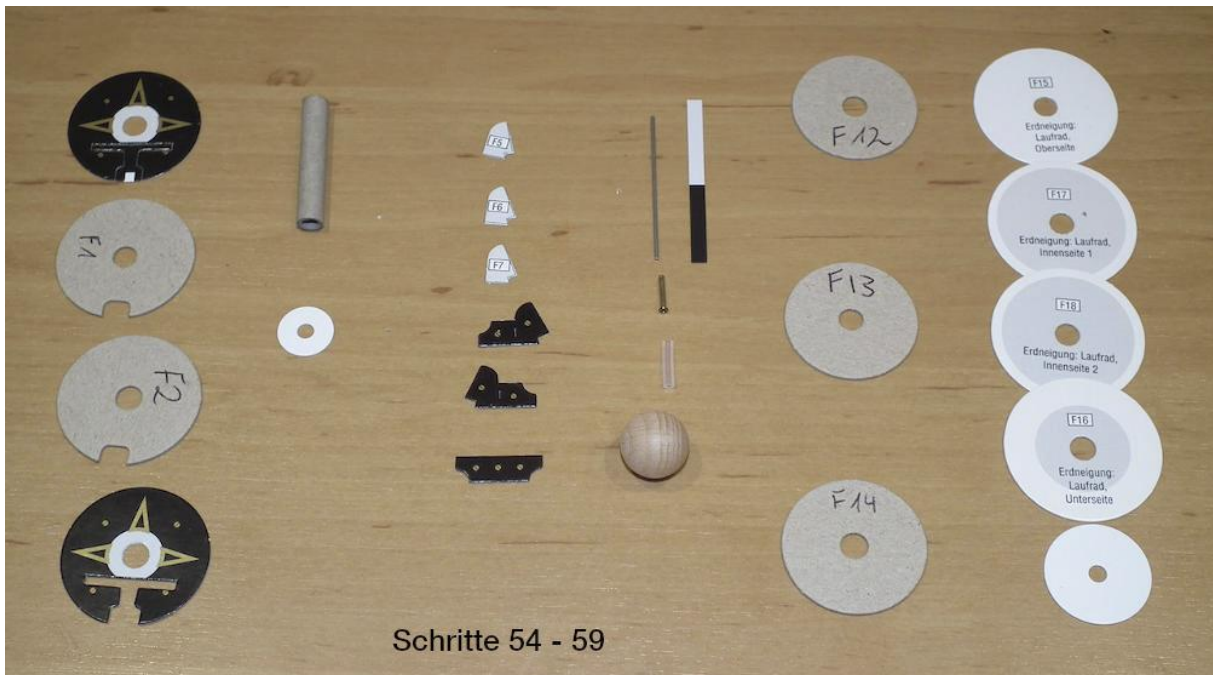


Steps 50 & 51: The moon orbit disc after steps 50 and 51. The metal pin is first removed again and serves here only to check its vertical alignment.



Steps 52 & 53: In step 52 the Venus driving wheel is created, step 53 leads to the completion of the planetary gear.

Earth tilt alignment



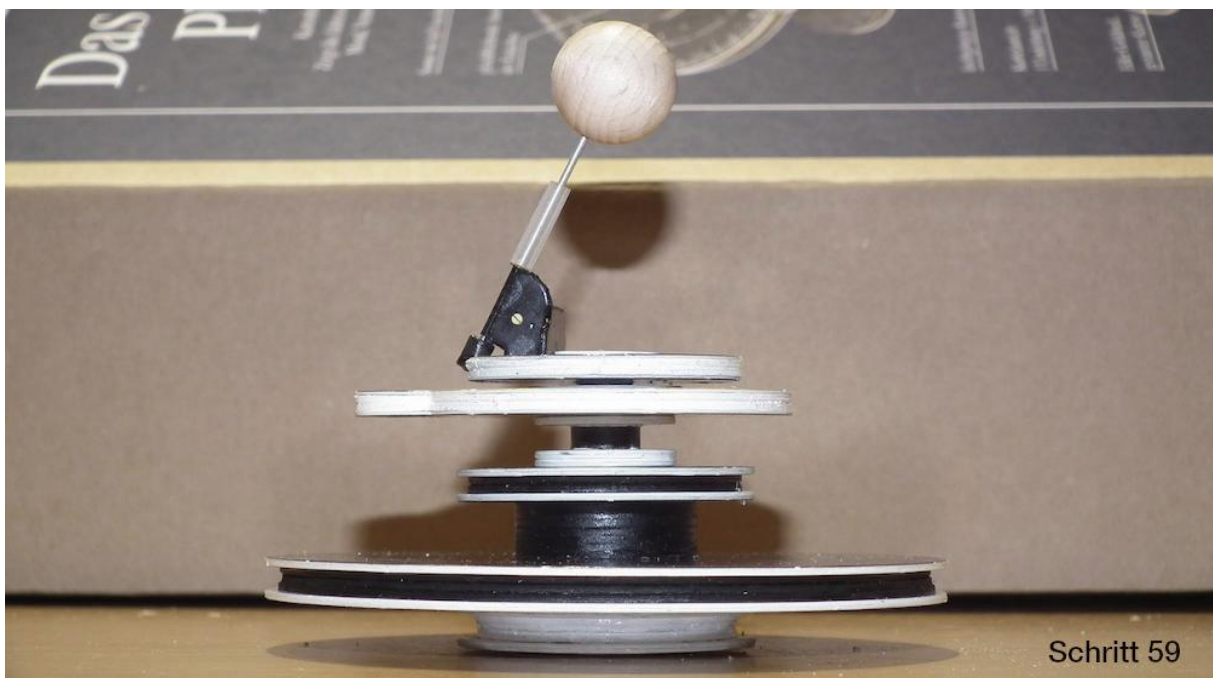
The parts needed in steps 54 to 59 for the construction of the earth tilt alignment.



Steps 55 & 56: The support for the earth axis is created according to steps 55 and 56 and the edges are coloured black.



Steps 54 – 58: Earth axis base made in the familiar layered construction method, now with assembled earth axis holder and "earth sphere" attached for testing purposes.



Step 59: After completing step 59, you will find the earth axis base at the top and the earth tilt impeller at the bottom.

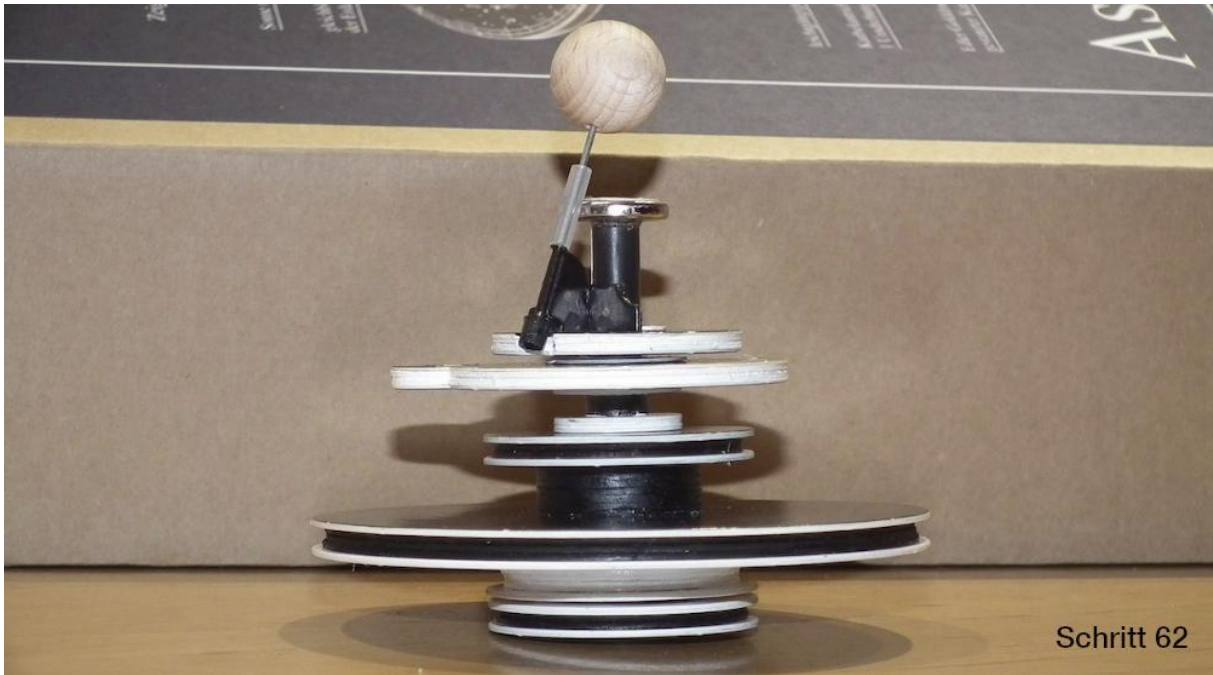
The Earth's rotation



Steps 60 – 62: The parts needed to build the Earth's rotation.

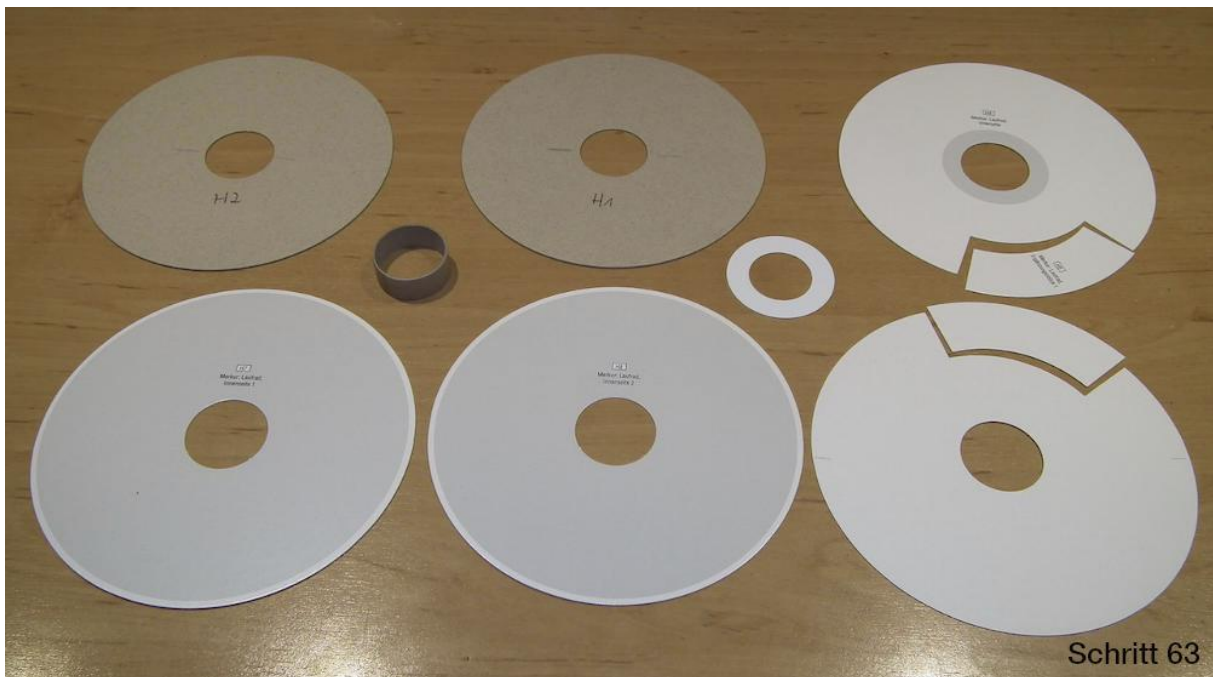


Steps 60 & 61: Magnet with bracket, axle and impeller Earth rotation ready for installation in the planetary gear.



Step 62: After installing the earth rotation, the planetary gear is complete. The magnet must have secure contact with the silicone tube pulled over the earth axis. If this is not the case, because the magnet is too low, the sleeve must be extended, e.g. by attaching a suitable section of pipe or drinking straw. Alternatively, washers can be used.

The Mercury track disc



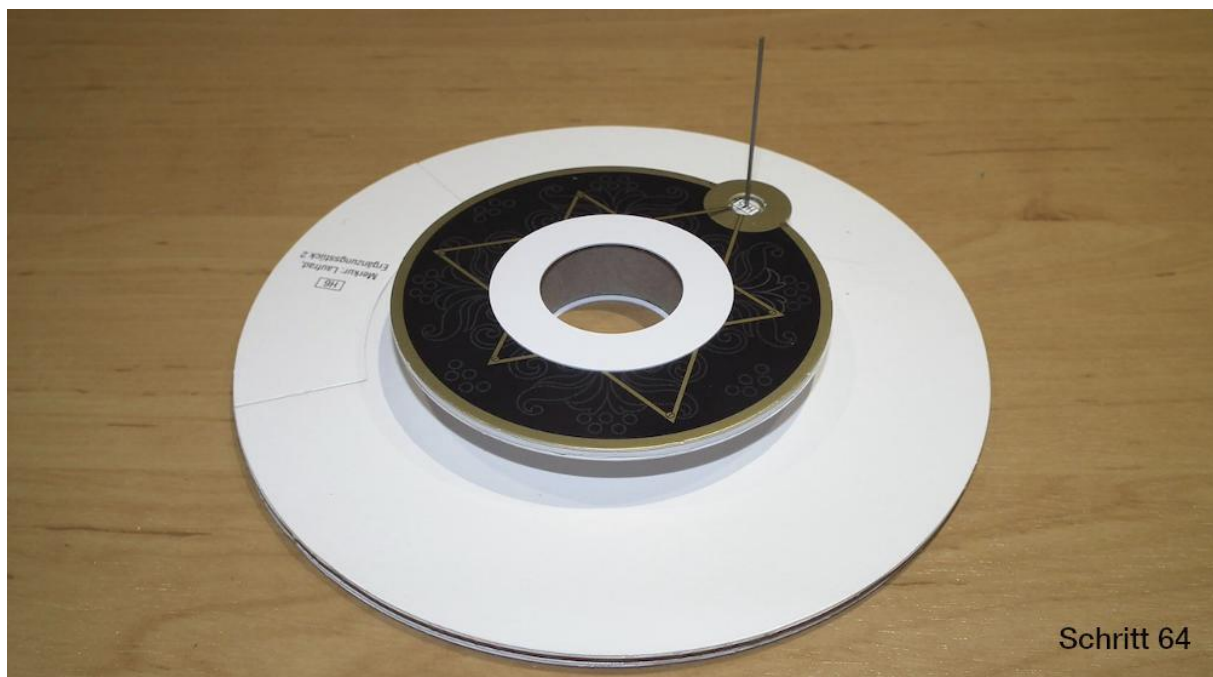
Step 63: The parts prepared for the first part of the Mercury track disc.



Step 63: The Mercury impeller after completing step 63.



Step 64: The parts prepared for the creation of the Mercury track disc.

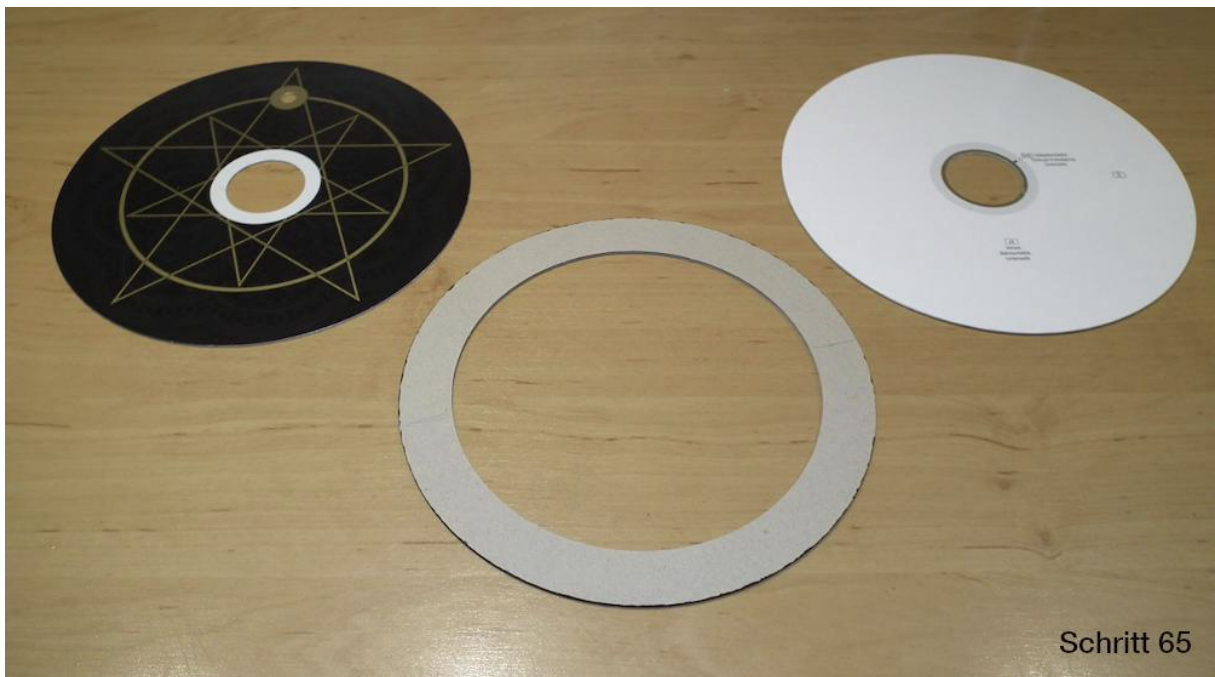


Step 64: The Mercury track disc is also created in the familiar layered construction method, paying attention to the details in step 64, and placed on the hard paper sleeve of the impeller - do not glue it down yet!

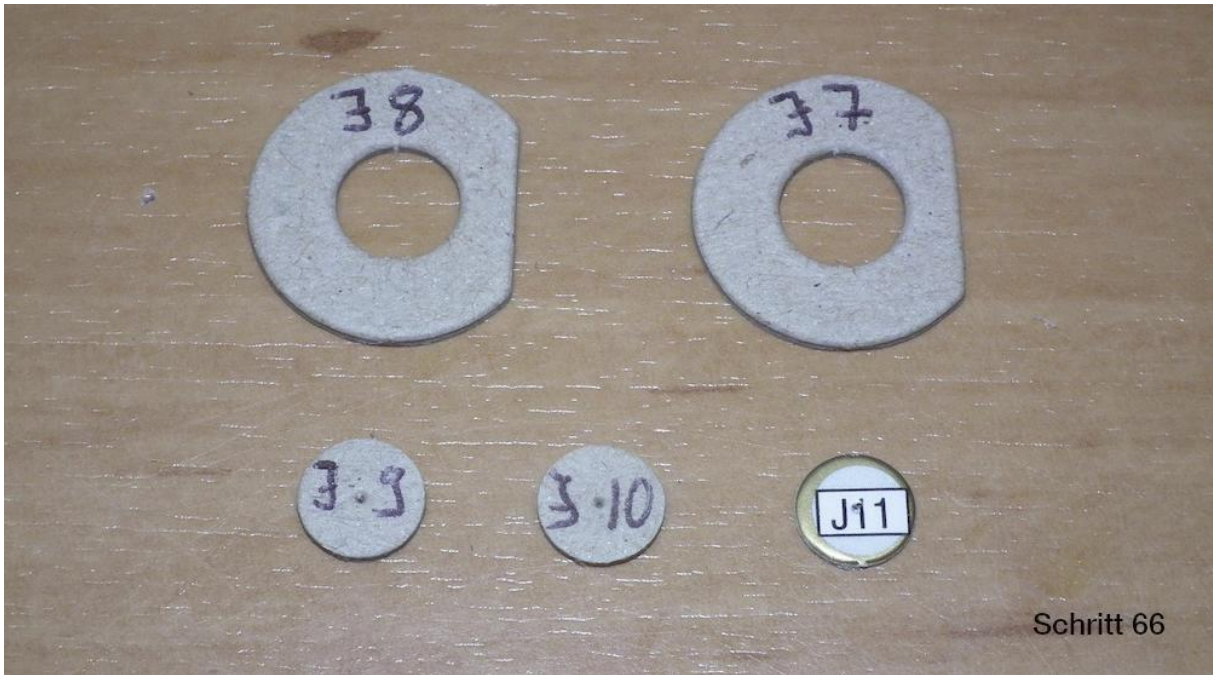
The Venus track disc



Step 65: Individual parts for the "1st act of the Venus railway disc".



Step 65: Glue two parts each to form the upper, middle and lower parts of the Venus track disc.



Schritt 66

Step 66: The parts of the wire pin base needed to complete step 66.

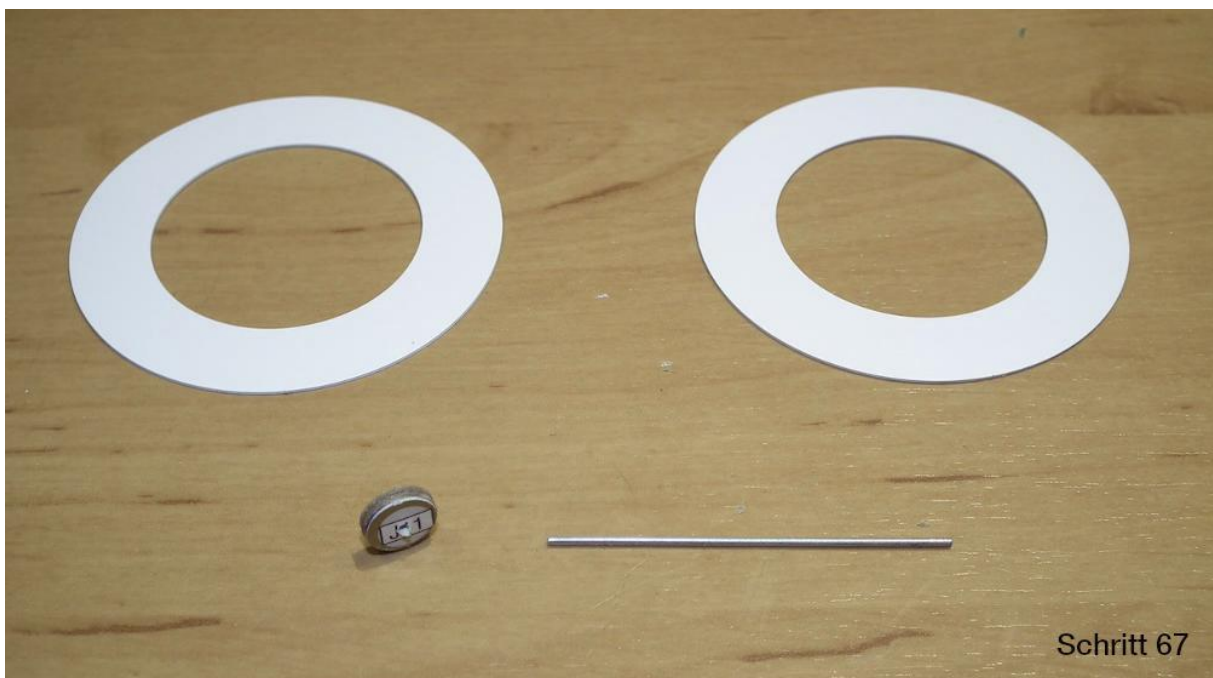


Schritt 66

Step 66: Part 1, wire pin base and its holder, which is glued to the bottom of the top of the Venus track disc.



Step 66: The upper, middle and lower parts of the Venus track disc are glued together after completing step 66.



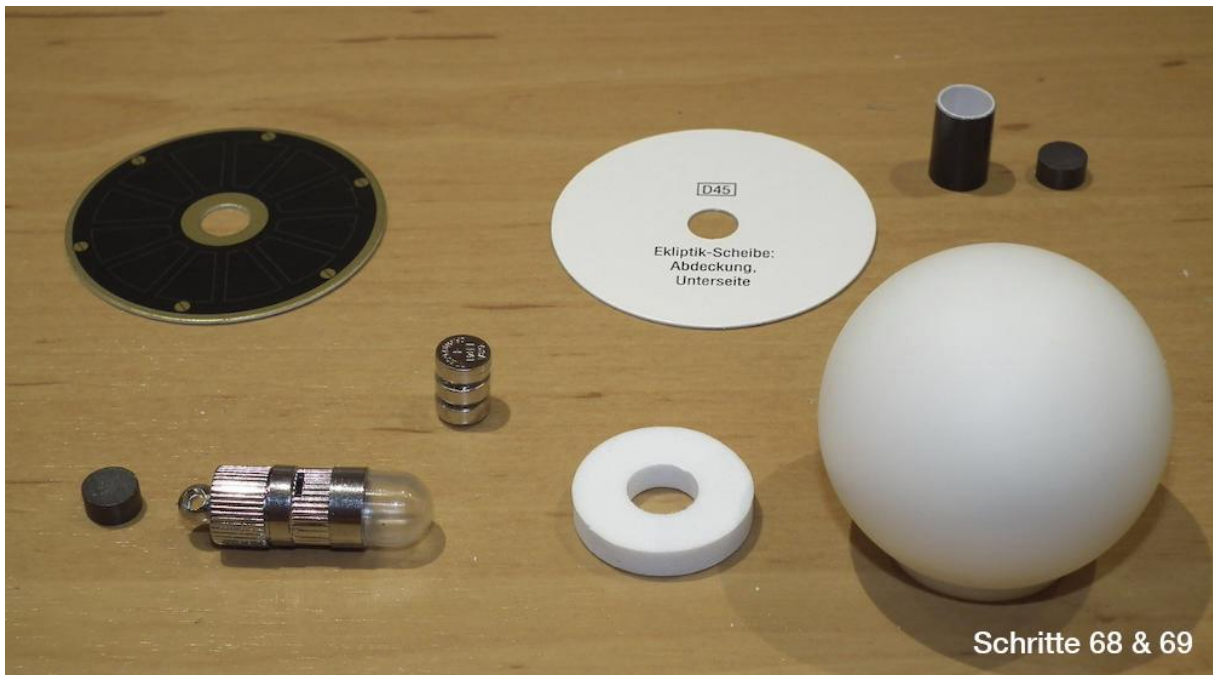
Step 67: Bearing plates and wire pin with its base for the use in step 67.



Schritt 67

Step 67: Venus track disc after attaching the bearing washers and the wire pin base.

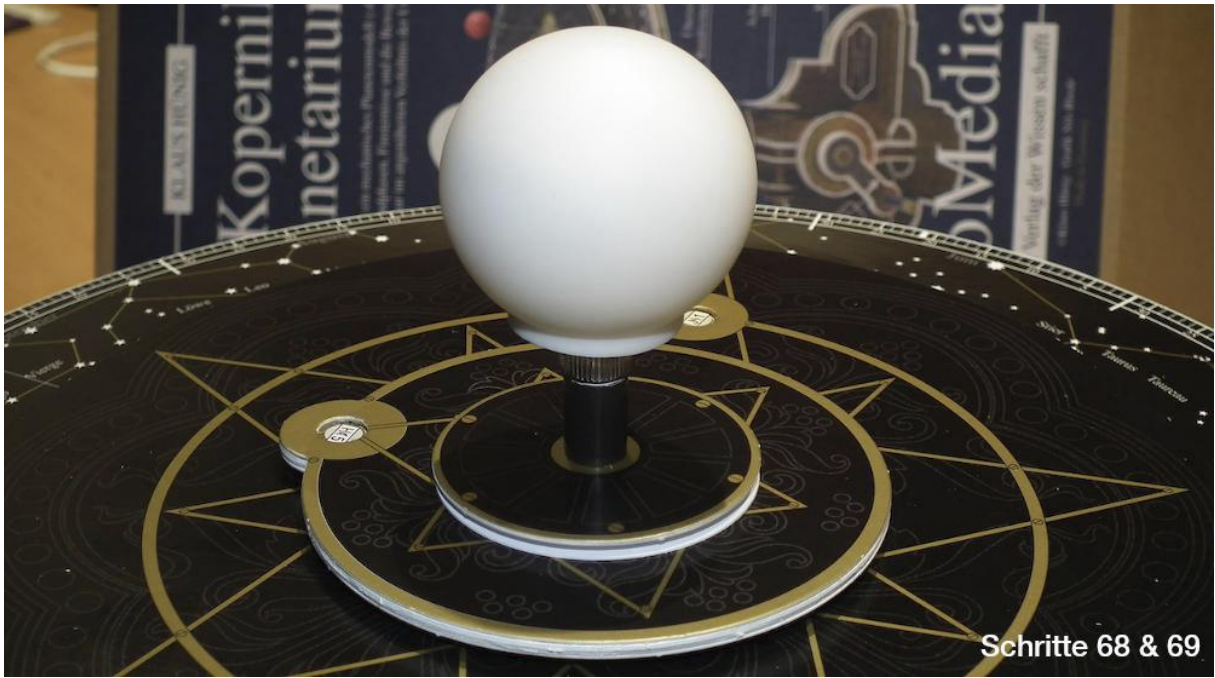
The Sun



Steps 68 & 69: Parts for covering the ecliptic disc and for the sun.

Attention! The picture above shows the currently delivered version of the sun. In a previous edition of the kit there was a different sun:





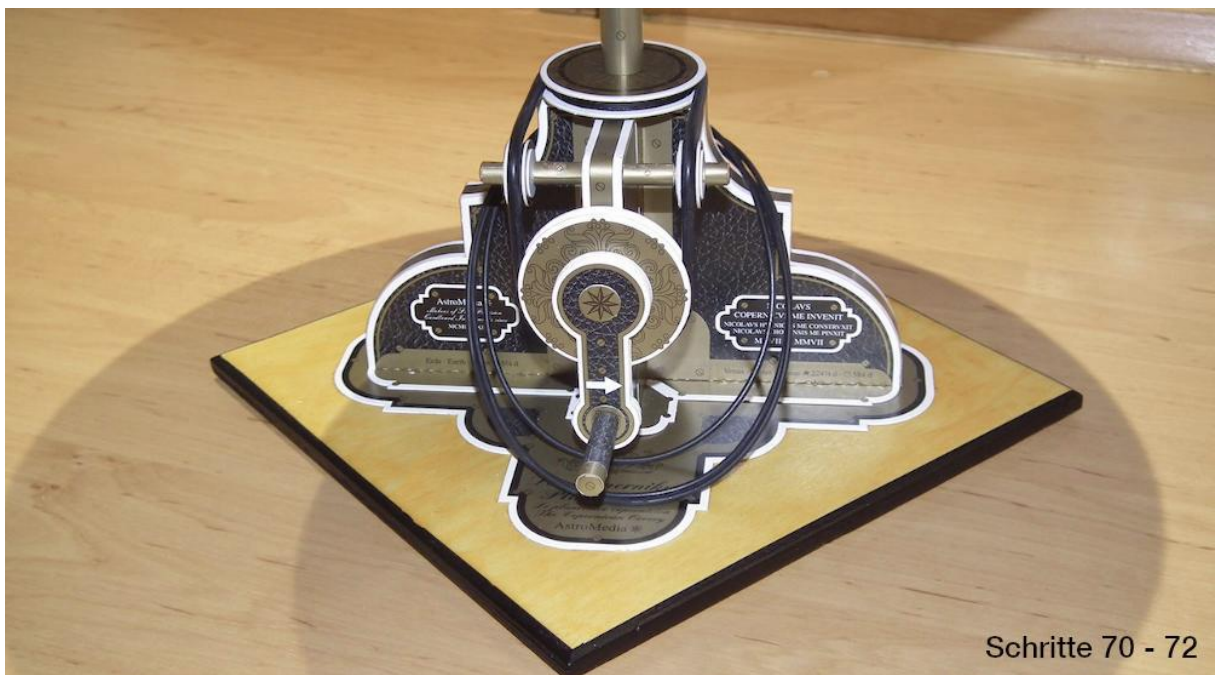
Schritte 68 & 69

Steps 68 & 69: After assembling the sun and creating the cover as well as mounting it, the Copernican Orrery is ready except for the rubber rings and the celestial bodies.

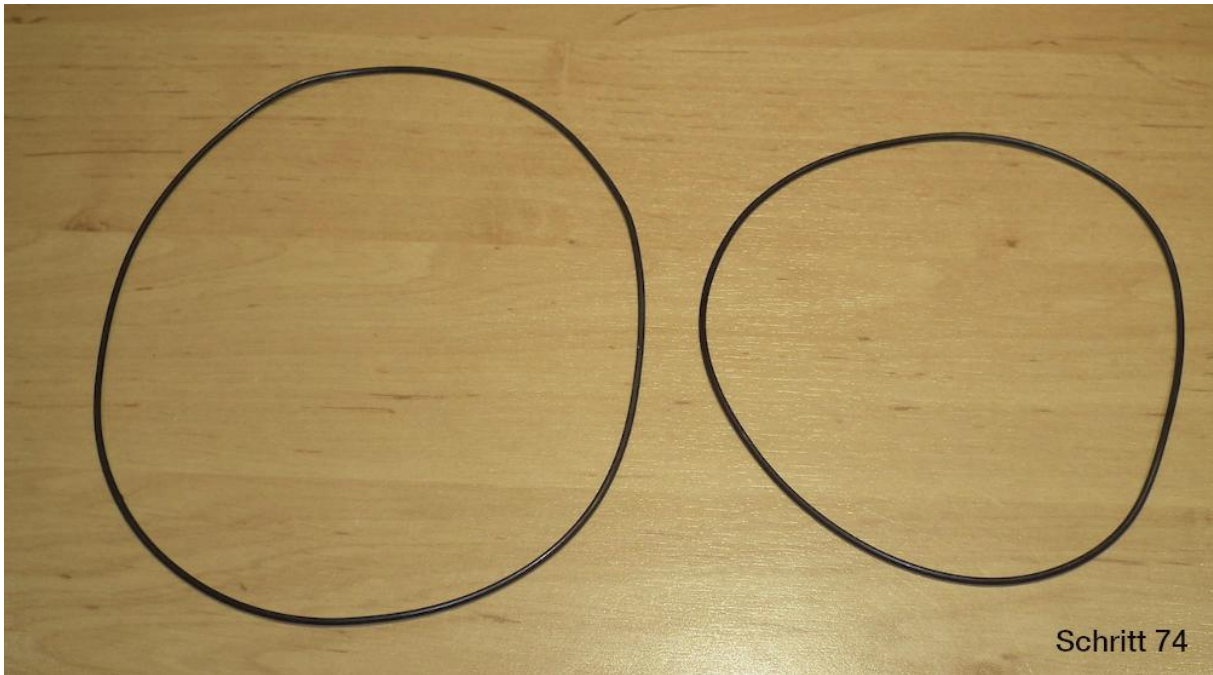
The completion



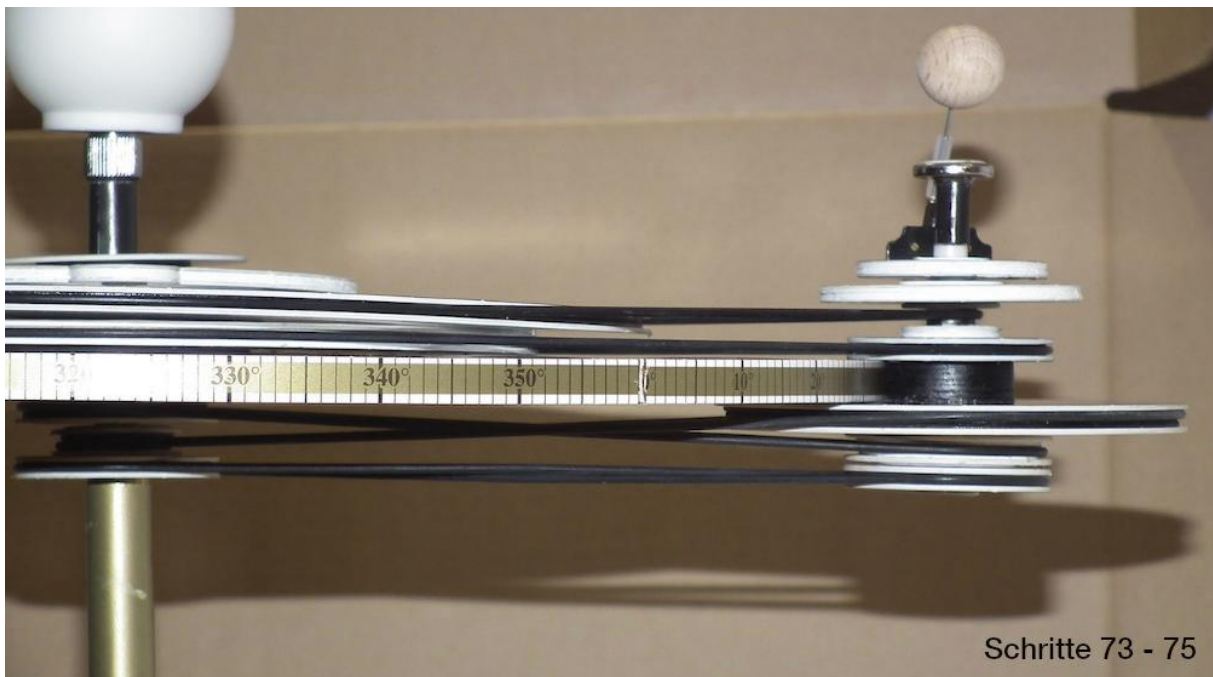
Steps 70 & 72: The four rubber rings, which are placed on the base before gluing in the central axle. Rub the rubber rings with spirit before fitting to increase static friction.



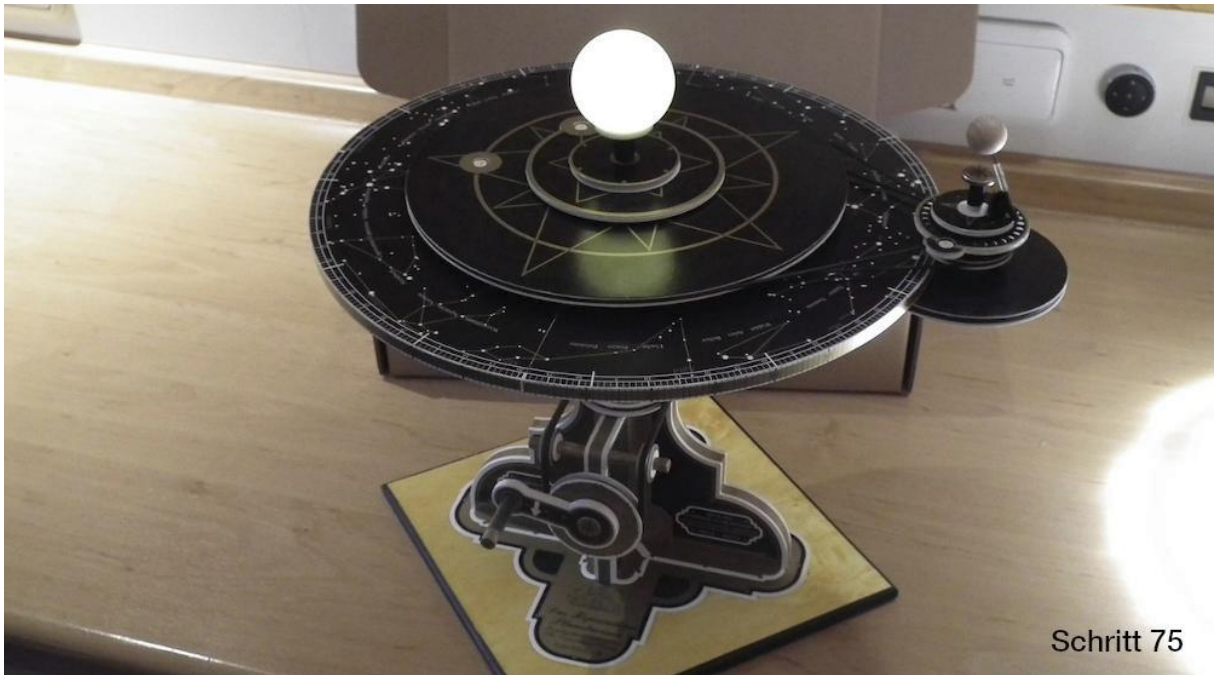
Steps 70 & 72: Glue the axle in place and prepare the rubber rings. The thickest of the rings is placed around the crank wheel, the pulleys and the driving wheel of the central axle.



Step 74: The two longest rubber rings for the Mercury and Venus drives.



Steps 73 – 75: The rubber rings are placed on the grooved wheels according to their function.



Step 75: First performance test: Everything spins!



Step 76: Assembly of the pins and covers for Mercury, Venus and the Moon.

