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(54) KIT OF PARTS FOR VERSATILE FUNCTIONAL TOYS

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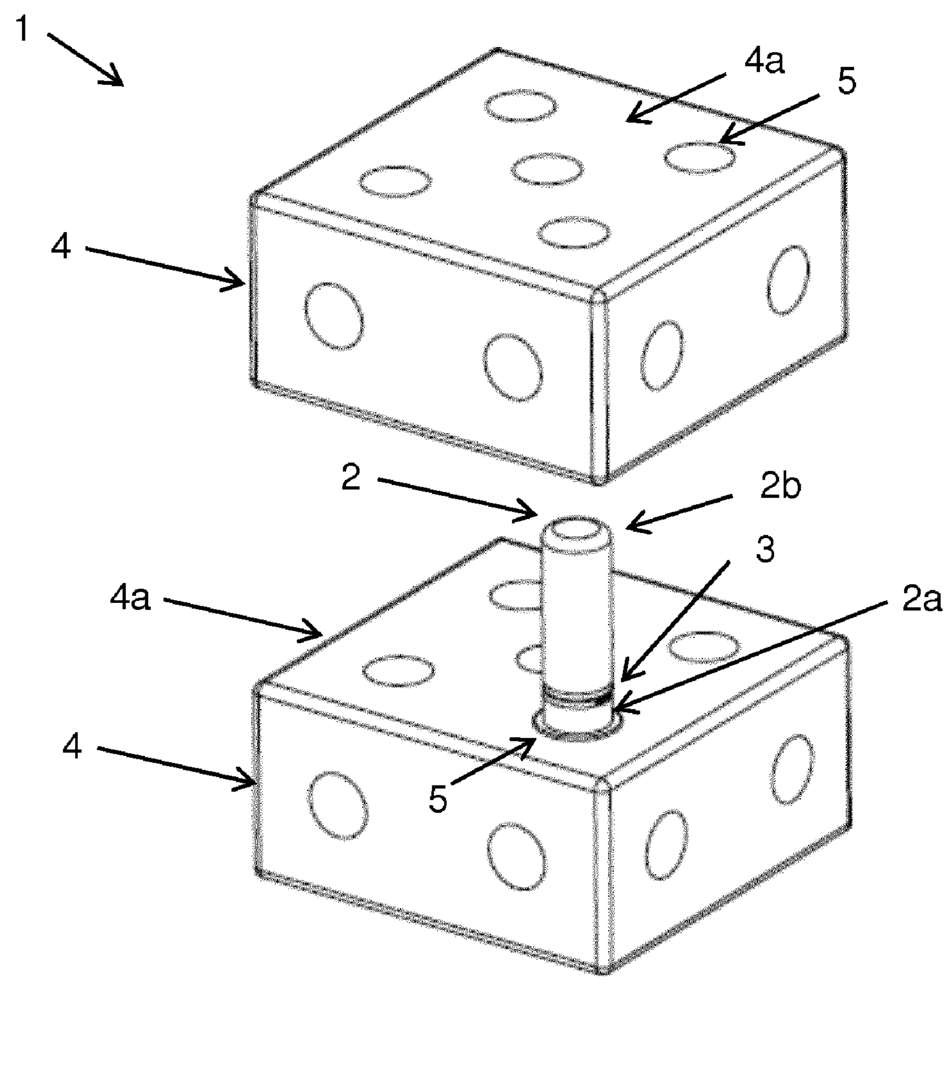
(57) **ABSTRACT**

A kit of parts is provided for a functional toy, such as a children's walker or push along wagon. The kit includes one or more connector(s) having a first and second end, and a radially extending flange therebetween; and one or more foam element(s) with at least one essentially planar surface having at least one opening extending perpendicular to the surface for receiving at least the first end of the connector. The connector flange is configured as a stopper for the insertion of the first end into the foam element opening. When the first end is inserted into the foam element opening to the stopper position, and a further suitable amount of force is applied, the flange of the connector is countersunk into the surface of the foam element, and remains countersunk after the further force is removed due to the frictional force between the connector and the opening.



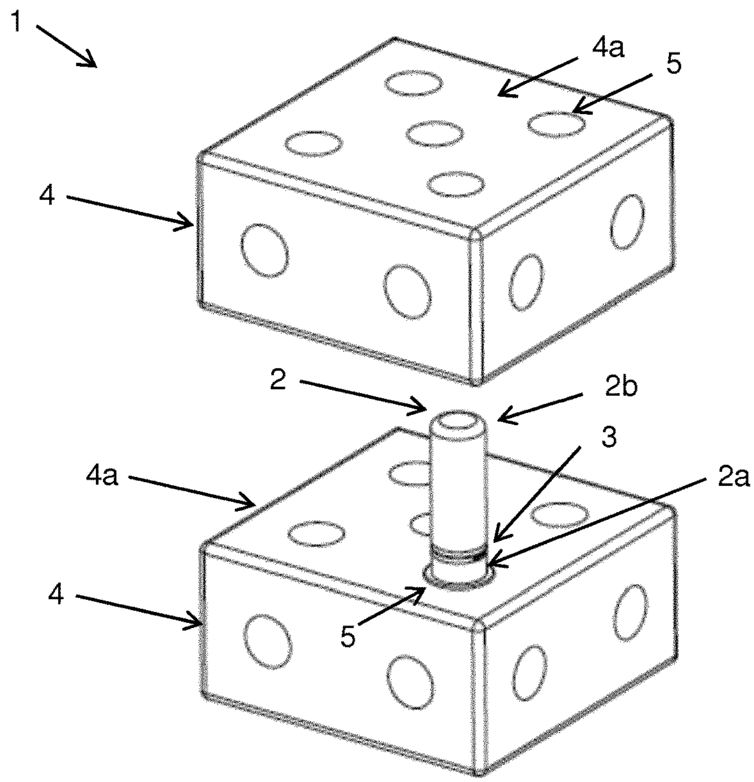


Fig. 1

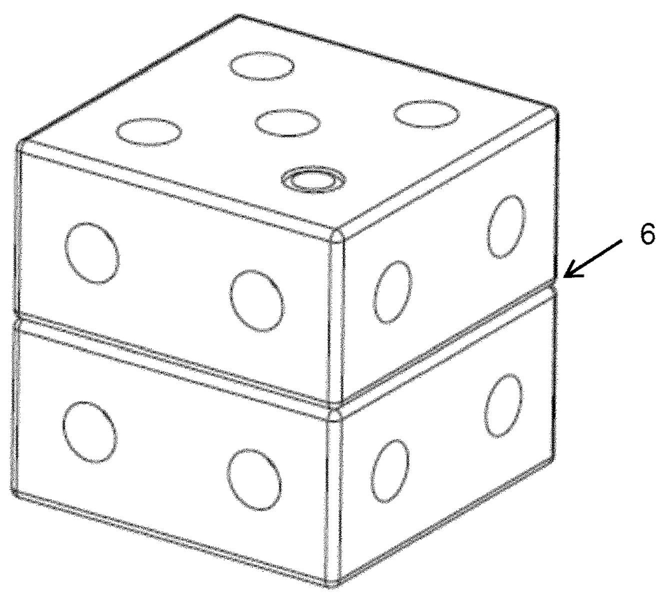


Fig. 2

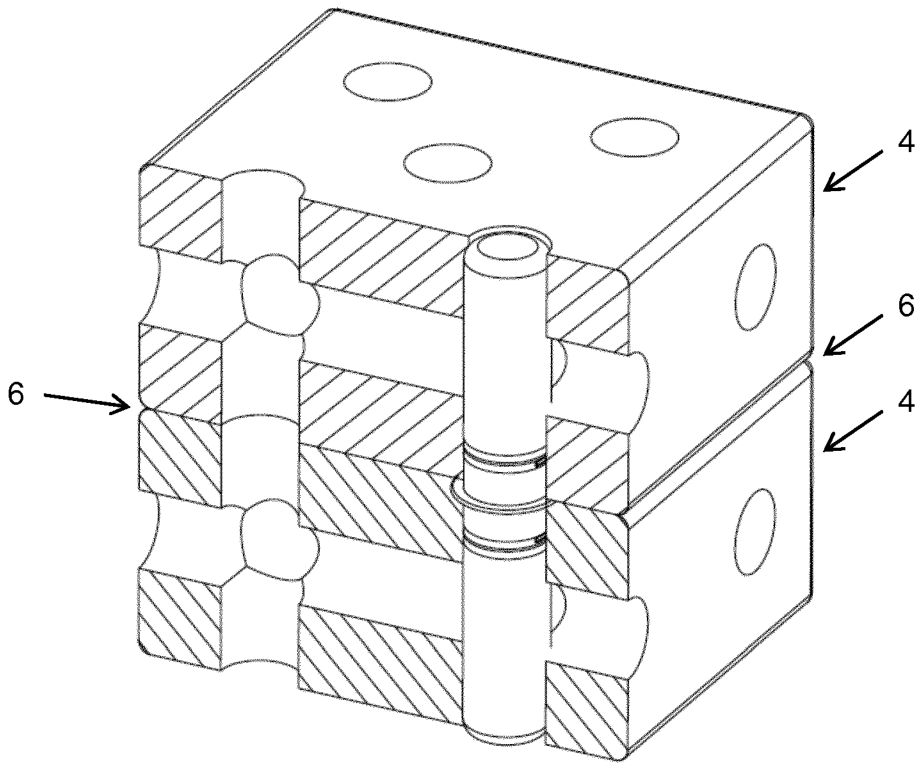


Fig. 3

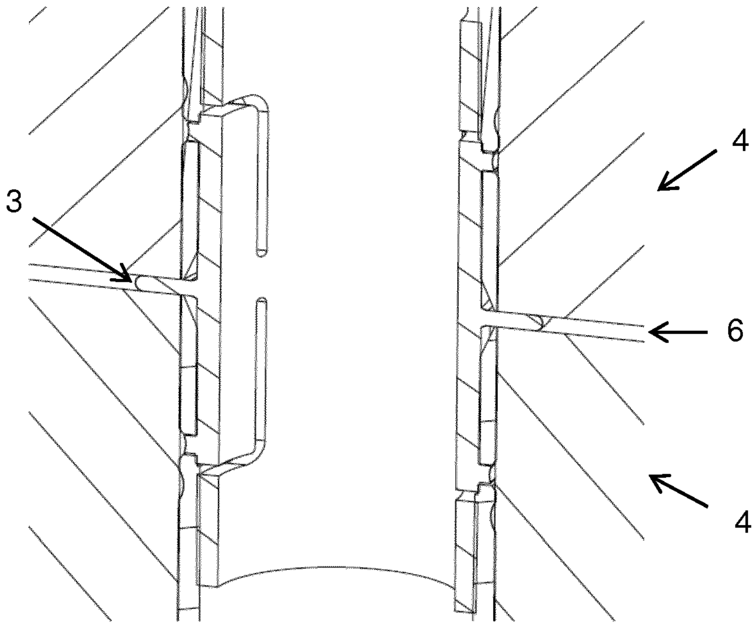


Fig. 4A

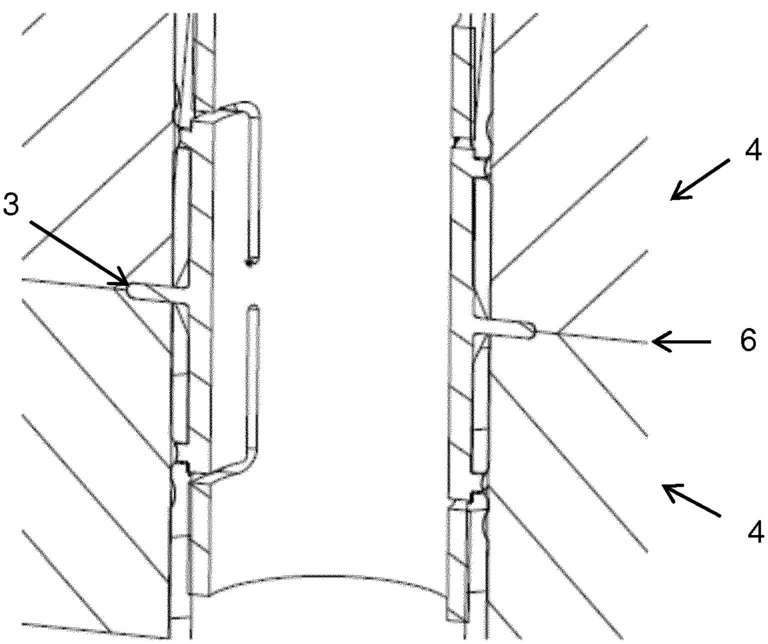


Fig. 4B

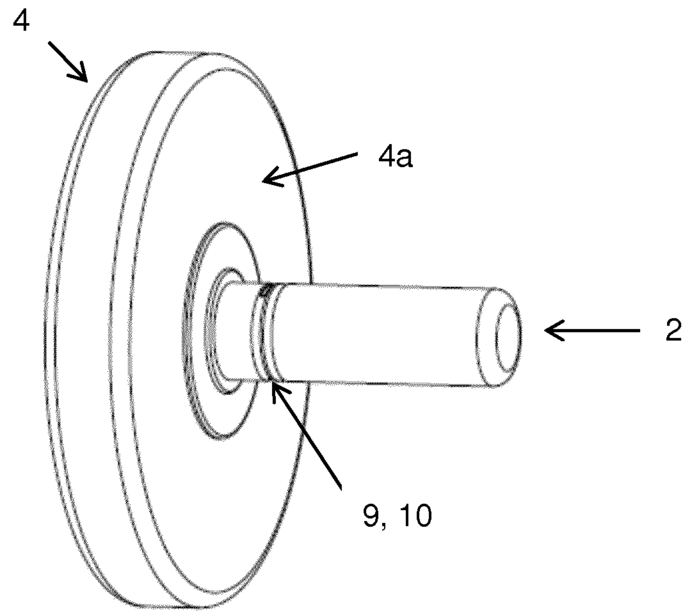


Fig. 5A

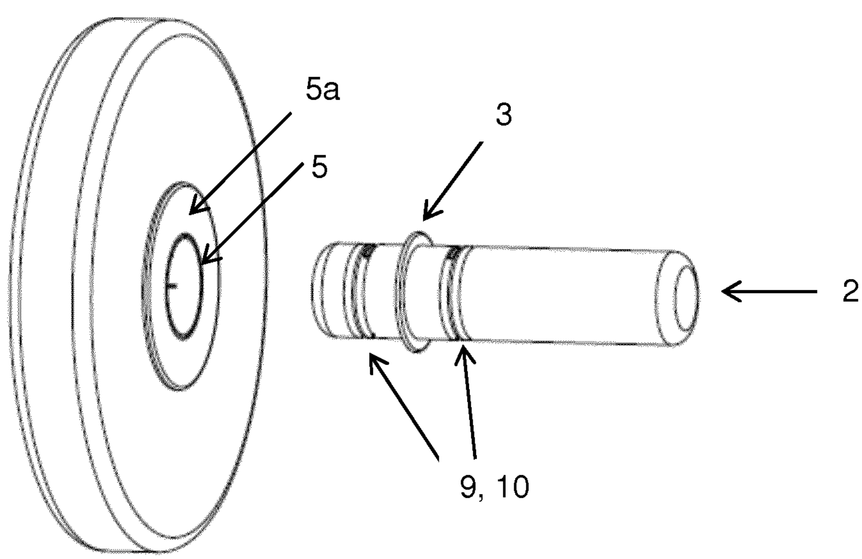


Fig. 5B

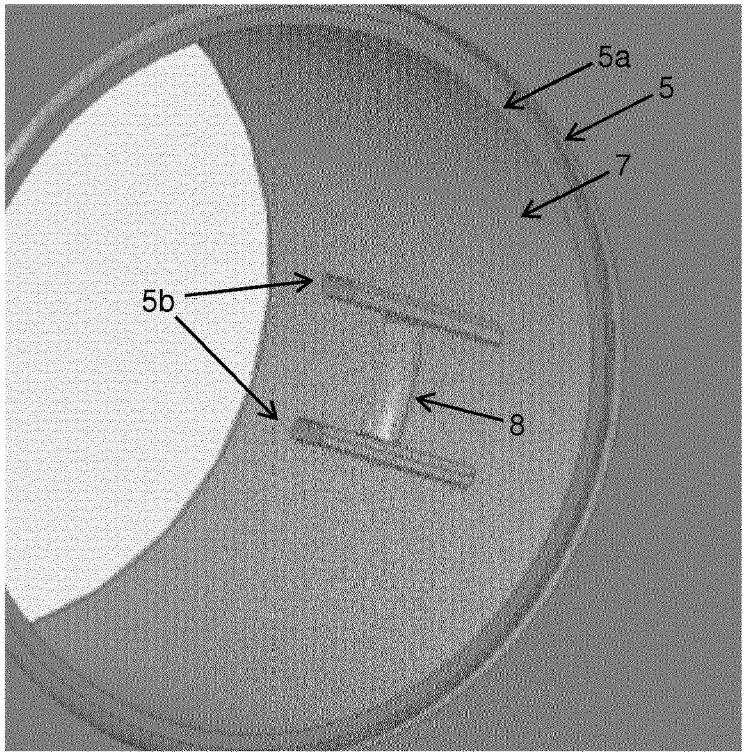


Fig. 6A

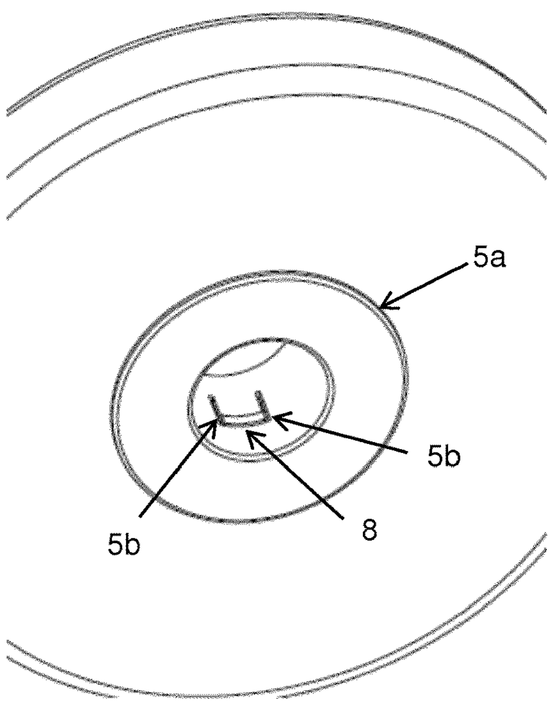


Fig. 6B

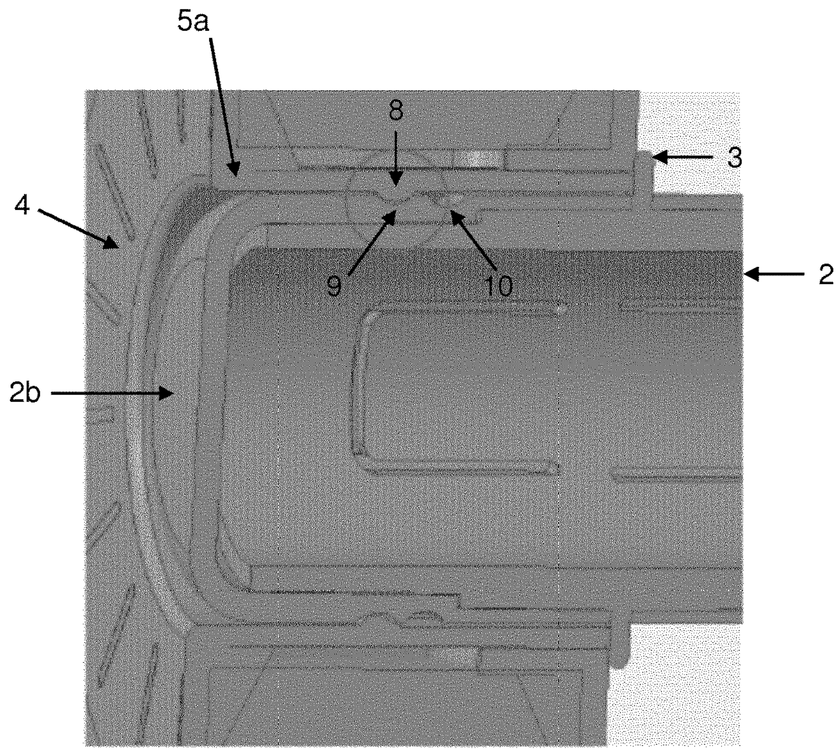


Fig. 7A

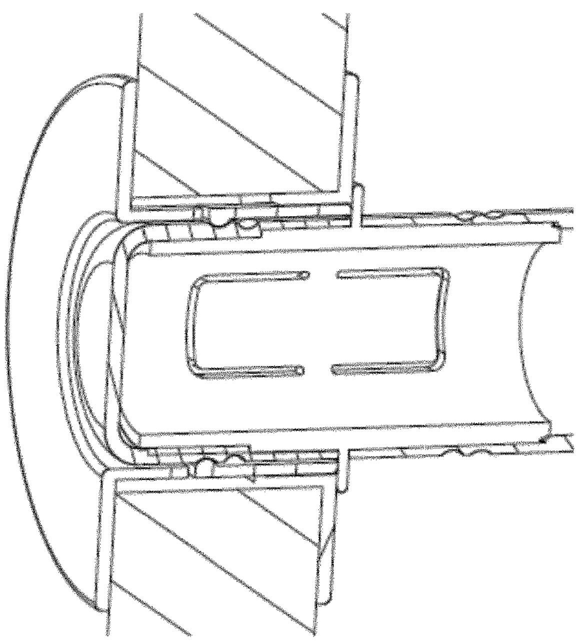


Fig. 7B

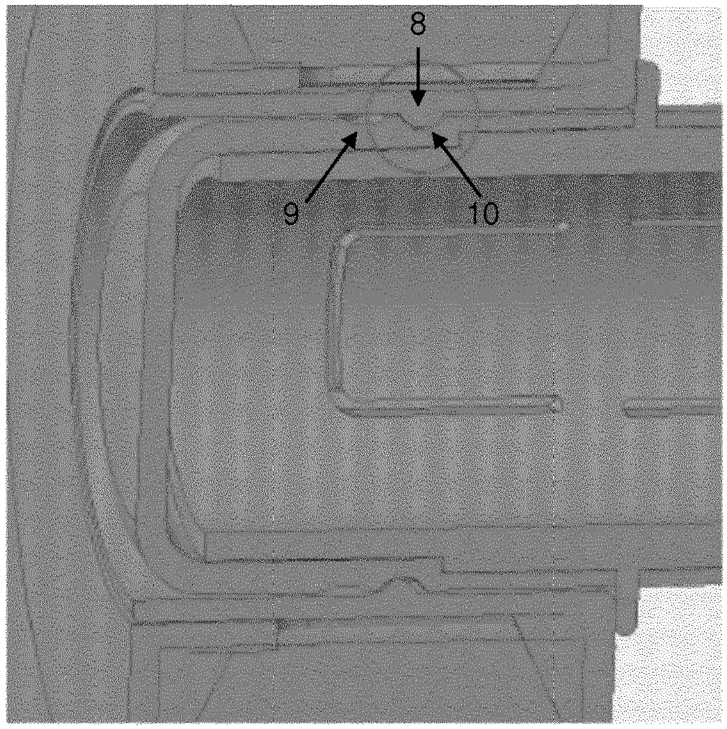


Fig. 8A

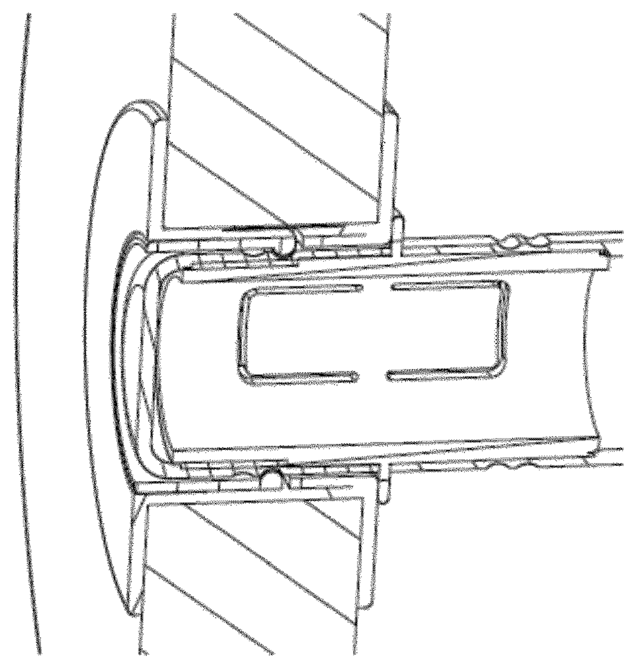


Fig. 8B

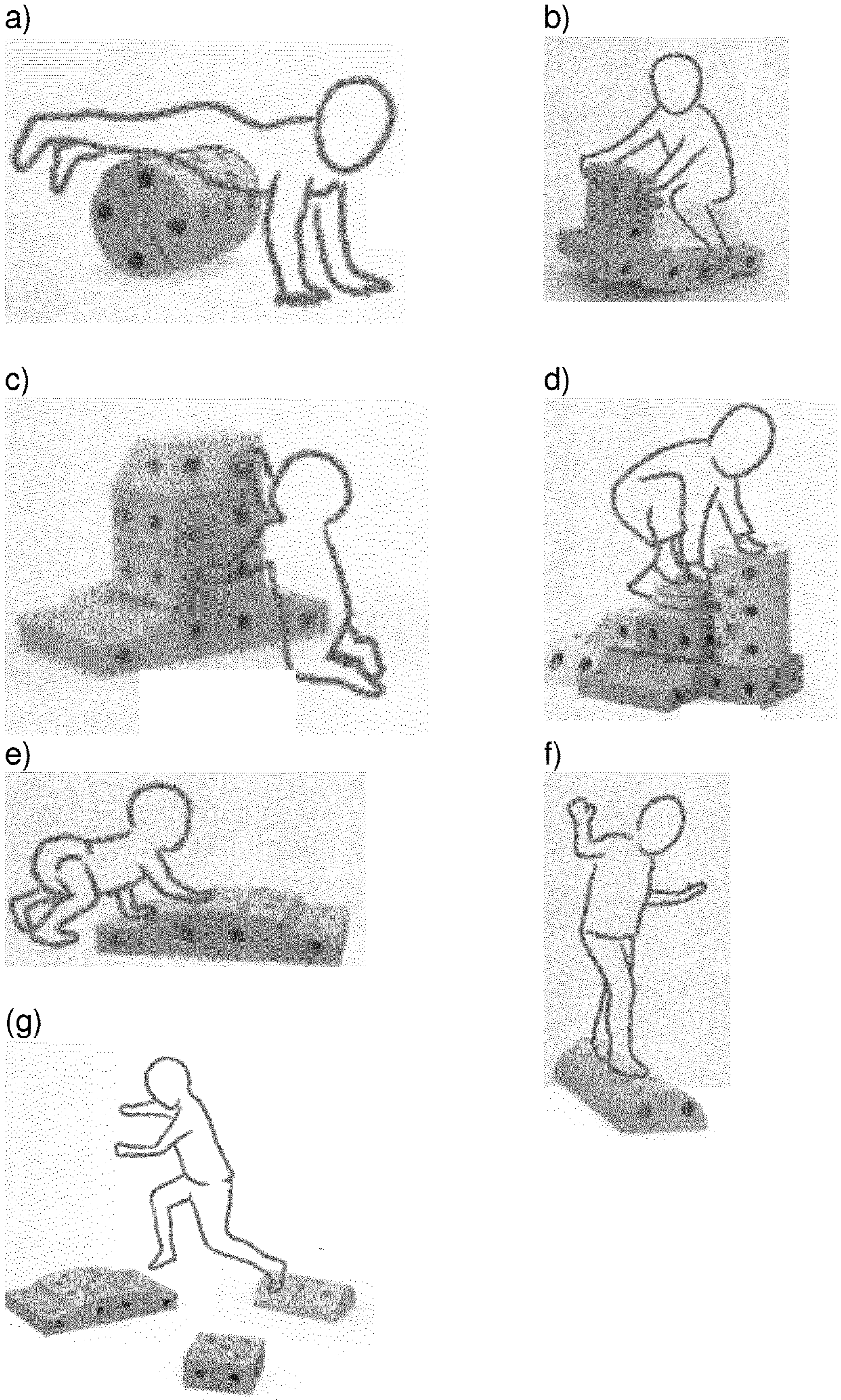
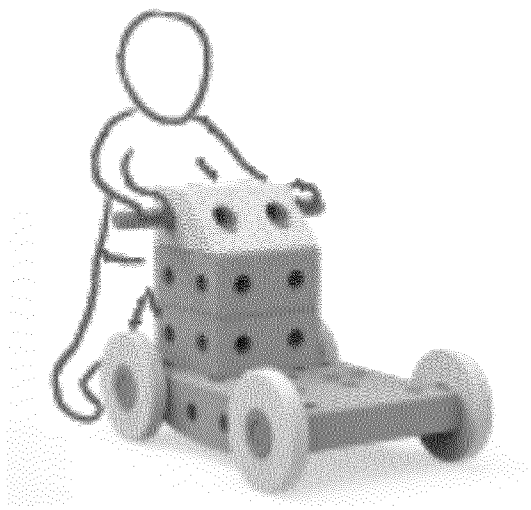


Fig. 9

a)



b)

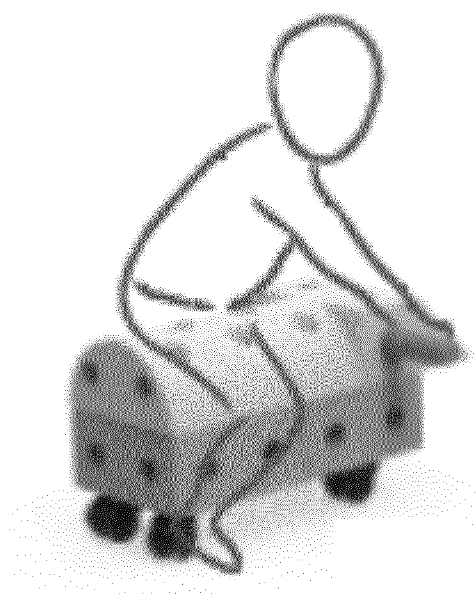


Fig. 10

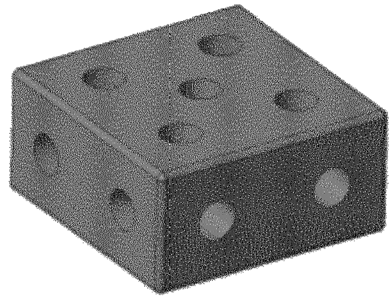


Fig. 11A

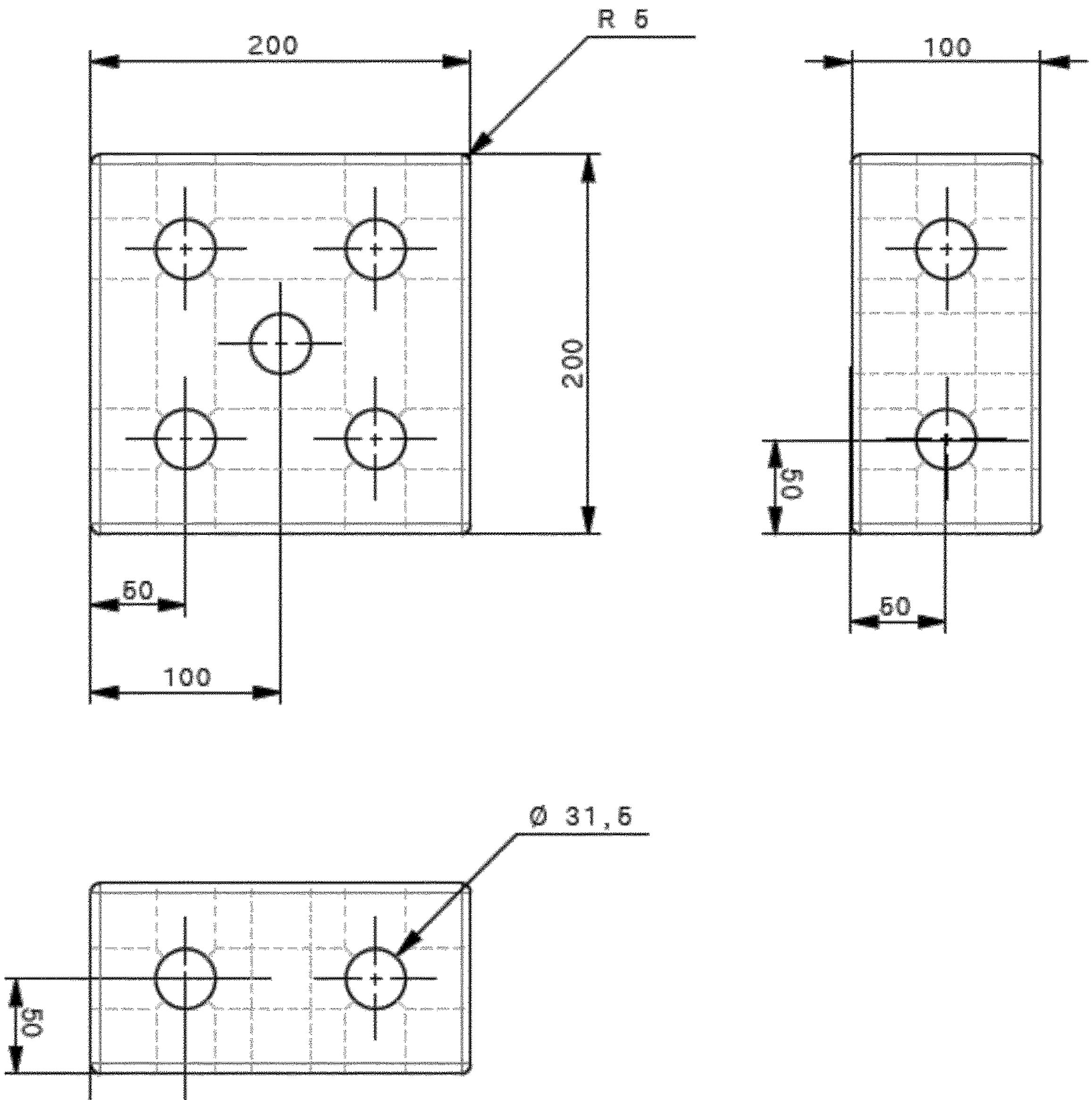


Fig. 11B

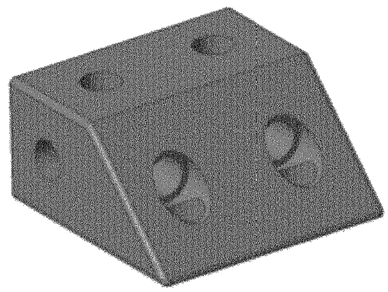


Fig. 12A

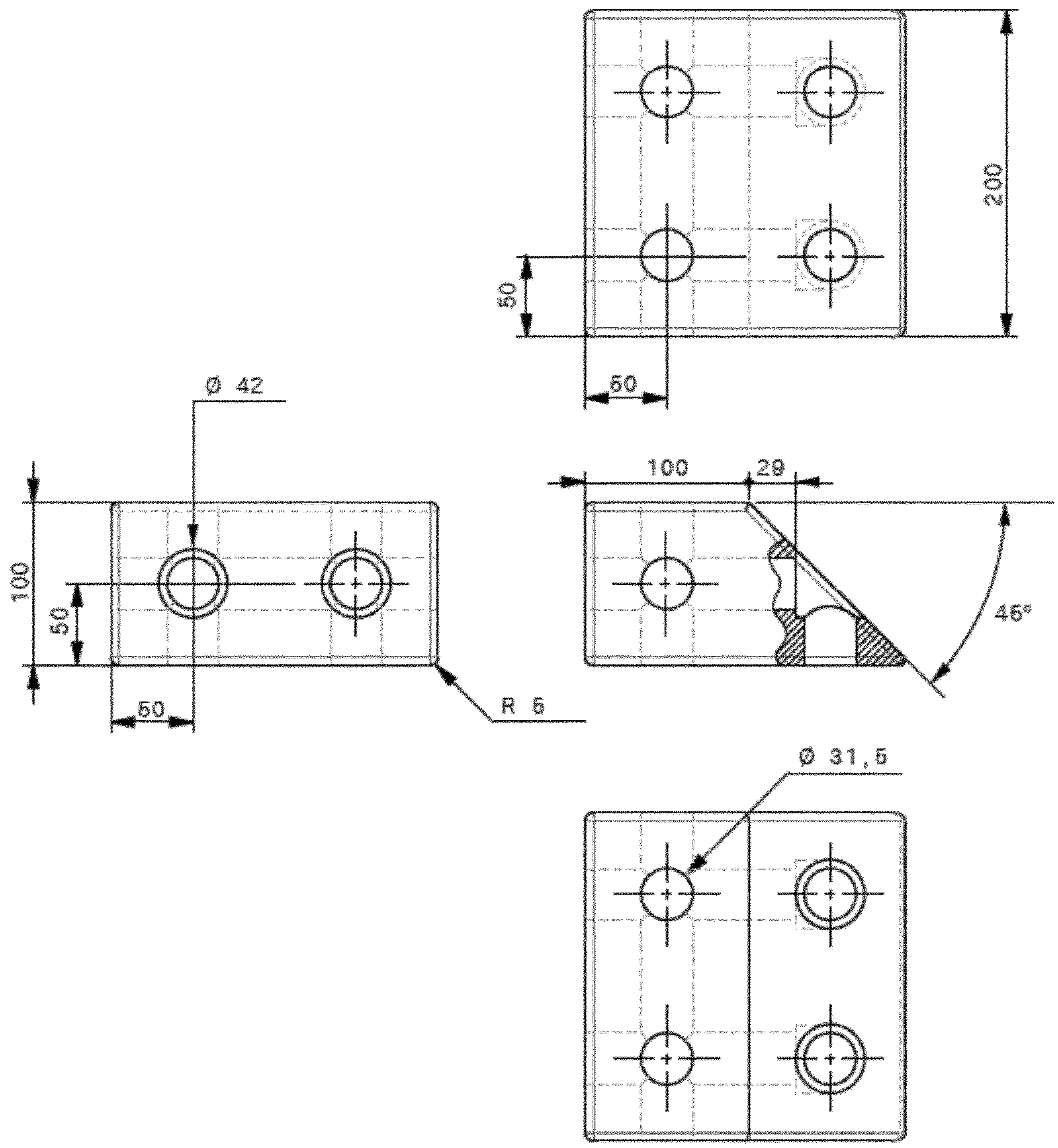


Fig. 12B

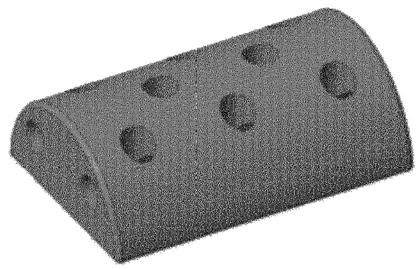


Fig. 13A

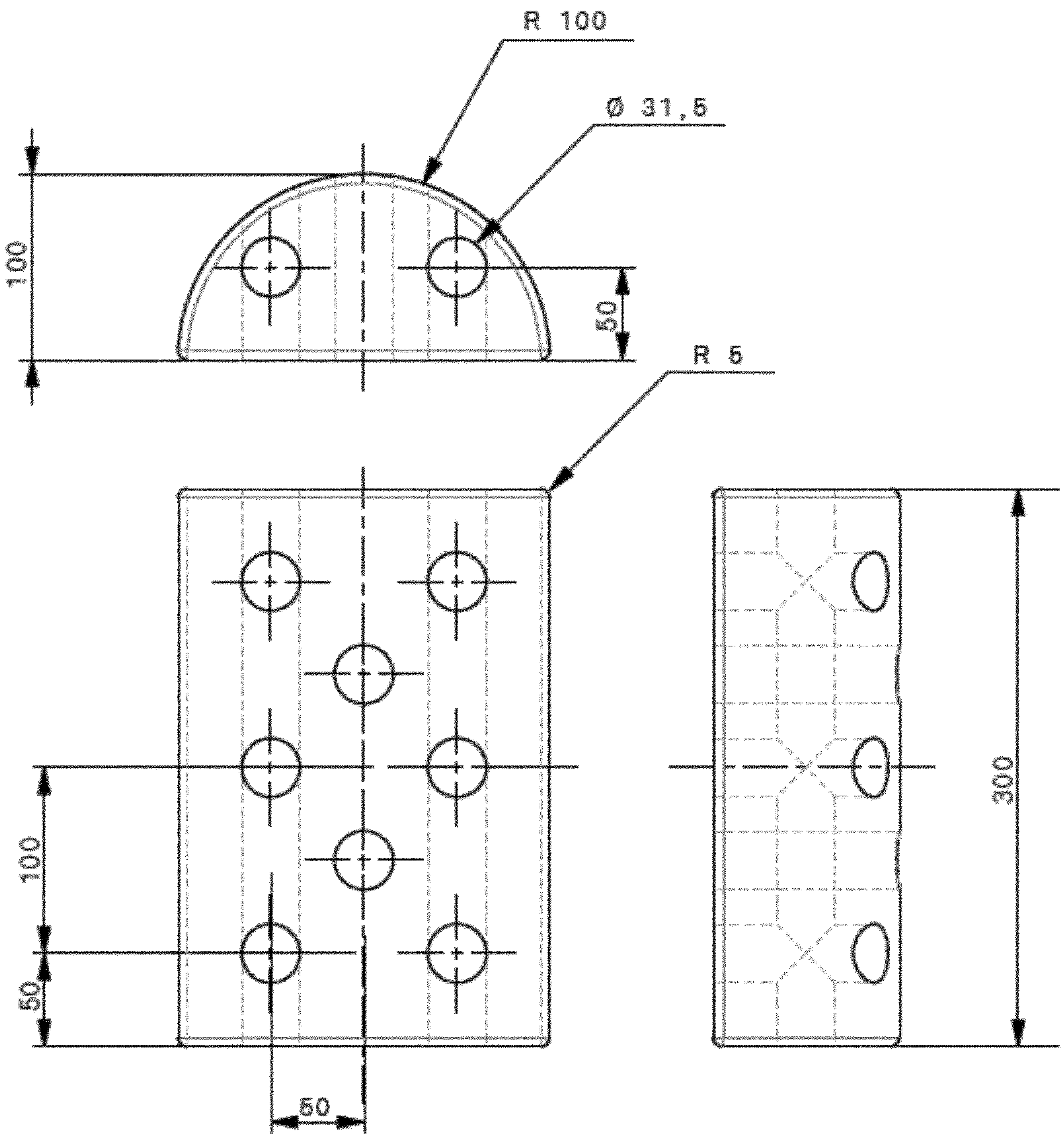


Fig. 13B

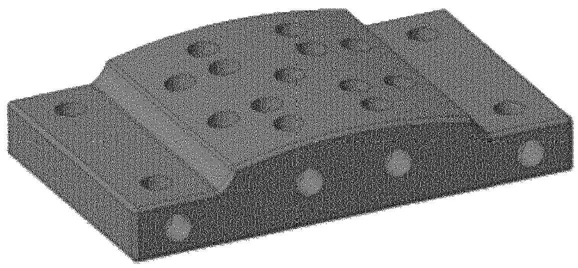


Fig. 14A

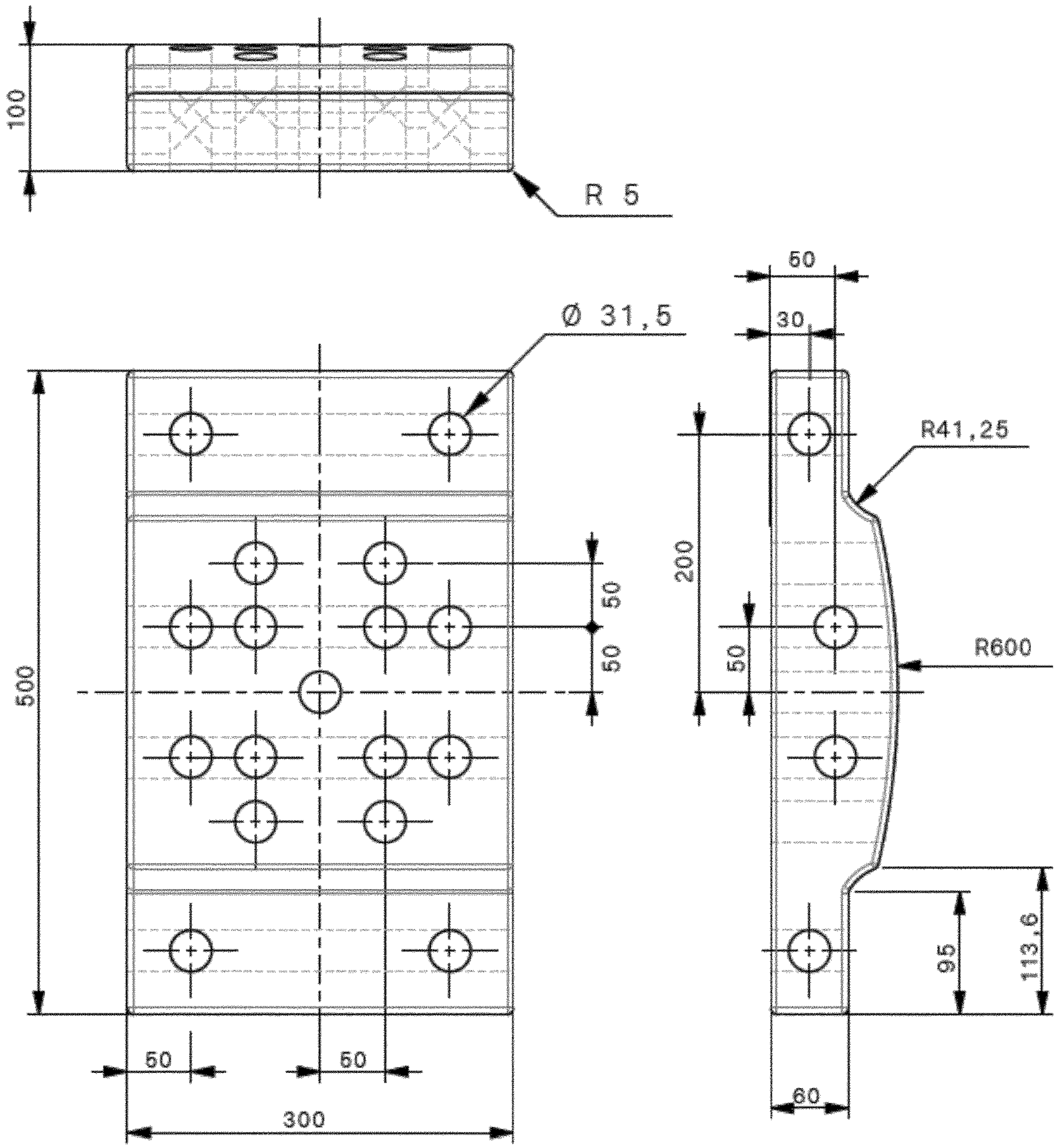


Fig. 14B

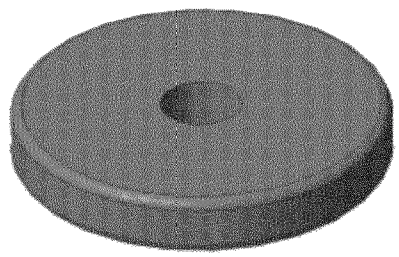


Fig. 15A

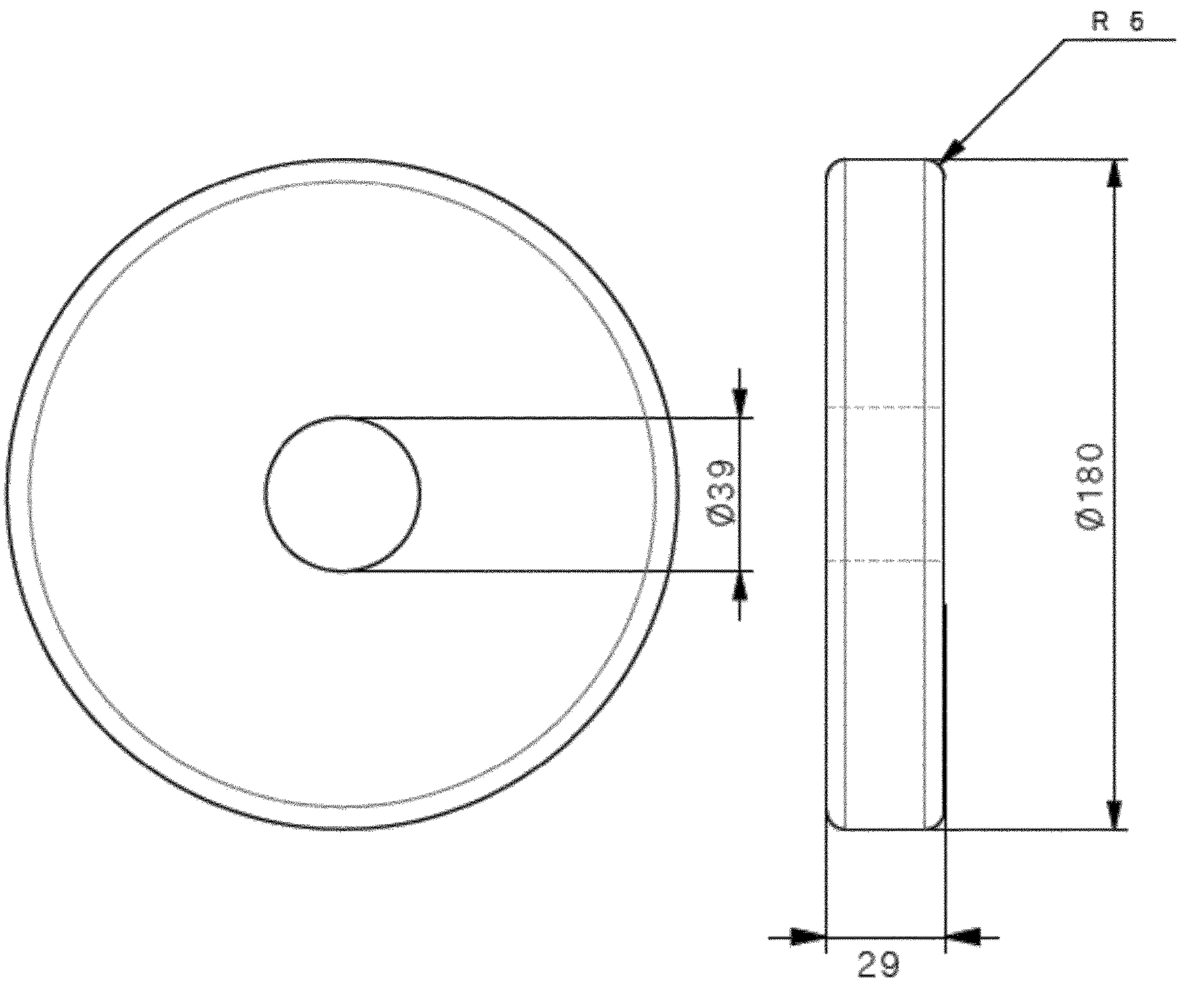


Fig. 15B

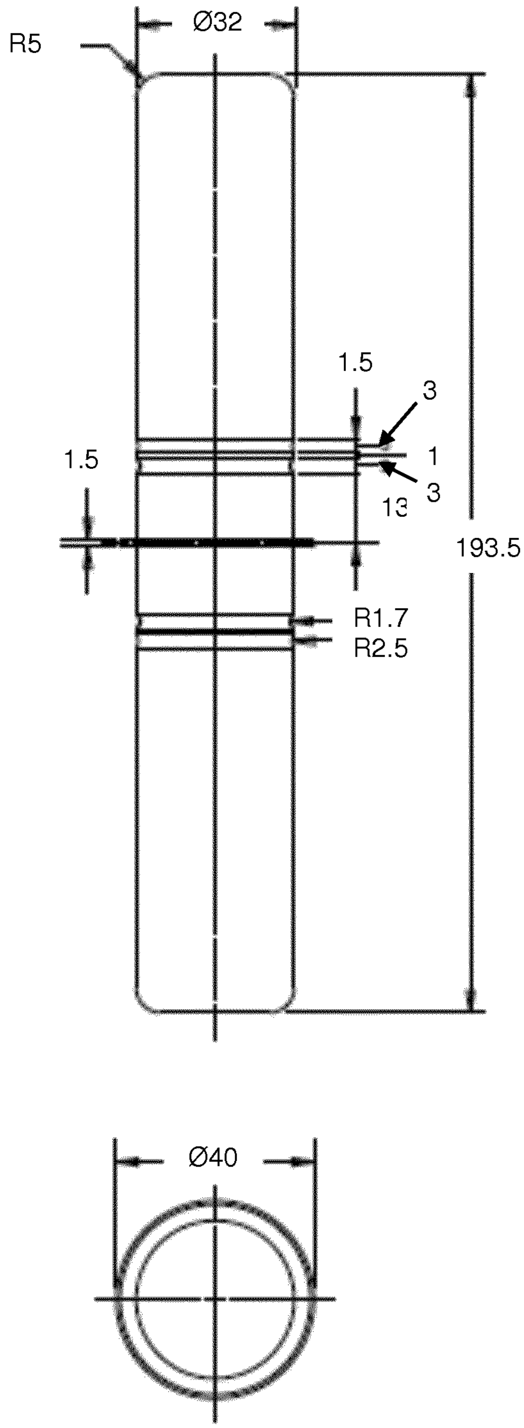


Fig. 16

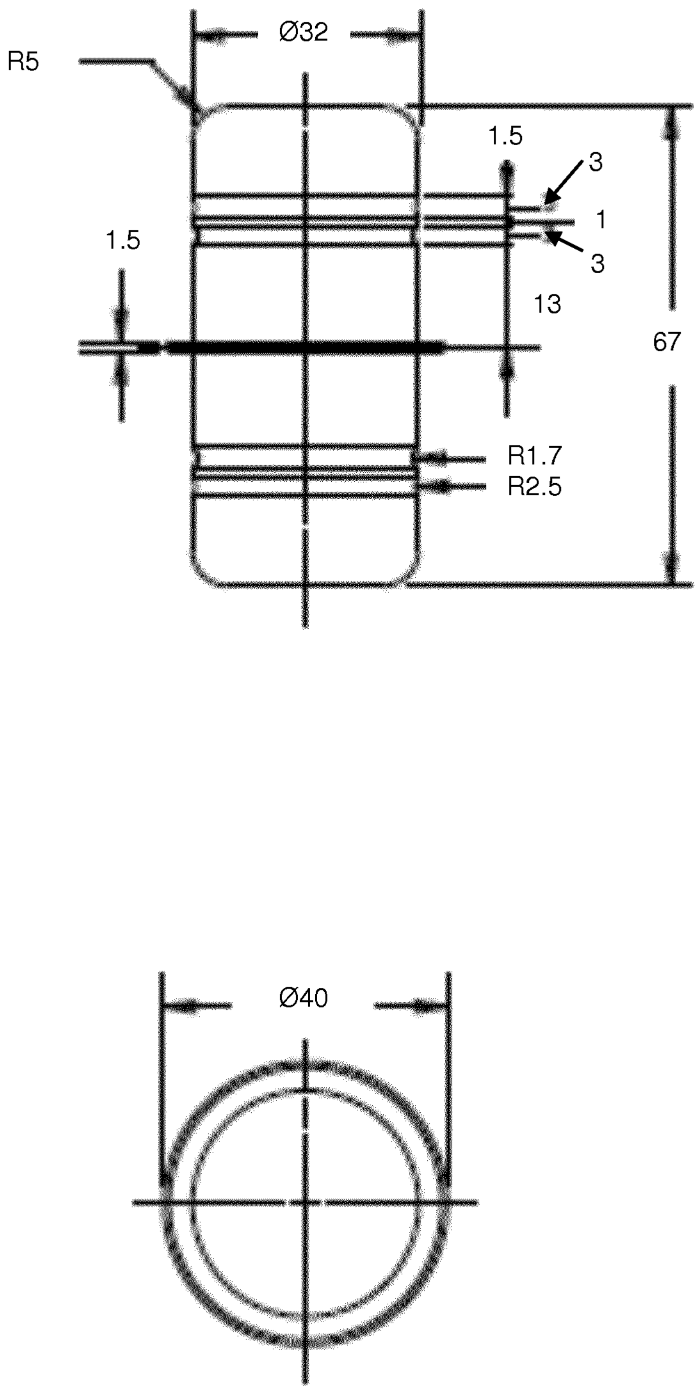


Fig. 17

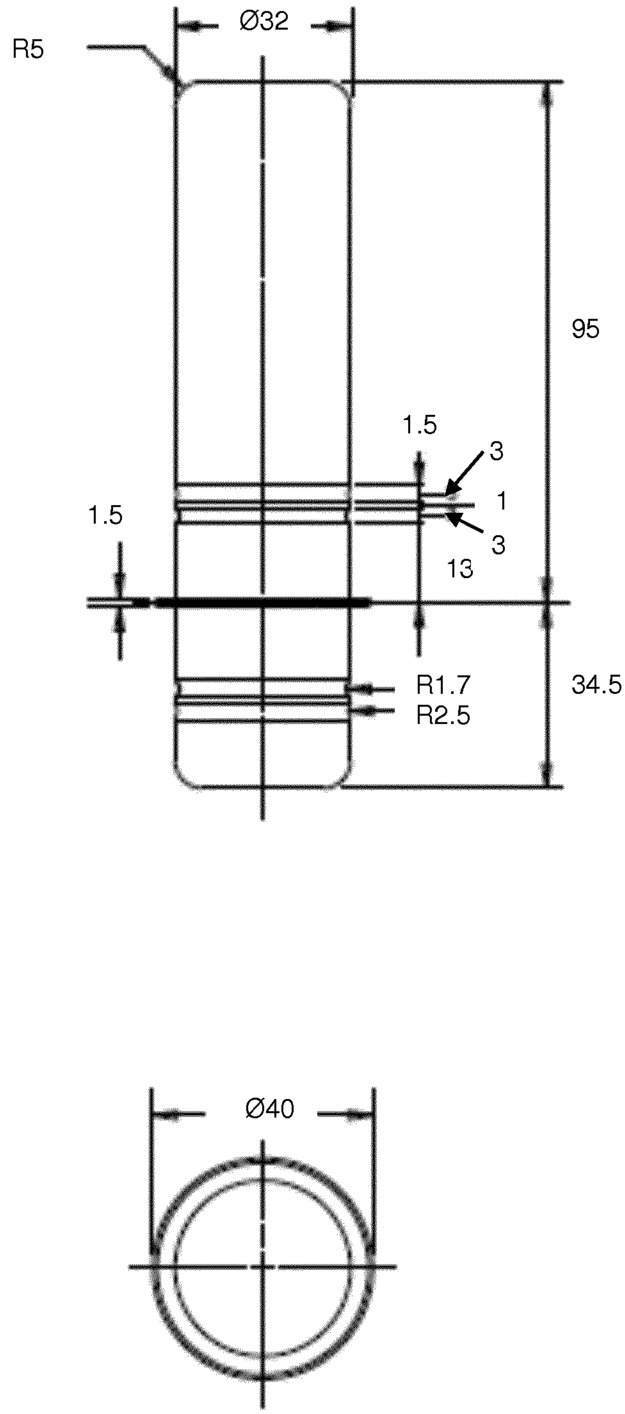


Fig. 18

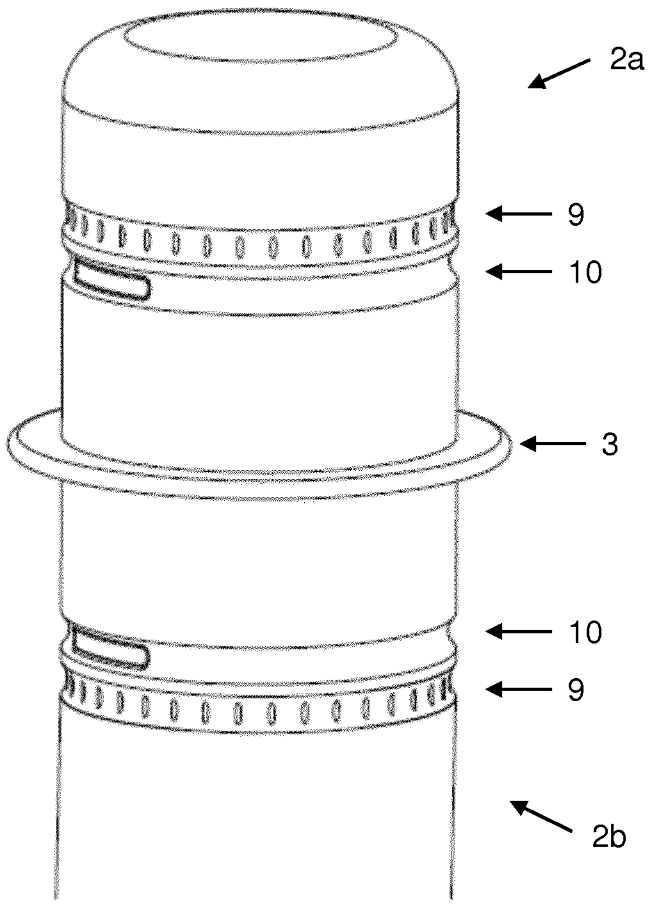


Fig. 19

KIT OF PARTS FOR VERSATILE FUNCTIONAL TOYS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is the U.S. national stage of PCT/EP2019/058651 filed Apr. 5, 2019, which claims priority of European patent application 18165820.4 filed Apr. 5, 2018, both of which are hereby incorporated by reference in their entirety.

FIELD OF INVENTION

[0002] The present invention relates to kits of parts for a functional toy, such as a children's walker, push along wagon, and ride-ons, wheel toys, rocking horse, and aid for crawling, standing, rolling, jumping, climbing, and balance training.

BACKGROUND OF INVENTION

[0003] Solid foams are a popular material for toys due to their physical and mechanical properties, including resilience, low hardness, pliability, elasticity, and light weight. Thus, elements of solid foam tolerate and are easily handled by children, and at the same time have a low risk of being harmful or breaking during handling or play. Furthermore, depending on the purpose of the toy, the physical and mechanical properties of the solid foam may be tailored by choosing the type of the solid foam.

[0004] Functional toys are designed to stimulate and develop a child's skills, such as the imagination and spatial intelligence, the fine motor-, and the gross motor strength and skills. An example of functional toys are construction toys or toy building sets, where parts are detachably attached to each other to form variable constructions that may be disassembled and reassembled to further constructions.

[0005] US 2007/0173095 discloses a multi-piece construction toy, where cuboid members are assembled by connectors to form a coherent construction of abutting cuboids. The cuboid members are made of resilient foam material, exemplified as polyurethane foam with a density of 3-9 pounds per cubic foot and a hardness rating of about 20 on the Shore OO scale. The connectors are made of non-resilient material, and each end of the connectors is received in openings of opposing cuboid surfaces. The connectors may have an intermediate stop portion, such as a disk, ensuring the positioning of the connectors in the opposing cuboid surfaces. Tightly abutting cuboids are thus obtained by an interference fit, where the intermediate portion of the connector is received in a matching opening of the cuboid surfaces.

SUMMARY OF INVENTION

[0006] The present invention relates to kits of part for functional toys, and provides building elements comprising elements of solid foam and connectors, which may further be adapted as rotation shafts.

[0007] A first aspect of the invention relates to a kit of parts for a functional toy, comprising:

one or more connector(s) having a first end, a second end, and a radially extending flange placed between the two ends,

one or more foam element(s) with at least one essentially planar surface, said surface comprising at least one opening extending perpendicular to the planar surface for receiving at least the first end of the connector,

wherein the connector flange is configured as a stopper for the insertion of the first end into the foam element opening, and

wherein the kit of parts are configured such that when the first end is inserted into the foam element opening to the stopper position, and a further suitable amount of force is applied to the connector in the direction of insertion, the flange of the connector is countersunk into the surface of the foam element, and remains countersunk after the further force is removed due to the frictional force between the connector and the opening.

[0008] Accordingly, the connector flange is configured as a stopper for the insertion of the first end and/or the second end of the connector into a foam element opening.

[0009] The kit of parts is preferably configured such that when an end of the connector is inserted into the foam element opening to the stopper position, and a further force is applied to the connector in the direction of insertion, the flange of the connector can elastically deform the essential planar surface of the foam element, in particular the part of the planar surface adjacent and/or surrounding the opening.

[0010] The deformation will typically be provided upon application of a suitable amount of force to the connector in the direction of insertion, i.e. a force applied perpendicular to the planar surface of the foam element. The result is that a connector flange can be countersunk in the foam element surface.

[0011] The kit of parts is further configured such that when the further force is removed, the connector flange remains countersunk in the foam element, due to the frictional force between the connector and opening, or the frictional force at the interface between connector and opening.

[0012] The frictional resistance between the inserted connector end and the foam element opening further determines the amount of force needed to assemble and disassemble the kit.

[0013] When attaching two of these foam elements together by means of one or more of these connectors, the result of the deformation of the surface of foam element and the countersinking of the connector flange is that adjacent planar surfaces of the foam elements can abut each other such that substantially no gap is seen between neighbouring foam element surfaces.

[0014] Advantageously, the connector is an elongated element with a shape that is identical to the opening of the foam element, and further advantageously the foam element opening has a cross-sectional size dimension, which is smaller than the cross-sectional size of the connector. For example the connectors may be cylindrical connectors having a first cylindrical end, a second cylindrical end, and a radially extending flange placed between the two cylindrical ends, and the opening of the foam element is advantageously a cylindrical opening, where the diameter of the opening is at least 0.2, 0.3, 0.4, or 0.5 mm smaller than the diameter of the connector.

[0015] A second aspect of the invention relates to a kit of parts for a functional toy, comprising:

a wheel comprising solid foam having a concentric opening for the axis of rotation,

a bushing placed in the concentric opening, a connector adapted as a rotation shaft attachable to the bushing by means of a fastening mechanism, such as a snap-fit,

wherein the kit of parts is configured such that the frictional resistance of the fastening mechanism is adjustable.

[0016] The wheel is preferably attachable to a connector adapted as a cylindrical rotation shaft by means of fastening mechanism, such as a snap-fit. Similarly the connector adapted as a cylindrical rotation shaft can be attachable by means of fastening mechanism, such as a snap-fit, to any foam building element as disclosed herein, such that the wheel can be mounted on the building element. Thus, a first end of the connector may be adapted as a rotation shaft and connected to a wheel, and the second end of the connector may be inserted into a foam element opening as described above.

[0017] The frictional resistance between wheel and rotation shaft and between building element and rotation shaft then determines the rolling resistance of the wheel relative to the building element. Advantageously, the kit of parts is configured such that the frictional resistance of the fastening mechanism between wheel and shaft and/or between building element and shaft is adjustable such the rolling resistance of the wheel relative to a building element is variable.

[0018] Advantageously, the rolling resistance of the wheel and/or building element is determined by the frictional resistance between the rotation shaft, or connector, and a bushing placed in the concentric opening of the wheel coinciding with the axis of rotation.

[0019] The frictional resistance is preferably varied by varying the contact surface area between the bushing and the rotation shaft. For example in a snap-fit arrangement, the contact surface area may be varied by the size of the snap-fit.

[0020] A third aspect of the invention relates to a functional toy comprising the kits according to the first and/or second aspect of the invention. Preferably, the functional toy may be selected from the group of: children's walker, push along wagon, and ride-ons, wheel toys, rocking horse, and aid for crawling, standing, rolling, jumping, climbing, and balance training.

[0021] The presently disclosed kit of parts provides improved versatility, since the kit of parts may be assembled, disassembled, and re-assembled into a large number of structures, where the different structures are suitable for stimulating and enhancing the gross motor development of children in different age groups and with different motor skills. Thus, advantageously, the kit of parts is re-build and re-used along with the child's development, and thus provides a cost-efficient functional toy. The present invention further provides a more simple and easy assembled functional toy, where the toy is robust with improved safety, as well as being more eco-friendly.

DESCRIPTION OF DRAWINGS

[0022] The invention will in the following be described in greater detail with reference to the accompanying drawings.

[0023] FIG. **1** shows an embodiment of the assembly of the kit of parts in perspective view, where the kit comprises two building blocks, or foam elements, to be connected by a connector, and where the kit is shown before assembly.

[0024] FIG. **2** shows an embodiment of an assembled kit of parts in perspective view, where the two building blocks of FIG. **1** has been assembled via the connector.

[0025] FIG. **3** shows an embodiment of the connected building blocks, or foam elements, of FIG. **2** in a cross-sectional view including the inserted connector.

[0026] FIG. **4** shows an embodiment of the connected foam elements in a cross-sectional view including the connector, where (A) shows a close-up of the connector flange **3** and the adjacent surfaces **6** when the ends of the connector are inserted into the foam elements opening to the stopper position, and (B) shows a close-up of the of the connector flange **3** and the adjacent surfaces **6** after a force is applied to the connector, such that the flange of the connector is countersunk into the adjacent surfaces of the neighboring foam elements.

[0027] FIG. **5** shows an embodiment of a rotatable foam wheel, where (A) shows the wheel assembled, or connected to a rotational shaft or axis, such that the wheel is rotationally attached to the cylindrical shaft, and (B) shows the wheel and rotational shaft before assembly.

[0028] FIG. **6** shows an embodiment of a foam wheel, where the cylindrical surface of the wheel opening comprises a bushing **5*a***, which further comprises a protrusion **8** and bushing openings **5*b***, where (A) shows a close-up of the protrusion in perspective view, and (B) shows a close-up of the protrusion in a schematic perspective view.

[0029] FIG. **7** shows a combined perspective and cross-sectional view of an embodiment of a foam wheel rotationally attached to a cylindrical connector by a first snap-fit, where (A) shows a close-up of the first snap-fit as indicated by the circle, and (B) shows the close-up in a schematic view.

[0030] FIG. **8** shows a combined perspective and cross-sectional view of an embodiment of a foam wheel rotationally attached to cylindrical connector by a second snap-fit, where (A) shows a close-up of the second snap-fit as indicated by the circle, and (B) shows the close-up in a schematic view.

[0031] FIG. **9** shows embodiment of the kit of parts according to the present disclosure assembled to different functional toys: (a) for rolling, (b) for rocking, (c) for standing, (d) for climbing, (e) for crawling, (f) for balancing, (g) for jumping.

[0032] FIG. **10** shows embodiment of the kit of parts according to the present disclosure assembled to different functional toys: (a) a baby walker, (b) a push and pedal ride-on.

[0033] FIG. **11** shows an embodiment of a foam element with a cuboid shape, where the planar surfaces of the cuboid comprises respectively 2, 2, and 5 openings. (A) shows the cuboid in perspective view, and (B) shows cross-sectional views of the planar surfaces including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0034] FIG. **12** shows an embodiment of a foam element with a prism shape in the form of an angled block, where the planar surfaces of comprises respectively 1, 2, and 2 openings. (A) shows the block in perspective view, and (B) shows cross-sectional views of the planar surfaces including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0035] FIG. **13** shows an embodiment of a foam element with a half cylinder shape, where the planar surfaces comprises respectively 2, and 9 openings, and the cylindrical curved surface comprises 9 openings. (A) shows the block in perspective view, and (B) shows cross-sectional views of the planar surfaces including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0036] FIG. **14** shows an embodiment of a foam element with a complex shape in the form of a curved coboid, where the planar surfaces comprises respectively 2, 4, and 17 openings, and the curved surface comprises 13 openinges. (A) shows the block in perspective view, and (B) shows cross-sectional views of the planar surfaces including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0037] FIG. **15** shows an embodiment of a foam element with a wheel shape, where the planar surfaces comprises respectively 1 opening for the rotational attachment to a the rotational axis. (A) shows the block in perspective view, and (B) shows cross-sectional views of the planar surfaces including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0038] FIG. **16** shows an embodiment of a connector, where the first end and the second end of the connector are symmetrical, including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0039] FIG. **17** shows an embodiment of a connector, where the first end and the second end of the connector are symmetrical, including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0040] FIG. **18** shows an embodiment of a connector, where the first end and the second end of the connector are assymmetrical, including exemplified dimensions of the lengths, diameters (Ø) and curvature (R).

[0041] FIG. **19** shows an embodiment of a connector for a rotational axis, where the first end and optionally the second end of the connector are configured to be rotationally attached to a wheel. Each end of the connector further comprises two grooves, wherein the groove furthest away from the flange comprises multiple second protrusions placed within the groove channel, said second protrusions having the form of a pattern of parallel ridges oriented perpendicular to the groove direction.

DETAILED DESCRIPTION OF THE INVENTION

[0042] The disclosure is described below with the help of the accompanying figures. It would be appreciated by the people skilled in the art that the same feature of component of the device are referred with the same reference numeral in different figures. A list of the reference numbers can be found at the end of the detailed description section.

Functional Toys

[0043] The kit of parts according to the present disclosure may be assembled, disassembled and re-assembled into a variety of functional toys suitable for stimulating and enhancing the gross motor development of children in different age groups and with different motor skills. Thus, the kit of parts provide a versatile functional toy with a variety of assembled structures, having a variety of functions, and which can be adapted to the motor skills of children with different age and motor skills development.

[0044] FIGS. **9-10** illustrates embodiments of the kit assembled to different functional toys. For children learning to crawl, stand, and walk, the parts and the kit of parts may be assembled as illustrated in respectively FIGS. **9***e*, **9***c*, and **10***a*. For children possessing and developing more advanced motor skills, the parts and the kit of parts may be assembled as a toy for rolling (FIG. **9***a*), a rocking horse (FIG. **9***b*), a climbing toy (FIG. **9***d*), a toy for balancing (FIG. **9***f*), a toy for jumping (FIG. **9***g*), a push and pedal ride-on (FIG. **10***b*), or similar wheel toys, such as a balance bike, and push along bike.

[0045] In an embodiment of the disclosure, the kit of parts is assembled into a functional toy selected from the group of: rocking horse, aid for crawling, standing, rolling, jumping, climbing, and balance training. In another embodiment, the kit of parts is assembled into a functional toy selected from the group of: children's walker, push along wagon, and ride-ons, and wheel toys.

[0046] The kit of parts according to the present disclosure further provides functional toys with improved robustness and stability of the assembled construction, and the parts are made of environmental friendly materials. Thus, the kits provide functional toys that are safe and reliable to use.

Assembly and Disassembly

[0047] FIGS. **1-2** show an embodiment of the assembly of the kit of parts. The embodied kit of parts **1** comprises a cylindrical connector **2** and two cuboid foam elements **4**, and FIG. **1** shows a perspective view of the kit before assembly, and FIG. **2** a perspective view of the assembled kit.

[0048] The foam elements are cuboids, wherein each planar surface **4***a* comprises two or more cylindrical openings **5** extending perpendicular to the planar surface comprising the opening. As indicated in FIGS. **1-2**, the cylindrical openings may extend from a first planar surface of the foam element to the opposite surface of the foam element, which optionally also is a planar surface. Thus, the two foam elements illustrated in FIG. **1** are identical in geometry and have identical geometry of the openings.

[0049] The cylindrical connector comprises a first cylindrical end **2***a*, a second cylindrical end **2***b*, and a radially extending planar flange **3** placed between the two cylindrical ends.

[0050] In FIG. **1**, the first cylindrical end **2***a* is partially inserted into a cylindrical opening **5** of the foam element **4** placed at the bottom. Thus, the cylindrical opening is configured for receiving the first cylindrical end. The insertion of the connector end is restricted by the connector flange **3**. This may be obtained by the size of the connector flange being larger than the diameter of the opening, such as the connector flange having a larger diameter than the diameter of the opening. Thus, the connector flange is configured as a stopper for the insertion of the first cylindrical end into the foam element opening. Thus, when the cylindrical end is inserted into the foam element opening, and the flange contacts the planar surface of the foam element, the connector is fully inserted and in a stopper position.

[0051] FIG. **1** shows the connector being partially inserted into the bottom foam element. When the connector is fully inserted, the connector flange **3** is abutting the planar surface **4***a* of the bottom foam element.

[0052] After the first end of the connector is inserted into the stopper position of the first foam element, the second end of the connector may be inserted to the stopper position of a second foam element. Thus, the first and second foam elements are neighboring foam elements and become connected as illustrated in FIG. **2**.

[0053] In the stopper position, the flange contacts or abuts the respective planar surfaces of the neighboring foam elements. Thus, there is a gap between the adjacent surfaces **6** of the neighboring foam elements as illustrated in FIG. **4**A, and the gap size will depend on the thickness of the flange.

[0054] When a further force is applied to the connector in the direction of insertion, i.e. in the longitudinal direction of the connector, the flange of the connector may become countersunk into the adjacent surfaces of the neighboring foam elements, as illustrated in FIGS. **3** and **4**B. The further force may be obtained by simply pressing the neighboring foam elements together.

[0055] FIGS. **3** and **4**B show that when the connector is inserted into the foam element opening to the stopper position, and a further force is applied to the connector in the direction of insertion, the flange of the connector elastically deforms the essential planar surface of the foam element, in particular the part of the planar surface adjacent and/or surrounding the opening. The deformation will typically be provided upon application of a suitable amount of force to the connector in the direction of insertion, i.e. a force applied perpendicular to the planar surface of the foam element. The result is that a connector flange can be countersunk in the foam element surface.

[0056] FIGS. **3** and **4**B also show that when the further force is removed, the connector flange remains countersunk in the foam element, due to the frictional force between the connector and opening, or the frictional force at the interface between connector and opening. Thus, the frictional force, or resistance, between the inserted connector end and the foam element opening will determine the amount of force needed to assemble and disassemble the kit.

[0057] The frictional force between the fully inserted connector and the foam element opening will depend on several factors including: foam element material, connector material, the interface structure between the foam and connector, such as the morphological structure or roughness of the foam surface and connector surface, the size of the interface, i.e. the amount of surface area of the connector in contact with the foam, the shape of the connector, and the shape of the foam opening. Further inherently, the frictional force for assembling/disassembling the kit will further depend on the number of connectors used for connecting a foam element.

[0058] Advantageously, the frictional resistance is adapted such that assembly, including countersinking of the flange, and disassembly is possible with two hands and no further tools, and optionally adapted to assembly and dissassembly by children, and furthermore the frictional resistance should be sufficent to provide sufficient stability to the assembled structure. Thus a suitable force for the assembly, including countersinking of the flange, and disassembly of the kit is between 20-80 N (newton), and preferably is ca. 60 N. Further advantageously, the suitable force is in a range, where the foam element surface is not permanently deformed, but only elastically deformed, when the connector flange is countersunk into the foam surface.

[0059] In an embodiment of the disclosure, the suitable force is configured to be below 80 N, more preferably below 75, 70, 65 N, and most preferably below 60 N.

[0060] In a further embodiment, the connector is countersunk into the surface of the foam element by elastic deformation of the foam element.

[0061] The kit of parts advantageously comprises a multiple of connectors and a multiple of foam elements, whereby a variety of structures may be build, assembled, disassembled, and re-build.

[0062] Thus, neighboring foam elements, or building elements, may be connected by a connector as illustrated in FIGS. **1**-**2**. For example, the second cylindrical end **2***b* of the connector may be inserted into an opening of further foam element, such as the top foam element **4** illustrated in FIG. **1**, whereby the bottom foam element and the top foam element becomes connected or attached as illustrated in FIG. **2**.

[0063] Upon connection or attachment, the flange **3** is abutting both the planar surface of the bottom foam element **4***a*, and the planar surface of the top foam element **4***a*. Thus, the two planar surfaces connected by the connector are placed adjacent **6**, as illustrated in FIG. **2**, and the distance or gap between them may be determined by the thickness of the flange. Upon application of a further force, the flange of the connector is countersunk equally into the surface of the top and bottom foam element, and will remain countersunk after the further force is removed depending on the frictional force between the connector and the opening.

[0064] To improve the stability of the assembly and for safety reasons and hygienic reasons, it is advantageous that the gap between the adjacent planar surfaces **6** is as small as possible. Advantageously, the adjacent planar surfaces are abutting with substantially no gap, thus providing stability and ensuring that dirt and body parts cannot be trapped within the gap.

[0065] In an embodiment of the disclosure, the kit is configured such that when the first end of a connector is received within a first opening of a first foam element, and the second end of the connector is received within a first opening of a second foam element, using sufficient force, the adjacent surfaces of the first and second foam elements are abutting.

[0066] In a further embodiment, the adjacent planar surfaces of the first and second foam element are essentially abutting with a gap below 1 mm, more preferably below 0.5 mm, such as 0 mm.

[0067] The abutting planar surfaces is obtained by configuring the assembling force needed, with the deformation properties between the foam and the flange, and the frictional force between the connector and the opening.

[0068] Advantageously, the foam is configured to be resilient and elastically deformed or compressed upon contact with the flange and application of a suitable amount of force to the connector. For example, the elastic deformation may be configured such that the foam is compressed and the flange of the connector partially depressed into the compressed planar surface of the foam element. The result is that a connector flange can be countersunk in the foam element surface. When attaching two of these foam elements together by means of one or more of these connectors, the result of the deformation of the surface of foam element and the countersinking of the connector flange is that adjacent planar surfaces of the foam elements can abut each other such that substantially no gap is seen between neighbouring foam element surfaces. FIGS. **3**-**4** show embodiments of connected foam element, showing the flange and abutting planar surfaces **6** in cross-sectional view. The deformation properties are configured such that the adjacent planar surfaces of the foam elements are elastically compressed symmetrically around the flange, whereby the adjacent planar surfaces are abutting with no gap.

[0069] Upon removal of the connector flange, the deformation or compression force is removed, and the resilient foam will resume the unloaded shape. Thus, by configuring the deformation properties, adjacent planar surfaces abutting with substantially no gap may be obtained.

Connector

[0070] For easy and stable insertion, the connector advantageously is an elongated element as exemplified in FIGS. **1-4**. The shape of the elongated element will further affect the size of the frictional force between the inserted connector and the foam element opening. Advantageously, the elongated element has a shape that facilitates a large surface contact area with the foam element opening, whereby a larger frictional force may be obtained. Thus, advantageously, the elongated element has a cylindrical shape or ovalic shape, or a columnar or prism shape approximating a cylindrical shape, such as an elongated element having a cross-section shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal. The frictional force between the inserted connector and the foam element is further determined by the size of the connector. Thus, for easy insertion and stable assembled structures, the connector advantageously has a cross-sectional size or diameter of below 7 cm.

[0071] In an embodiment of the disclosure, the connector is an elongated element with a first end and second end, said element having a cross-section shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal.

[0072] In a further embodiment, the connector is cylindrical with a first cylindrical end, a second cylindrical end, and a radially extending flange placed between the two cylindrical ends.

[0073] In a further embodiment, the connector diameter is below 7 cm, more preferably below 6, 5, 4, cm, and most preferably equal to or below 3.2 cm.

[0074] Upon compressive contact between the surface of the foam element, and the flange, the foam is configured to be compressed and the connector flange partially depressed into the compressed planar surface of the foam element, if the hardness of the flange is higher than the hardness of the foam. However, the degree of deformation and countersinking of the connector flange into the foam element surface, will also depend on the shape and size of the connector.

[0075] To ensure uniform and reliable countersinking, the flange advangeously is planar with a regular shape, such as a planar circular, ovalic, or polygonal shape, such as hexagonal, octagonal, decagonal, dedecagonal. Further, to ensure sufficient countersinking facilitating abutting neighboring foam building elements with essentially no gap between them, the thickness of the flange should be small, but still thick enough to provide mechanical strength and robustness to the flange, such that it is adapted as a stopper.

[0076] In an embodiment of the disclosure, the radially extending flange is planar.

[0077] In a further embodiment, the radially extending flange has a shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal.

[0078] In a further embodiment, the thickness of the radially extending flange is below 4 mm, more preferably below 3 or 2 mm, and most preferably equal to or below 1.5 mm.

[0079] The frictional force between the inserted connector and the foam element opening will depend on the length of the connector end, since this influences on the amount of surface area in contact between connector and opening. The longer the connection end, the stronger the frictional force. However, the versatility and the possible connection options between multiple connectors and multiple foam element openings increases, the shorter the length of the connection ends, since the risk of connectors blocking a neighboring foam element opening is reduced.

[0080] Thus, to improve the assembling versatility and provide sufficient frictional force, the kit advantageously comprises one or more connectors, where both ends are longer, where both ends are shorter, and/or where the first end is longer and the second end is shorter. Examples of connectors are: a connector where both ends are 10 cm long, a connector where both ends are 3.4 cm long, and a connector where the first end is 10 cm long, and the second end is 3.4 cm long.

[0081] In an embodiment of the disclosure, the first end and the second end of the connector are symmetrical or assymmetrical.

[0082] In a further embodiment, the first end of the connector has a length of between 15-2 cm, more preferably between 11-3 cm, such as a length of 10 cm or 3.4 cm.

[0083] In a further embodiment, the second end of the connector has a length of between 15-2 cm, more preferably between 11-3 cm, such as a length of 10 cm or 3.4 cm.

[0084] The frictional force between the connector and foam element opening will also depend on the connector material.

[0085] In an embodiment of the disclosure, the connector material is selected from the group of: wood, and polymers, such as thermoplastic polymers, such as acrylonitrile butadiene styrene (ABS).

[0086] To improve simple and easy handling of the connectors during assembly/disassembly, the connectors are advantageously light-weight, which may be obtained by the connectors being hollow. A hollow polymer is simply and cost-efficiently manufactured by e.g. injection molding. A hollow connector further has the advantage that it provides space, or a compartment, for storing auxiliary parts, such as electronic elements. Optionally, the hollow connector is assembled from multiple parts, thereby facilitating a storage compartment in the interior of the connector.

[0087] In an embodiment of the disclosure, the connector is a hollow element. In a further embodiment, the connector is made by an injection molding process.

[0088] FIGS. **16-18** show embodiments of the connector, including exemplified dimensions of the lengths, diameters (Ø) and curvature (R). FIGS. **16-17** are examples of connectors where the first end and the second end of the connector are symmetrical, and FIG. **18** shows an embodiment of a connector, where the first end and the second end of the connector are assymmetrical.

Foam Elements

[0089] The foam elements may also be referred to as building elements. The versatility of the kit of parts, and the number of structures that can be build, will depend on the foam element shapes and the number of openings the planar surfaces of the foam element comprises. For example, a cylinder may be build by assembling two half cylinders, and a complex prism may be obtained by assembling a cuboid and a triangular prism. Furthermore, the frictional force for assembling/disassembling neighboring foam elements increases with the number of connectors used for connecting the neighboring foam elements.

[0090] In an embodiment of the disclosure, the foam element shape is selected from the group of: cube, cuboid, square prism, prism, cylinder, half cylinder, cone, pyramid, disk, and any combinations thereof. In another and further embodiment, the at least one planar surface of the foam element comprises 2 or more openings, such as 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, or 20 openings.

[0091] To further improve the versatility, it is advantageous that each foam element can be connected at one or more of the surfaces. This may be obtained by the cylindrical opening extending from a first planar surface of the foam element to the opposite surface of the foam as illustrated FIGS. **1-2**.

[0092] In an embodiment of the disclosure, the at least one foam element opening extends from a first planar surface of the foam element to the opposite surface of the foam element, optionally a second planar surface of the foam element.

[0093] To improve the versatility, a foam element shaped as a wheel, i.e. a disk with a concentric opening for the axis of rotation, is advantageous.

[0094] In an embodiment of the disclosure, the foam element shape is a disk, and the at least one foam element opening is concentric with the disk.

[0095] The frictional force between the inserted connector and the foam element opening will depend on the relative dimensions of the connector, flange, and foam element opening. To improve the frictional force, the contact area between the connector and opening is advantageously large. Thus, advantageously, the shape of the opening is identical to the shape of the connector end for insertion into the opening. Further advantageously, the foam element opening has a smaller cross-sectional dimension than the connector. For example, the opening may be cylindrical with a cross-sectional diameter of 2.7 cm, and the connector end may be cylindrical with a cross-sectional diameter of 3.2 cm.

[0096] In an embodiment of the disclosure, the shape of the at least one opening of the foam element is identical to the shape of the connector ends.

[0097] In a further embodiment, the foam element opening has a cross-sectional size dimension, which is smaller than the cross-sectional size of the connector.

[0098] In a further embodiment, the foam element opening has a cross-sectional size dimension, which is at least 0.2, 0.3, 0.4, or 0.5 mm smaller than the cross-sectional size of the connector.

[0099] FIGS. **11-15** show embodiments of the foam elements, including exemplified dimensions of the lengths, diameters (Ø) and curvature (R), and the position and dimensions of the openings.

[0100] The flange of the connector is configured as a stopper for the insertion of the connector. The flange further provides stability between neighboring connected foam elements. The efficiency of the stopper, i.e. the risk of the flange being pushed into the opening, as well as the stability of the connection will depend on the relative dimensions of the flange, and foam element opening. It was found advantageously that the connector flange has a radially extending portion, which is at least 2 or 3 mm larger than the cross-sectional size of the foam element opening. For example the foam element opening may be cylindrical with a diameter of 2.7 cm, and the flange may be shaped as a disk having a diameter of 2.9 cm or 3 cm.

[0101] In an embodiment of the disclosure, the connector flange has a radially extending portion, which is at least 2, 3, 4, or 5 mm larger than the cross-sectional size of the foam element opening, preferably more than 3 mm.

[0102] The deformation properties of a foam element will depend on the foam material properties, such as the hardness, the microstructure of the foam, as well as the manufacturing process. Table 1 shows a hardness rating scale, which is applicable for solid foams. The hardness may be measured based on the method of JIS S 6050 SRIS-0101 (GS-701N).

TABLE 1

Hardness rating scale.

A	10 20 30 40 50 60 70 80 90 100
B	10 20 30 40 50 60 70 80 90 100
C	10 20 30 40 50 60 70 80 90 100
D	10 20 30 40 50 60 70 80 90 100
DO	10 20 30 40 50 60 70 80 80 100
O	10 20 30 40 50 60 70 80 90 100
OO	10 20 30 40 50 60 70 80 90 100
M	30 40 50 60 70 80 90

[0103] Solid foam materials of EVA copolymers (i.e. ethylene-vinyl acetate, also known as poly (ethylene-vinyl acetate)) have advantageous deformation properties. EVA foams may be configured to be resilient, elastically deformable or compressable, at the same time as having a high hardness, and is furthermore eco friendly materials.

[0104] In an embodiment of the disclosure, the foam material is selected from the group of: EVA copolymers. In a further embodiment, the foam material has a hardness rating above about OO 20, more preferably above about O 20, and most preferably above about 10, 20, 30, 40, 45, or 50 on the Shore C scale, where the hardness is based on the method of JIS S 6050 SRIS-0101 (GS-701N).

[0105] The frictional force between the connector and the foam element opening will also depend on the foam element material, and the interface structure between the foam and connector, which again will depend on the morphological structure or roughness of the foam surface. The morphological structure of a foam element surface depends on the manufacturing process.

[0106] Advantageously, the foam elements and foam element openings are manufactured by a mechanical cutting process. Due to the cutting process, the foam elements will have a surface roughness. This is in contrast to foams produced by casting or molding, where the molded foam element will have no or insignificant surface roughness, and the surface of the molded foam element is smooth with no open cell structures or pores.

[0107] In an embodiment of the disclosure, the shape of the foam elements is obtained by a mechanical cutting process, such as stamping, punching, and/or blade cutting.

[0108] The surface roughness of the foam elements further has the advantage of facilitating handling, assembly, and disassembly of the foam elements, as well as increasing the robustness of the foam elements.

[0109] The deformation properties of a foam element may also depend on other properties of the foam material, such as hardness, density, elongation, tensile strength, tear strength, and compression strength.

[0110] Advantageous deformation properties may be obtained with foam materials having a density in the range of 100 kg/m^3 based on method of ASTM D3575. In an embodiment of the disclosure, the foam material has a density between 50-200 kg/m^3, more preferably between 75-150 kg/m^3.

[0111] Advantageous deformation properties may be obtained with foam materials having an elongation in the range of 86% based on method of ASTM D3575. In an embodiment of the disclosure, the foam material has an elongation between 60-95%, more preferably between 70-90%.

[0112] Advantageous deformation properties may be obtained with foam materials having a tensile strength in the range of 1474 kPa based on method of ASTM D3575. In an embodiment of the disclosure, the foam material has a tensile strength between 1200-1600 kPa, more preferably between 1300-1500 kPa.

[0113] Advantageous deformation properties may be obtained with foam materials having a tear strength in the range of 7.06 N/mm based on method of ASTM D3575. In an embodiment of the disclosure, the foam material has a tear strength between 5-10 N/mm, more preferably between 6-9 N/mm.

[0114] Advantageous deformation properties may be obtained with foam materials having a 25% compression strength in the range of 182 kPa based on method of ASTM D3575. In an embodiment of the disclosure, the foam material has a 25% compression strength between 150-210 kPa, more preferably between 160-200 kPa.

Rotatable Wheel

[0115] To improve the versatility of the kit of parts, the kit of parts advantageously comprises a foam element which can be configured to a rotatable wheel. By rotatable wheel is meant a wheel that is rotatable around a rotation axis, more specifically a central and concentrically positioned rotation axis, such as a rotation shaft. For example, the connector according to the present disclosure may be adapted as a rotation shaft.

[0116] The ability, or resistance, of the wheel to rotate will depend on the frictional rotation resistance between the wheel and the rotation shaft. Inherently, the frictional rotation resistance will depend on the fastening mechanism between the wheel and the rotation shaft. If the frictional rotation resistance is high, the wheel will have a high resistance to rotate, corresponding to a high rolling resistance. If the frictional rotation resistance is low, the wheel will have a low rolling resistance.

[0117] For example, the frictional rotation resistance between the concentric opening of a disk shaped foam element and a connector attached as a rotation shaft, may be high. The high frictional rotation resistance may be due to a high surface contact area between the connector and the opening is high, and due to the surface structure or morphology of the foam element opening, which may have a roughness or a granulated surface structure. Thus a connector according to the present disclosure, applied as a rotation shaft for a wheel may result in a wheel with low rotateability and which is essentially non-rotatable. A high rotation resistance may be advantageous for functional toys for small children, where rapid rolling may be dangerous. In an embodiment of the disclosure, the cylindrical connectors **2** are applied as rotational shafts.

[0118] To improve the versatility of the kit and to provide functional toys for children with variable motor skills and of variable ages, rotatable wheels with variable rolling resistances are advantageous. Thus, the fastening mechanism between the wheel and rotational shaft advantageously is configured to have adjustable frictional resistance. This may be obtained by a fastening mechanism, such as a snap-fit, between the rotation shaft and a bushing placed in the concentric opening of the wheel.

[0119] An embodiment of a rotatable foam wheel **4** and a rotation shaft **2** where the frictional resistance of the fastening mechanism is adjustable, is illustrated in FIG. **5**, where FIG. **5**A shows the wheel assembled, or connected to a rotational shaft or axis, such that the wheel is rotationally attached to the cylindrical shaft, and FIG. **5**B shows the wheel and rotational shaft before assembly. The foam element, or wheel, is shaped as a disk having two planar surfaces **4*a*** with a concentric opening **5** for rotational attachment to the rotation shaft or connector **2**. A cylindrical bushing **5*a*** is placed in the concentric opening **5**, thus functioning as a lining or coating surface to be in contact with the rotation shaft.

[0120] FIG. **6** shows an embodiment of the bushing placed in the concentric opening of the wheel, where FIG. **6**A shows a close-up of the bushing surface, which is in rotational contact with the rotational shaft, in perspective view, and FIG. **6**B a close-up in a schematic perspective view.

[0121] In the embodiment of FIG. **6**, the rotation shaft is attached to the bushing by a snap-fit fastening mechanism. The snap-fit fastening is obtained between a protrusion of the bushing **8** (as shown in FIG. **6**), and a groove **9**,**10** in the rotation shaft or connector circumference (as shown in FIG. **5**). Thus, the contact area between the rotation shaft and the bushing is essentially the contact between the protrusion and groove. Thus, the frictional rotation resistance of the wheel is dependent on the contact area between the protrusion and groove.

[0122] FIG. **6** shows an embodiment of a foam wheel **4**, where the cylindrical inner surface **7** of the opening **5**, comprises a cylindrical bushing **5*a*** comprising a protrusion **8**. In this embodiment, the protrusion is disposed along at least a part of the perimeter of the cylindrical bushing, and is disposed concentric with the cylindrical perimeter of the opening **5**.

[0123] The shape and length of the protrusion along the perimeter will affect the frictional resistance and the force needed to fastened the rotation shaft and bushing, i.e. the force needed to obtain the snap-fit.

[0124] If the protrusion extends along the full perimeter of the cylindrical surface, the protrusion is ring shaped, and a higher force will be needed to obtain the snap-fit. If the protrusion is disposed and extending along only a part of the perimeter of the surface, less force is needed to obtain the snap-fit. Advantageously, the protrusion is configured such that the snap-fit force needed is possible with two hands and no further tools, and optionally possible to assembly and dissassembly by children. A suitable snap-fit force for the assembly and disassembly of the wheel and rotation shaft is between 20-80 N (newton), and preferably is ca. 60 N. This is advantageously obtained by an elongated convex shaped protrusion disposed partially along the perimeter of the bushing.

[0125] In an embodiment of the disclosure, the protrusion of the bushing has an elongated convex shape and is disposed partially along the perimeter of the bushing. In a further embodiment, the protrusion extends along below 25% of the perimeter of the bushing, more preferably below 20, 15, 10%.

[0126] To further reduce the force needed to form the snap-fit between the bushing and the rotation shaft, it is advantageous that the bushing is elastically deformable and may be deformed as a spring. Especially in the bushing area adjacent to the protrusion, it is advantageous that when force is applied to form the snap-fit, the protrusion and the bushing is elastically deformable. This may be obtained by one or more bushing openings **5***b* adjacent to the protrusion as illustrated in FIG. **6**. The bushing openings will facilitate elastical deformation of the bushing, such that less force is needed to form the snap-fit. Advantageously, the bushing openings are placed symmetrically around the protrusion and has the shape of slits as illustrated in FIG. **6**.

[0127] In an embodiment of the disclosure, the bushing further comprises one or more bushing openings adjacent to the protrusion. In a further embodiment, the bushing comprises two openings placed symmetrically around the protrusion. In a further embodiment, the two openings are slits extending perpendicular to the elongation of the protrusion.

[0128] To further control and reduce the force needed to form the snap-fit, it is advantageous that the bushing and rotational shaft is made of the same material. In an embodiment of the disclosure, the bushing and rotational shaft is made of the same material.

[0129] To improve the versatility of the kit and to improve the versatility of the connectors, it is advantageous that different rolling resistances may be obtained with a single rotation shaft. A fastening mechanism with adjustable frictional resistance of a single rotation shaft may be obtained as illustrated in FIGS. **7**-**8**. The fastening mechanism between the wheel and rotational shaft has adjustable frictional resistance, if the bushing placed in the concentric opening of the wheel facilitates multiple fastening configurations.

[0130] FIG. **7** shows a cross-sectional view of the snap-fit attachment. FIG. **7** shows an embodiment of a foam wheel **4** with a cylindrical bushing **5***a* rotationally attached to a rotation shaft, optionally an end **2***b* of a cylindrical connector **2**. The shaft or the end of the connector is illustrated to the left of the connector flange **3**. The bushing comprises a convex protrusion **8**, and the second end of the connector comprises a first circular groove **9** configured to form a snap-fit with the protrusion. The snap-fit is indicated by a circle in FIG. **7**A.

[0131] The connector further comprises at least one further circular groove in the connector circumference, such as a second circular groove **10**, as illustrated in FIGS. **7**-**8**. The second circular groove is in parallel to the first circular groove, and has a groove depth different from the first groove depth, as illustrated in FIGS. **7**-**8**. Thus, the second groove is configured to form a second snap-fit with the ring shaped protrusion. Due to the different groove depth, the contact area between the groove and protrusion of the snap-fit is different, and thus the frictional resistance, or rolling resistance, will be different.

[0132] In FIG. **7**, the snap-fit is formed between a first groove **9** with a smaller groove depth than the second groove **10**, and in FIG. **8**, the snap-fit is formed with the second groove (as indicated by the circle). Thus, the contact area is larger between the protrusion and the second groove (FIG. **8**), than the contact area between the protrusion and the first groove (FIG. **7**). The frictional force, or rolling resistance, within the snap-fit of FIG. **8** is therefore larger, than the frictional force within the snap-fit of FIG. **7**.

[0133] By translating the wheel along the longitudinal direction of the rotation shaft, it is possible to change from a snap-fit formed with the first groove to a snap-fit formed with the second groove, and vice versa. Thus, a fastening mechanism with adjustable frictional resistance of a single rotation shaft may be obtained.

[0134] In an embodiment of the disclosure, the fastening mechanism is a snap-fit between a protrusion of the bushing to at least one groove in the connector circumference, wherein the groove depth is adjustable. In a further embodiment, the connector circumference comprises at least two parallel grooves, wherein the depth of the first groove is different from the depth of the second groove. In a further embodiment, the frictional resistance of the snap-fit is adjusted by translating the wheel along the longitudinal direction of the rotation shaft.

[0135] To obtain rolling resistances relevant for functional toys for children, it is advantageous that the groove depths are in a certain range. For example, a first groove depth of 0.8 mm may result in a rolling resistance suitable for a children ride-on, and a second groove depth of 1.5 mm may result in a rolling resistance suitable for a children's walker or baby walker.

[0136] In an embodiment of the disclosure, the depth of the first groove is between 0.5-3 mm, more preferably between 1-2 mm, and most preferably is 1.5 mm, and wherein the depth of the second groove is between 0.2-1.5 mm, more preferably between 0.4-1 mm, and most preferably is 0.8 mm.

[0137] To further enable adjustable frictional resistance of the fastening mechanism, one or more of the grooves may comprise multiple second protrusions placed within the groove channel, or groove surface, as illustrated in FIG. **19**. Depending on the number, shape, and pattern, the multiple second protrusions will further increase the frictional rotation resistance. Advantageously, the second protrusions have the form of a pattern of parallel ridges oriented perpendicular to the groove direction as illustrated in FIG. **19**, and further advantageously, the height of the second protrusions is around 0.5 mm. Such second protrusions may generate a sound when the rotation shaft is rotated within the bushing, thereby providing a further entertainment aspect to the functional toy.

[0138] In an embodiment of the disclosure, the surface of the least one groove comprises multiple second protrusions. In a further embodiment, the multiple second protrusions form a pattern of parallel ridges oriented perpendicular to the groove direction. In a further embodiment, the height of the second protrusions is between 0.1-2 mm, more preferably between 0.2-1 mm, and most preferably is 0.5 mm.

[0139] Thus, wheels with adjustable rolling resistance can be assembled from the kit of the present disclosure. This is especially advantageous for functional toys for children of different ages and motor skills. For example, a baby walker or children's walker, may be adjusted to the walking speed of the child. In particular a toddler that is learning to walk can use the presently disclosed kit of parts as a baby walker where one or more of the wheels attached by means of the high friction assembly such the child does not fall when trying to walk supporting itself to the baby walker. When the child is older the presently disclosed kit of parts is probably more fun to play with if all the wheels rotate with a low friction.

REFERENCE NUMBERS

[0140] **1**—kit of parts
[0141] **2**—cylindrical connector
[0142] **2***a*—first cylindrical connector end
[0143] **2***b*—second cylindrical connector end
[0144] **3**—planar flange
[0145] **4**—foam element
[0146] **4***a*—planar surface of foam element
[0147] **5**—cylindrical opening
[0148] **5***a*—bushing
[0149] **5***b*—bushing opening
[0150] **6**—adjacent planar surfaces
[0151] **7**—wheel opening inner surface
[0152] **8**—protrusion
[0153] **9**—first groove
[0154] **10**—second groove

Items

[0155] The presently disclosed may be described in further detail with reference to the following items.

[0156] 1. A kit of parts for a functional toy, comprising:

[0157] one or more connector(s) having a first end, a second end, and a radially extending flange placed between the two ends,

[0158] one or more foam element(s) with at least one essentially planar surface, said surface comprising at least one opening extending perpendicular to the planar surface for receiving at least the first end of the connector,

[0159] wherein the connector flange is configured as a stopper for the insertion of the first end into the foam element opening, and

[0160] wherein the kit of parts are configured such that when the first end is inserted into the foam element opening to the stopper position, and a further suitable amount of force is applied to the connector in the direction of insertion, the flange of the connector is countersunk into the surface of the foam element, and remains countersunk after the further force is removed due to the frictional force between the connector and the opening.

[0161] 2. The kit according to item 1, wherein the suitable force is configured to be below 80 N, more preferably below 75, 70, 65 N, and most preferably below 60 N.

[0162] **3**. The kit according to any of the preceding items, wherein the connector is countersunk into the surface of the foam element by elastic deformation of the foam element.

[0163] 4. The kit according to any of the preceding items, wherein the connector is an elongated element with a first end and second end, said element having a cross-section shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal.

[0164] 5. The kit according to any of the preceding items, wherein the connector is cylindrical with a first cylindrical end, a second cylindrical end, and a radially extending flange placed between the two cylindrical ends.

[0165] 6. The kit according to item 5, wherein the connector diameter is below 7 cm, more preferably below 6, 5, 4, cm, and most preferably equal to or below 3.2 cm.

[0166] 7. The kit according to any of the preceding items, wherein the radially extending flange is planar.

[0167] 8. The kit according to item 7, wherein the thickness of the radially extending flange is below 4 mm, more preferably below 3 or 2 mm, and most preferably equal to or below 1.5 mm.

[0168] 9. The kit according to any of the preceding items, wherein the radially extending flange has a shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal.

[0169] 10. The kit according to any of the preceding items, wherein the first end and the second end of the connector are symmetrical or assymmetrical.

[0170] 11. The kit according to any of items 4-10, wherein the first end of the connector has a length of between 15-2 cm, more preferably between 11-3 cm, such as a length of 10 cm or 3.4 cm.

[0171] 12. The kit according to any of items 4-11, wherein the second end of the connector has a length of between 15-2 cm, more preferably between 11-3 cm, such as a length of 10 cm or 3.4 cm.

[0172] 13. The kit according to any of the preceding items, wherein the shape of the at least one opening of the foam element is identical to the shape of the connector ends.

[0173] 14. The kit according to any of the preceding items, wherein the foam element opening has a cross-sectional size dimension, which is smaller than the cross-sectional size of the connector.

[0174] 15. The kit according to item 14, wherein the foam element opening has a cross-sectional size dimension, which is at least 0.2, 0.3, 0.4, or 0.5 mm smaller than the cross-sectional size of the connector.

[0175] 16. The kit according to any of the preceding items, wherein the connector flange has a radially extending portion, which is at least 2, 3, 4, or 5 mm larger than the cross-sectional size of the foam element opening, preferably more than 3 mm.

[0176] 17. The kit according to any of the preceding items, configured such that when the first end of a connector is received within a first opening of a first foam element, and the second end of the connector is received within a first opening of a second foam element, the adjacent surfaces of the first and second foam elements are abutting.

[0177] 18. The kit according to item 17, wherein the adjacent planar surfaces of the first and second foam element are essentially abutting with a gap below 1 mm, more preferably below 0.5 mm, such as 0 mm.

[0178] 19. The kit according to any of the preceding items, wherein the foam element shape is selected from the group of: cube, cuboid, square prism, prism, cylinder, half cylinder, cone, pyramid, disk, and any combinations thereof.

[0179] 20. The kit according to any of the preceding items, wherein the at least one essentially planar surface of the foam element comprises 2 or more openings, such as 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, or 20 openings.

[0180] 21. The kit according to any of the preceding items, wherein the at least one foam element opening extends from a first essentially planar surface of the foam element to the opposite surface of the foam element, optionally a second essentially planar surface of the foam element.

[0181] 22. The kit according to any of the preceding items, wherein the foam element shape is a disk, and the at least one foam element opening is concentric with the disk.

[0182] 23. A kit of parts for a functional toy comprising:

[0183] a wheel comprising solid foam having a concentric opening for the axis of rotation,

[0184] a bushing placed in the concentric opening,

[0185] a connector adapted as a rotation shaft attachable to the bushing by means of a fastening mechanism, such as a snap-fit,

[0186] wherein the kit of parts is configured such that the frictional resistance of the fastening mechanism is adjustable.

[0187] 24. The kit according to item 23, wherein the fastening mechanism is a snap-fit between a protrusion of the bushing to at least one groove in the connector circumference, wherein the groove depth is adjustable.

[0188] 25. The kit according to item 24, wherein the connector circumference comprises at least two parallel grooves, wherein the depth of the first groove is different from the depth of the second groove.

[0189] 26. The kit according to item 25, wherein the depth of the first groove is between 0.5-3 mm, more preferably between 1-2 mm, and most preferably is 1.5 mm, and wherein the depth of the second groove is between 0.2-1.5 mm, more preferably between 0.4-1 mm, and most preferably is 0.8 mm.

[0190] 27. The kit according to any of items 25-26, wherein the frictional resistance of the snap-fit is adjusted by translating the wheel along the longitudinal direction of the rotation shaft.

[0191] 28. The kit according to any of items 24-27, wherein the surface of the least one groove comprises multiple second protrusions.

[0192] 29. The kit according to item 28, wherein the multiple second protrusions form a pattern of parallel ridges oriented perpendicular to the groove direction.

[0193] 30. The kit according to item 29, wherein the height of the second protrusions is between 0.1-2 mm, more preferably between 0.2-1 mm, and most preferably is 0.5 mm.

[0194] 31. The kit according to any of items 24-30, wherein the protrusion of the bushing has an elongated convex shape and is disposed partially along the perimeter of the bushing.

[0195] 32. The kit according to any of items 24-31, wherein the bushing further comprises one or more bushing openings adjacent to the protrusion.

[0196] 33. The kit according to item 32, wherein the bushing comprises two openings placed symmetrically around the protrusion.

[0197] 34. The kit according to item 33, wherein the two openings are slits extending perpendicular to the elongation of the protrusion.

[0198] 35. The kit according to any of items 23-34, wherein the bushing and rotational shaft is made of the same material.

[0199] 36. The kit according to any of the preceding items, wherein the foam material is selected from the group of: EVA copolymers.

[0200] 37. The kit according to any of the preceding items, wherein the foam material has a hardness rating above about OO 20, more preferably above about O 20, and most preferably above about 10, 20, 30, 40, 45 or 50 on the Shore C scale.

[0201] 38. The kit according to any of the preceding items, wherein the shape of the foam elements is obtained by a mechanical cutting process, such as stamping, punching, and/or blade cutting.

[0202] 39. The kit according to any of the preceding items, wherein the connector material is selected from the group of: wood, and polymers, such as thermoplastic polymers, such as acrylonitrile butadiene styrene (ABS).

[0203] 40. The kit according to any of the preceding items, wherein the connector is a hollow element.

[0204] 41. The kit according to item 35, wherein the connector is made by an injection molding process.

[0205] 42. A functional toy comprising the kit of parts according to any of the preceding items.

[0206] 43. The functional toy according to item 42, wherein the toy is selected from the group of: children's walker, push along wagon, children push and ride-ons, wheel toys, rocking horse, and aid for crawling, standing, rolling, jumping, climbing, and balance training.

1. A kit of parts for a functional toy, comprising:

one or more connector(s) each having a first end, a second end, and a radially extending flange placed between the two ends;

one or more foam element(s) each with at least one essentially planar surface, said surface comprising at least one opening extending perpendicular to the planar surface for receiving at least the first end of the connector;

wherein the connector flange is configured as a stopper for the insertion of the first end into the foam element opening; and

wherein the kit of parts are configured such that when the first end is inserted into the foam element opening to the stopper position, and a further suitable amount of force is applied to the connector in the direction of insertion, the flange of the connector is countersunk into the surface of the foam element, and remains countersunk after the further force is removed due to the frictional force between the connector and the opening.

2. The kit according to claim **1**, wherein the suitable force is configured to be below 80 N, and/or wherein the connector is countersunk into the surface of the foam element by elastic deformation of the foam element.

3. The kit according to claim **1**, wherein the connector is an elongated element with a first end and second end, said element having a cross-section shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal.

4. The kit according to claim **1**, wherein the radially extending flange is planar.

5. The kit according to claim **1**, wherein the radially extending flange has a shape selected from the group of: circular, ovalic, and polygonal, such as hexagonal, octagonal, decagonal, dedecagonal, and/or wherein the first end and the second end of the connector are symmetrical or asymmetrical.

6. The kit according to claim **1**, wherein the shape of the at least one opening of the foam element is identical to the shape of the connector ends, and/or wherein the foam element opening has a cross-sectional size dimension, which is smaller than the cross-sectional size of the connector.

7. The kit according to claim **1**, wherein the connector flange has a radially extending portion, which is at least 2, 3, 4, or 5 mm larger than the cross-sectional size of the foam element opening.

8. The kit according to claim **1**, configured such that when the first end of a connector is received within a first opening of a first foam element, and the second end of the connector is received within a first opening of a second foam element, the adjacent surfaces of the first and second foam elements are abutting.

9. The kit according to claim **1**, wherein the foam element-shape is selected from the group of: cube, cuboid, square prism, prism, cylinder, half cylinder, cone, pyramid, disk, and any combinations thereof, and/or wherein the at least one essentially planar surface of the foam element comprises 2 or more openings.

10. The kit according to claim **1**, wherein the at least one foam element opening extends from a first essentially planar surface of the foam element to the opposite surface of the foam element, or wherein the foam element shape is a disk, and the at least one foam element opening is concentric with the disk.

11. (canceled)

12. A kit of parts for a functional toy comprising:

a wheel comprising solid foam having a concentric opening for the axis of rotation;

a bushing placed in the concentric opening;

a connector adapted as a rotation shaft attachable to the bushing by means of a fastening mechanism;

wherein the kit of parts is configured such that the frictional resistance of the fastening mechanism is adjustable.

13. The kit according to claim **12**, wherein the fastening mechanism is a snap-fit between a protrusion of the bushing to at least one groove in the connector circumference, wherein the groove depth is adjustable.

14. The kit according to claim **13**, wherein the connector circumference comprises at least two parallel grooves, wherein the depth of the first groove is different from the depth of the second groove.

15. The kit according to claim **14**, wherein the frictional resistance of the snap-fit is adjusted by translating the wheel along the longitudinal direction of the rotation shaft.

16. The kit according to claim **13**, wherein the surface of the least one groove comprises multiple second protrusions.

17. The kit according to claim **13**, wherein the protrusion of the bushing has an elongated convex shape and is disposed partially along the perimeter of the bushing, or wherein the bushing further comprises one or more bushing openings adjacent to the protrusion.

18. (canceled)

19. The kit according to claim **12**, wherein the bushing and rotational shaft is made of the same material.

20. The kit according to claim **1**, wherein the foam material is selected from the group of: EVA copolymers, and/or wherein the foam material has a hardness rating above about OO 20, or wherein the shape of the foam elements is obtained by a mechanical cutting process.

21. (canceled)

22. The kit according to claim **1**, wherein the connector material is selected from the group of: wood, and polymers, such as thermoplastic polymers, such as acrylonitrile butadiene styrene (ABS), and/or wherein the connector is a hollow element, and/or wherein the connector is made by an injection molding process.

23. A functional toy comprising the kit of parts according to claim **1**.

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