

The invention concerns a junction part, preferably for model building, with two like cylindrical or prismatic structures which for their part are each composed of two like roughly disc-shaped structure halves, each structure half and thus each structure exhibiting a cut-out which extends from the centre axis to the edge and is of a width adapted to the height of the structure, two structures each being interlocked crosswise by means of these cut-outs and together forming a junction part with four ribs which are each offset by 90° to one another and project radially outwards and each of which is provided with essentially radially directed recesses which in each case lie partly in one and partly in the other structure half and are designed for detachable attachment of the free end of at least one component.

Such junction parts can be used in the construction of frameworks or models for example and generally have the shape of a sphere in which radial recesses are formed for screwing in or otherwise fixing framework bars or threaded shanks or the like disposed on any components. Such junction parts are shown for example in DE-C 876 977, DE-C 901 955 or DE-A 2 905 638.

Further, DE-U 1 781 362 shows a junction part for toy construction kits. This junction part has two like cylindrical structures which for their part are composed of two like disc-shaped structure halves, each structure exhibiting a cut-out which extends from the centre axis to the edge and is of a width adapted to the height of the structure, and to form the junction part two structures are interlocked crosswise by means of these cut-outs. This produces a junction part with four radial ribs and each of these ribs has radial recesses for detachable attachment of an end of a rod. The end of the rod is inserted in such an opening and held in it by friction. Alternatively, the radial recesses can be provided with threads into which corresponding threads on the ends of the rods can be screwed.

A connection based on friction is unreliable. A connection by means of threads cannot be used if a complex framework, e.g. a complicated model of a molecule, is to be constructed by means of such junction parts.

Therefore, the object of the present invention is to create a junction part which permits easy but secure attachment of the free ends of components while being of simple construction and light weight.

According to the invention this object is achieved with a junction part named at the start in that a first constriction which is essentially complementary to a corresponding constriction of the component and outwardly

delimits a cavity which is approximately complementary to the free end of the component, is formed in each radially directed recess a distance from the associated outside of the structure concerned. The constriction and the cavity adjoining it on the inside ensure easy attachment of an end of a component designed to complement it. This attachment is secure and strong and can easily be detached again if need be, which facilitates the construction of stable models.

Here, it is particularly advantageous that a cavity with the shape of a spherical section which is complementary to a sphere-like shank at the free end of the component is provided in each recess on the side of the first constriction remote from the outside of the junction part. Assembly is facilitated in that in each case the first constrictions widen in the shape of a cone towards the outside of the junction part.

In one particularly preferred embodiment the structures each exhibit a hexagonal or an octagonal cross-section and the adjacent essentially radially directed recesses enclose an angle of 60° or 45° respectively.

If the junction part according to the invention is used for model construction or for toy kits or the like, the loads encountered in these applications are only relatively small, making it possible to manufacture the structures according to the invention from an elastic material, in particular from plastic.

In a further development of the invention, in order to centre the two structure halves of a structure securely in relation to one another and moreover prevent them turning in relation to one another, the adjacent sides of the two structure halves have cylindrical recesses formed in them the longitudinal axes of which are directed perpendicularly relative to the longitudinal axes of the radial recesses or channels and in which pegs or the like formed on the opposite side of the other structure half engage fully.

If these two structure halves manufactured from plastic are to be joined together by means of ultrasonic welding for example, it is expedient if projecting ribs, feet, pegs or the like are formed on at least one of the two facing sides of the two structure halves, considerably reducing the contact cross-section between the two structure halves and thus considerably increasing the effect of the ultrasound.

Absolutely any shape of component as well as rods can be joined together by

means of such a junction part made of plastic. For this, these components and rods each exhibit a shank engaging completely in a radial recess in the junction part concerned, and then at least this shank is also made of an elastic material, e.g. of plastic.

Further details and advantageous developments of the invention will become apparent from the embodiment example which is described in the following and illustrated in the drawing and not to be taken as limiting the invention in any way, and from the subordinate claims.

Fig.1 is a side view of a junction part according to one preferred embodiment example of the invention, with rods attached to it;

Figs.2 and 3 each show one of the two like structures which form the junction part and are offset by 90° to one another, prior to assembly;

Fig.4 shows a section through the structure in Fig.2 along the line 4-4 in Fig.2 to an enlarged scale;

Fig.5 shows a partially sectioned plan view from above of the structure shown in Fig.2, also to an enlarged scale, and

Fig.6 shows a plan view of the inside of a structure half of the structure shown in Fig.5 and viewed in the direction of the arrow A in Fig.5.

Fig.1 shows a junction part denoted by 1 which is used to connect elements denoted by 2, here in the form of rods. The junction part 1 is composed of the two structures 3 and 4 which are illustrated in Figs.2 and 3 and each exhibit the shape of an octagonal prism. Each structure 3, 4 is provided with four continuous bores or channels 6 which in each case enclose an angle alpha of 45° and extend parallel with the outer side faces 5 of the structures, i.e. the end faces of the prisms. In addition, each structure 3, 4 has a rectangular cut-out denoted by 7, which extends from its outer edge 9 to its centre axis 8. The width b of this cut-out 7 is equal to the height h of each of the two structures 3 and 4. This makes it possible to interlock the two structures 3 and 4 in the direction of the two arrows 10 and 11 so as to produce the junction part 1 illustrated in Fig.1 with its four ribs 12 which extend radially outwards and are in each case offset by 90° to one another; this is suitable as a junction part for a space grid.

As can also be seen in Figs.1 and 3 and in particular in Figs.4 and 5, each

of the two structures 3, 4 again consists of two structure halves denoted by 13 and 14 which lie with their facing inside surfaces 15 and 16 against one another and are glued or welded together, e.g. by ultrasonic welding.

Fig.6 shows a view of one structure half 13, viewed in the direction of the arrow A in Fig.5. Here, the inside 15 of this structure half 13 has moulded in it seven grooves denoted by 17 which in each case are offset by the angle α of 45° to one another. In order that these grooves 17 form a channel similar to the bore or the channel 6 with the opposing grooves 18 in the facing inside 16 of the other structure half 14, the cross-section of these grooves 17, 18 is in each case semi-circular. These grooves 17, 18 meet in the centre axis 8 and in each case terminate in an opening denoted by 19 which widens like a cone towards the outside. An annular groove denoted by 20 is formed in each of the grooves 17 and 18 at a distance denoted by a (Fig.6) from the edge 9 of these structure halves 13 and 14 and forms a hemispherical cavity 21 with the groove 17 or 18 as shown.

As Fig.5 shows, between these grooves 17 and 18 in the inside 15 of the structure half 13 there are cylindrical holes 22 into which pegs 23 moulded on the facing inside 16 of the other structure half 14 and exhibiting the same dimensions project. Similarly, there are also cylindrical holes 24 formed in the inside 16 of the other structure half 14 and pegs 25 moulded on the inside 15 of the structure half 13 cooperating with these. These pegs 23, 25 serve to join and correctly position the two structure halves 13, 14.

In order to weld these two plastic structure halves 13, 14 together by means of ultrasound if necessary, the insides 15 and 16 of these structure halves 13, 14 have feet 26, indicated solely by broken lines in each case, which are moulded on them, as shown in Fig.6, and project towards the inside 16 or 15 of the other structure half 14 or 13 respectively and rest on the facing inside when these two structure halves 13 and 14 are joined together. These feet 26 produce the reduction in contact cross-section required for ultrasonic connection, ensuring a secure connection between the two structure halves 13 and 14.

When the junction part 1 shown in Fig.1 is assembled, the plastic structure halves 13 and 14 are placed together with their insides 15 and 16 facing one another and the cylindrical pegs 23 and 25 engage in the facing cylindrical recesses 22 and 24 respectively and thus prevent the two structure halves 13 and 14 from turning in relation to one another. Then the two structure halves 13, 14 are securely glued, welded or otherwise joined together,

forming the structures 3, 4 illustrated in Figs.2 and 3. These two structures 3 and 4 are then interlocked in the direction of the arrows 10 and 11 in the manner already mentioned and if necessary glued or otherwise joined together, forming the junction part 1.

This junction part 1 serves to connect the rods denoted by 2 the ends 27 of which each exhibit a shank 28 which lies in their axial extension and has to be introduced in an axial direction into one of the radial recesses 6 in the junction part 1. As shown in particular in Figs.4 and 6, the shanks 28 each terminate in spherical ends 29 the diameter D of which (Fig.6) is greater than the diameter d of the bore or channels 6. Thus, when these shank ends 29 are inserted into the associated radial recesses 6, in each case the elastic plastic material of the annular mouth area 30 must yield in order to allow the spherical shank end 29 to pass through. Once this shank end 29 has entered the spherical cavity 21 of the radial recess 6 concerned, the annular area 30 reverts to its original shape and thus surrounds the neck 31 of this shank 28 so that the spherical shank end 29 can no longer come out of the recess 6. This ensures secure location of the shank end 29, the end 27 of the rod and thus the entire rod 2.

If the rod 2 is to be detached from the junction part 1 again, a corresponding pull must be exerted on it so that the spherical shank end 29 slips out of the radial recess 6 again while the annular area 30 again undergoes elastic deformation and allows the spherical shank end 29 to pass.

If the junction part 1 exhaustively described above is made of plastic, it is very light and elastic, opening up the particular possibility of using it both for model building and in toys of many kinds, in particular in toy construction kits.



Patent Claims

1. A junction part (1), preferably for model building, with two like cylindrical or prismatic structures (3, 4) which for their part are each composed of two like, roughly disc-shaped structure halves (13, 14), each structure half and thus each structure (3, 4) exhibiting a cut-out (7) which extends from the centre axis to the edge and is of a width (b) adapted to the height (h) of the structure, two structures each being interlocked crosswise by means of these cut-outs (7) and together forming a junction part (1) with four ribs (12) which are each offset by 90° to one another and project radially outwards and each of which is provided with essentially radially directed recesses (6) which in each case lie partly in one and partly in the other structure half (13 and 14 respectively) and are designed for detachable attachment of the free end (27) of at least one component (2), characterised in that a first constriction (30) which is essentially complementary to a corresponding constriction (31) of the component (2) and outwardly delimits a cavity (21) which is approximately complementary to the free end (27) of the component (2), is formed in each radially directed recess (6) a distance from the associated outside of the structure (3, 4) concerned.

2. A junction part as in claim 1, characterised in that a cavity (21) with the shape of a spherical section which is complementary to a sphere-like shank (28, 29) at the free end (27) of the component (2) is provided in each recess (6) on the side of the first constriction (30) remote from the outside of the junction part (1).

3. A junction part as in claim 1 or 2, characterised in that in each case the first constrictions (30) widen in the shape of a cone (19) towards the outside of the junction part (1).

4. A junction part as in at least one of the preceding claims, characterised in that the structures (3, 4) each exhibit a hexagonal or octagonal cross-section and in that adjacent, essentially radially directed recesses (6) enclose an angle (alpha) of 60° or 45° respectively.

5. A junction part as in at least one of the preceding claims, characterised in that the structure halves (3, 4) are each made of an elastic material, in particular a plastic.

6. A junction part as in at least one of the preceding claims, characterised in that the adjacent sides (15, 16) of the two structure halves



(13, 14) have cylindrical recesses (22, 24) formed in them the longitudinal axes of which are directed perpendicularly relative to the longitudinal axes of the radial recesses (6) and in which in each case pegs (23, 25) or the like formed on the opposite side (16, 15) of the other structure half (14, 13) engage fully.

7. A junction part as in at least one of the preceding claims, characterised in that projecting ribs, feet (26), pegs or the like are moulded on at least one of the two facing sides (15, 16) of the structure halves (13, 14).

8. A junction part as in at least one of the preceding claims, characterised in that each structure half (13, 14) is provided with at least one peg (25) and at least one recess (22) adapted to this peg (25) which are equidistant from the plane of symmetry of the structure half so that in each case when two identical structure halves (13, 14) are joined together to form a structure (3, 4) the peg (23) of one structure half engages in the recess of the other structure half and vice versa.

9. A junction part as in at least one of the preceding claims, characterised in that the shank (28) of an associated component (2) is disposed in at least one of the radially directed recesses (6) and in that at least this shank (28) is made of an elastic material, in particular a plastic.