Building blocks and building block assemblies

Abstract: A building block comprises a first coupling surface on a first side of a main body, a second coupling surface on a second side of the main body, one peripheral wall or a plurality of peripheral walls extending between the first coupling surface and the second coupling surface and defining a lateral boundary of the main body, and one partial connector or a plurality of partial connectors formed on a peripheral wall.

Figure 1A
BUILDING BLOCKS AND BUILDING BLOCK ASSEMBLIES

Field

[01] The present disclosure relates to building blocks and building block assemblies, and more particularly to interconnectible modular building blocks for use in toys, industrials and commerce.

Background

[02] Modular building blocks that can be inter-connected to form structural assemblies have many practical use and applications, for example, in the toy, industry and commerce sectors. Modular interconnectible building blocks facilitate cost effective and expeditious assembly and promotes standardization and are widely used in the construction industry. Modular interconnectible toy building blocks are widely used in education and leisure, as wisely designed building blocks promote creativity and can help train motor skills.

[03] Modular building blocks that can be inter-connected typically comprises a main body and a plurality of inter-block connectors on the main body. The inter-block connectors are usually adapted for releasable interlocking of compatible building blocks without the need to use hand-tools to facilitate expeditious, efficient and convenient inter-block connection.

Disclosure

[04] There is disclosed a building block comprising a first coupling surface on a first side of a main body, a second coupling surface on a second side of the main body, one peripheral wall or a plurality of peripheral wall extending between the first coupling surface and the second coupling surface and defining a lateral boundary of the main body. The building block may be for toy, industrial or commercial application.

[05] The build block comprises one inter-block connector or a plurality of inter-block connectors defining a first coupling direction and the first coupling surface which is formed on the first side of the main body.

[06] The build block comprises one inter-block connector or a plurality of inter-block connectors defining a second coupling direction and the second coupling surface which is formed on the second side of the main body.

[07] The build block comprises one partial connector or a plurality of partial connectors which is formed on a peripheral wall.
[08] The partial connector is an axially split portion of a discrete inter-block connector and comprises an axially extending split surface.

[09] The discrete inter-block connector has a connector axis defining a coupling direction and the split surface extending along a splitting direction which is parallel to the connector axis of the discrete inter-block connector.

[01 0] The inter-block connector on the first coupling surface and the inter-block connector on the second coupling surfaces are compatible inter-block connectors having mating features of compatible mating feature dimensions.

[01 1] In general, an inter-block connector has a connector axis which defines a coupling direction. To facilitate inter-block connection, a building block having an inter-block connector and a counterpart building block having a matched inter-block connector are brought towards each other with the connector axes and coupling surfaces of the pair of matched inter-block connectors aligned until the pair of matched inter-block connectors or the corresponding coupling surfaces of the building blocks are in close-fitted engagement. When the corresponding coupling surfaces of the building blocks are in close-fitted or tight-fitted engagement, the building blocks are in interconnection, or more exactly, close-fitted or tight-fitted mechanical interconnection.

[01 2] The inter-block connectors are adapted for releasable or detachable inter-connection of building blocks. To facilitate tight yet releasable inter-connection, the inter-block connectors are preferable snap-fit connectors. To facilitate flexible inter-block connection, the inter-block connectors are preferably annular snap connectors, for example, cylindrical annular snap connectors or spherical annular snap connectors. An annular snap connector has a center axis which is also the connector axis which defines its coupling direction and has circular symmetry about its connector axis.

[013] When two building blocks having partial connectors of the same gender and compatible mating feature sizes are interconnected to form a building block sub-assembly such that the corresponding partial connectors are paired up, a discrete inter-block connector is formed. When the corresponding partial connectors are paired up, the adjacent building blocks in coupled engagement, their split surfaces are opposite facing and in abutment or in proximal juxtaposition.

[01 4] A discrete connector formed by interconnection of adjacent building blocks provides additional sophistication and flexibility to building blocks, as well as a useful choice to the public. For example, a third building block may be attached to the building block assembly with its
coupling surface not flush with the coupling surface of a component building block of the building block sub-assembly.

[01 5] The one inter-block connector or the plurality of inter-block connectors defining the first coupling direction and the first coupling surface on the first side of the main body is or comprises a first inter-block connector having a first connector axis, and the one inter-block connector or the plurality of inter-block connectors defining the second coupling direction and the second coupling surface on the second side of the main body is or comprises a second inter-block connector having a second connector axis, wherein the first connector axis and the second connector axis are axis aligned. The first inter-block connector and the second inter-block connector are compatible inter-block connectors having compatible mating feature size or dimensions. The first inter-block connector and the second inter-block connector may have same or opposite mating feature gender. For example, the first inter-block connector may be a male-type or female-type inter-block connector, and the second inter-block connector may be a male-type or female-type inter-block connector. When the inter-block connectors have compatible mating feature sizes or dimensions and opposite mating feature genders, the inter-block connectors are complementary and matched counterpart inter-block connectors.

[01 6] When two building blocks having complementary and matched counterpart connectors are inter-connected, non-permanent joints that are releasable and detachable and that extend between the two building blocks are formed. As the non-permanent joints need to be releasable and detachable and yet must be robust enough to maintain structural integrity of a building assembly formed by the building blocks, the inter-block connectors are preferably snap connectors, which are also known as snap-fit connectors.

[01 7] In some embodiments, the inter-block connector on the first coupling surface is an integrally formed male-type cylindrical annular connector, the inter-block connector defining the second coupling surface is an integrally formed female-type cylindrical annular connector, and the partial connector is a split portion of an assembled cylindrical annular connector having a characteristic connection axis defining a characteristic coupling direction; wherein the partial connector has a split surface extending along the characteristic coupling direction.

[01 8] In some embodiments, the split surface is flush with or in proximity with either the first coupling surface or the second coupling surface and has same facing direction with the coupling surface with which the split surface is flush with or in proximity with.
In some embodiments, the partial connector is an aligned part of a 3-dimensional array comprising the inter-block connectors on the first coupling surface and/or the inter-block connectors on the second coupling surface.

In this disclosure, coupled engagement means tight-fit or closely-fit engagement, including, friction fit, press fit, interference fit, and snap-fit engagement.

**Figures**

The present disclosure is described by way of example with reference to the accompanying drawings, in which:

- Figure 1A is a perspective view of an example building block according to the present disclosure,
- Figure 1A1 is a perspective view of the example building block of Figure 1A taken from an opposite side of the view of Figure 1,
- Figure 1A2 is an example side elevation view of the example building block of Figure 1A,
- Figure 1A3 is cross-sectional view of the example building block of Figure 1A taken along line A1-A1',
- Figure 1A4 is cross-sectional view of the example building block of Figure 1A taken along line A2-A2' which is parallel to and offset from the line A1-A1',
- Figure 1A5 is an enlarged cross-sectional view, taken along line A1-A1', of a male spherical annular snap connector 122 on the first coupling surface of the example building block of Figure 1A,
- Figure 1A6 is an enlarged cross-sectional view, taken along line A1-A1', of a female spherical annular snap connector 142 of the example building block of Figure 1A,
- Figure 1B is a side view of a building block assembly formed by stacking two building blocks of Figure 1A with their first panel members edge aligned,
- Figure 1B1 is an enlarged view of a spherical annular snap joint of the building block assembly of Figure 1B,
- Figure 1C is a perspective view of an example building block 100C,
- Figure 1D is a perspective view of an example building block 100D,
- Figures 1D1 and 1D2 are perspective views of a building block assembly formed by side-by-side interconnection of the example building block 100C and the example building block 100D.
Figures 1E, 1E1 and 1E2 are perspective and side views of an example building block 100E, [022] drawings, in which: 

Figures 2A and 2A1 are perspective views of an example building block 200A according to the present disclosure, 

Figures 2A2 and 2A3 are opposite plan elevation views of the example building block of Figure 2A, 

Figure 2A4 is a side elevation view of the example building block of Figure 2A, 

Figure 2A5 is a cross-sectional view of the example building block of Figure 2A taken along line A3-A3' of Figure 2A2, 

Figures 2B and 2B1 are perspective views of an example building block 200B according to the present disclosure, 

Figures 2B2 and 2B3 are opposite plan elevation views of the example building block of Figure 2B, 

Figure 2B4 is a side elevation view of the example building block of Figure 2B, 

Figure 2B5 is a cross-sectional view of the example building block of Figure 2B taken along line A3-A3' of Figure 2A2, 

Figures 2C and 2C1 are perspective views of an example building block 200C according to the present disclosure, 

Figures 2C2 and 2C3 are opposite plan elevation views of the example building block of Figure 2C, 

Figures 2C4 and 2C5 are side elevation views of the example building block of Figure 2C, 

Figure 2C6 is a cross-sectional view of the example building block of Figure 2C taken along line A-A' of Figure 2C2, 

Figures 2D and 2D1 are perspective views of an example building block 200D according to the present disclosure, 

Figures 3A, 3B and 3C are perspective views of various example building block assemblies constructed from the example building blocks 200C and 200D, and 

Figures 4A and 4B are perspective views of an example building block assembly constructed from the example building blocks 200C.
Description

[023] An example building block 100 comprises a first coupling surface 120, a plurality of connectors 122 formed on the first coupling surface 120, a second coupling surface 140, a plurality of connectors 142 formed on the second coupling surface 140, a plurality of peripheral walls 160 interconnecting the first coupling surface 120 and the second coupling surface 140, and a plurality of partial connectors 162 formed on the peripheral walls 160, as depicted in Figures 1A, 1A1, 1A2, 1A3, and 1A4.

[024] The connectors 122 on the first coupling surface 120 are integrally formed with a first panel 124 and the first coupling surface 120 is an outward facing surface of the first panel 124. The connectors 142 on the second coupling surface 140 are integrally formed with a second panel 144 and the second coupling surface 140 is an outward facing surface of the second panel 144. The partial connectors 162 are integrally formed with the peripheral walls 160.

[025] The plurality of peripheral walls 160 cooperates with the first panel 124 and the second panel 144 to define a main body 170 and a hollow internal compartment 180 of the building block. The main body 170 is formed of a hard and impact-resistant thermoplastic material with a small degree of resilience, such as acrylonitrile butadiene styrene (‘ABS’) or metal. The first panel 124, the connectors 122 on the first panel 124, the peripheral walls 160, and the partial connectors 162 on the peripheral walls 160 are integrally formed as a single piece and as a first sub-assembly, for example by injection molding or 3-D printing. The second panel 144 and the connectors 142 formed thereon are integrally formed as a single piece and as a second sub-assembly, for example by injection molding or 3-D printing. The second sub-assembly is joined with the first sub-assembly to form the building block 100, for example, by ultrasonic welding, fusion welding, gluing or other known joining methods. Specifically, the lateral edges of the second panel 144 are joined to the bottom end of the inside facing surface of the peripheral walls 160 to form the building block.

[026] An example connector 1221, 1222 on the first coupling surface 120 has a connector axis ZA1-ZA1’, ZA2-ZA2’. The connector axis ZA1-ZA1’, ZA2-ZA2’ defines a coupling axis and a coupling direction Z. The coupling axes of the example plurality of connectors 1221, 1222 on the first coupling surface are parallel and offset from each other and the coupling directions of all the example plurality of connectors 122 are the same. As the plurality of connectors 122 has a common coupling direction, the first coupling surface 120 has a characteristic first coupling
direction Z which is defined by the plurality of connectors 122 on the first coupling surface and which is parallel to the connector axis ZA1-ZA1', ZA2-ZA2'.

[027] Each connector 122 is for facilitating detachable or releasable mechanical interlocking of the example building block 100 with a counterpart building block having a complementary counterpart coupling surface. A building block having a complementary coupling surface is one which has at least one coupling surface on which there is at least one connector that is complementary and compatible to the connector 122. A counterpart building block having a complementary counterpart coupling surface means one which has at least one counterpart coupling surface on which there is at least one counterpart connector that is complementary and compatible to the connector 122. The connector 122 may be referred to as the "base connector" for ease of reference. For the avoidance of doubt, a counterpart building block herein is a building block that is separate or separable from the example building block 100. The example building block 100 may be referred to as a "base block" for ease of reference and is detachably or releasably attachable to the base block through interlocking between counterpart connectors distributed on the respective coupling surfaces of the counterpart building blocks forming a building block assembly.

[028] The example building block 100 and a counterpart building block will enter into detachable or releasable mechanical interlocking when the base connector 122 and the counterpart connector are in detachable or releasable mechanical interlocking as a result of mechanical interlocking between inter-block connectors on the corresponding coupling surfaces. To facilitate formation of detachable or releasable mechanical interlocking of corresponding coupling surfaces, the base connector and the counterpart connector are required to have complementary and compatible mechanical mating features. A base connector and a counterpart corresponding connector have compatible mechanical mating features when the mechanical mating features on the base connector and the counterpart connector are matched in mating feature sizes. A base connector and a counterpart complementary connector are matched in mating feature sizes when their characteristic mating feature sizes are same, equivalent or compatible. A base connector and a counterpart connector have complementary mechanical mating features when the mechanical mating features on the base connector and the counterpart connector are matched in mating feature properties or mating feature characteristics. A base connector and a counterpart complementary connector have matched mating characteristics or matched mating feature properties, for example, if one of the connectors has male-type mating features and the other one of the connectors has female-type mating features. A base connector and a counterpart
complementary connector having matched mating characteristics when interlocked or engaged will cooperate to form a closely fitted and detachable mechanical interlocking. A base connector and a counterpart complementary connector having matched mating characteristics when interlocked or engaged will cooperate to form a closely fitted and detachable mechanical interlocking, if the mating features on the base connector and the counterpart complementary connector have same or compatible effective functional sizes. A base connector and the counterpart connector having complementary and compatible mechanical mating features are a matched pair of complementary connectors.

[029] Each example connector 122 is an integrally formed inter-block connector which is shaped and dimensioned such that, when the connector 122 and its complementary and compatible counterpart inter-block connector are moved relatively towards each other along their respective coupling directions and with their respective connector axes aligned, the connector 122 and its complementary and compatible counterpart, and hence the building block 100 and the counterpart building block, will move into closely fitted and detachable mechanical interlocking or coupled engagement when the connector 122 and its complementary and compatible are prevented from moving further towards each under normal use conditions, for example, when the corresponding coupling surfaces are in abutment contact. When the connector 122 and its complementary and compatible counterpart are in closely fitted and detachable mechanical interlocking, the first coupling surface 120 is in abutment contact with the corresponding building block, or more specifically, in abutment contact with a corresponding coupling surface of the counterpart building block. In example embodiments such as the present, the connector axes ZA1-ZA1', ZA2-ZA2' and the first coupling direction Z is orthogonal to the first coupling surface 120.

[030] For succinctness, the terms "interlocking" and "mechanical interlocking", the terms "mating" and "mechanical mating", and the terms "coupling direction" and "inter-block coupling direction", are used interchangeably herein and shall be given the same meaning unless the context otherwise requires.

[031] The example plurality of connectors 122 comprises an example plurality of four connectors, and the four connectors are arranged into an array having two rows and two columns, with a column and a row being orthogonal to each other. The separation distance between adjacent connectors 122 in a row and the separation distance between adjacent connectors 122 in a column are the same. In general, the connector axes of the plurality of four connectors on adjacent rows and adjacent columns are on corners of a square.
[032] The example first panel 124 is a square shape panel member defining a square boundary. The example second panel 144 is a square shape panel member defining a square boundary which is identical in size to the square boundary of the first panel 124. The peripheral walls 160 extend between the outer boundaries of the first panel 124 and the second panel 144 to define the depth or thickness of the main body 170 of the building block 100. As the first panel 124 and the second panel 144 have identical boundary sizes, each one of the peripheral walls 160 extends in a direction which is orthogonal to the first coupling surface 120 and/or which is orthogonal to the second coupling surface 140 to define an internal compartment 180 having the shape of a rectangular cuboid. In some embodiments such as the present, the first coupling surface 120 and the second coupling surface 140 are parallel and the peripheral walls 160 have a uniform depth or thickness. In some embodiments, the first coupling surface 120 and the second coupling surface 140 are non-parallel or have different shapes and/or dimensions, and the peripheral walls 160 may have a non-uniform depth or thickness.

[033] The example building block 100 comprises an example plurality of four peripheral walls 160 since each one of the example first panel 124 and the example second panel 144 is a four-sided polygon. The square defined by the four peripheral walls 160 and the square defined by the connector axes of the plurality of four connectors are edge-parallel similar squares.

[034] An example connector 1421, 1422 on the second coupling surface 140 has a connector axis ZB1-ZB1', ZB2-ZB2', the connector axis ZB1-ZB1', ZB2-ZB2' defining a coupling axis and a coupling direction -Z. The coupling axes of the example plurality of connectors 1421, 1422 on the second coupling surface are parallel and offset from each other and the coupling directions of all the example plurality of connectors 142 are the same. As the plurality of connectors 142 has a common coupling direction, the second coupling surface 140 has a characteristic second coupling direction which is defined by the plurality of connectors 142 on the second coupling surface and which is parallel to the connector axis ZB1-ZB1', ZB2-ZB2'. In this example, the second coupling direction -Z is aligned with but opposite to the first coupling direction Z (or +Z).

[035] Each connector 142 is for facilitating detachable mechanical interlocking or interconnection between the example building block 100 and a corresponding building block having a matched connector on a matched coupling surface. More specifically, each connector 142 is for facilitating detachable mechanical inter-connection with a matched and compatible inter-block connector on a matched coupling surface of the corresponding building block. A corresponding building block is a building block that is separate or separable from the example building block.
Each connector 142 is an integrally formed inter-block connector which is shaped and dimensioned such that, when the connector 142 and its matched counterpart connector is moved relatively towards each other along the second coupling direction with their respective connector axes aligned, the connector 142 and the matched counterpart connector, and hence the building block 100 and the corresponding building block, will move into closely fitted and detachable mechanical engagement when the integral connector 142 and its matched counterpart connector are prevented from moving further towards each other under normal use conditions. When the connector 142 and its matched connector are in fitted and detachable mechanical engagement, the second coupling surface 140 is in abutment contact with the corresponding building block, or more specifically, in abutment contact with a corresponding coupling surface of the corresponding building block. In example embodiments such as the present, the connector axis ZB1-ZB1' and the second coupling direction is orthogonal to the second coupling surface 140.

The example plurality of connectors 142 comprises an example plurality of four connectors, and the four connectors are arranged into an array having two rows and two columns, with a column and a row being orthogonal to each other. The separation distance between adjacent connectors 142 in a row and the separation distance between adjacent connectors 142 in a column are the same. More specifically, the connector axes of the plurality of four connectors are disposed at corners of a square. Likewise, the connector axes of the plurality of four connectors on adjacent rows and adjacent columns are on corners of a square.

In some embodiments such as the present example, each connector 122, 142 comprises a rigid substantive hollow shell to define the effective functional shape of the connector. The effective functional function shape of a connector herein means the shape which confers the characteristic mating properties of a connector. For a male-type connector, the effective functional shape of the connector is in the form of a boss or protrusion. For a female-type connector, the functional shape of the connector is in the form of a recess, cavity or indentation defined by a peripheral wall.

In some embodiments such as the present, a connector 122 on the first coupling surface 120 has a corresponding connector 142 on the second coupling surface 140 and the connector axes ZA1 and ZB1 of the corresponding connectors are connector axes aligned. In other words, the connectors 122 and 142 are co-axially aligned.

The example connectors 122 on the first coupling surface 120 are male-type connectors 122 (or "male connectors" in short). Each example male connector 122 comprises a hollow and substantially rigid shell-like connector body which protrudes from the first coupling surface 120.
and extends orthogonally away from both the first coupling surface 120 and the second coupling surface 140. The male connector 122 is substantially a spherical annular male connector having a partial spherical portion protruding away from the first coupling surface 120. The spherical annular male connector has a circular symmetry about its connector axis so that the connector axis ZA1- ZA1', ZA2- ZA2' is also an axis of circular symmetry. The protruding connector body of a male connector 122 has a characteristic connector height. The characteristic connector height is a distance between an upper free end of the protruding connector body and its base surface and along the coupling direction. The base is the first coupling surface 120 in this example.

[041] The example connectors 142 on the second coupling surface 140 are female-type connectors 142 (or "female connector" in short). Each example female connector 142 comprises a hollow and substantially rigid connector body which protrudes from the second coupling surface 140 and extends orthogonally towards the first coupling surface 120. The female connector 142 is substantially a spherical annular female connector having a connector receptacle which retracts into the hollow compartment 180 of the building block, as depicted in Figure 1A3. The connector body includes a receptacle body wall which defines a partial spherical receptacle compartment 148 for closely fitted reception of a matched spherical annular male connector, such as the connector 122 on the first coupling surface. The receptacle body defines an entry aperture to the receptacle compartment 148 and the entry aperture is proximal the second coupling surface 140 and facing the second coupling direction. The receptacle compartment and its associated entry aperture share the connector axis ZB1', ZB2' as a common center axis.

[042] Referring more particularly to Figures 1A5, 1A6 and 1B1, The entry aperture defines an entry clearance D1 which is smaller than the maximum transversal clearance D2 of the partial spherical compartment, such that a maximum transversal portion of a matched spherical annular male connector having compatible mechanical mating feature dimensions with the spherical annular female connector 142 and having a maximum transversal dimension D2 has to resiliently overcome restriction of the entry aperture in order to advance fully into the partial spherical compartment to form a closely-fitted engagement with the spherical annular female connector 142. The spherical annular female connector has a circular symmetry about its connector axis ZB1', ZB2' so that the connector axis ZB1- ZB1', ZB2- ZB2' is also an axis of circular symmetry of the connector. In this example, the portions 1222 and 1442 are semi-spherical portion having a height which is equal to the diameter of a defining sphere of the spherical annular connector and the portions 1221 and 1441 are partial-spherical portions having an axial depth of
substantially less than the diameter of the defining sphere. The connector height of the connector is equal to the sum of the portions 1222 and 1442 without loss of generality.

[043] The example spherical annular male connector 122 and the corresponding example spherical annular male female connector 142 are a matched pair of spherical annular snap-fit connectors having compatible mechanical mating feature dimensions and opposite or complementary mechanical mating properties (also known as mechanical mating genders). When an annular snap fit connector and a matched annular snap-fit connector having compatible mechanical mating feature dimensions and opposite or complementary mechanical mating properties to the annular snap fit connector but formed on separate building blocks are moved towards each other with their connector axes aligned, the pair of matched annular snap fit connectors will enter into closely fitted detachable mechanical inter-connection, also known as snap-fit engagement.

[044] As the connector 122,142 is for facilitating detachable mechanical inter-connection between building blocks, the connector 122, 142 is also referred to as an inter-block connector. The distance between adjacent connectors 122 in a row or in a column may be defined with reference to the separation between connector axes of the adjacent connector as a convenient measure.

[045] An example plurality of eight partial connectors 162 is formed on the peripheral walls 160. The example plurality of partial connectors 162 on the peripheral walls 160 comprises an example plurality of four partial connectors 162 on the top edge of the peripheral walls 160 and an example plurality of four partial connectors 162 on the bottom edge of the peripheral walls 160. Each example partial connector 162 is disposed midway between adjacent connectors 122, 142 on the same coupling surface 120, 140.

[046] A partial connector herein is a split portion of an inter-block connector which comprises a characteristic split surface and at least one characteristic connection axis. When matched split portions of an inter-block connector of the female type are mechanically joined or connected together with their split surfaces opposite facing each other or with their split surfaces in juxtaposition, for example abutting juxtaposition, an assembled inter-block connector is formed. The split portion is a divided portion of an inter-block connector and the characteristic split surface is a characteristic dividing surface of the partial connector. An assembled inter-block connector herein is a mechanical connector which is for facilitating detachable or releasable mechanical interlocking of complementary and compatible building blocks. An assembled inter-block connector herein has same functional features as those of the inter-block connectors 122, 142, except that the assembled inter-block connector is constructed by releasable connection of
discrete partial connectors. An assembled inter-block connector herein may have mating feature dimensions which are compatible or non-compatible to those of the integral inter-block connectors 122, 142 without loss of generality. An assembled inter-block connector herein is also referred to as a complete inter-block connector, a full inter-block connector, or a discrete inter-block connector. An assembled inter-block connector has a characteristic connector axis which defines a characteristic coupling direction, along which the assembled inter-block connector has to move relative to a counterpart building block in order to enter into coupled engagement therewith. A partial connector may have more than one characteristic connector axis or characteristic coupling direction. For example, a partial spherical annular connector as shown in Figures 1A and 1A1 has a first characteristic connector axis Y1-Y1', X1-X1' defining a first characteristic coupling direction along the first characteristic connector axis and a second characteristic connector axis defining a second characteristic coupling direction, wherein the second characteristic connector axis and the second characteristic coupling direction are orthogonal to the first characteristic connector axis Y1-Y1', X1-X1' and the second characteristic connector axis intersects the first characteristic connector axis. The example connectors 142, 144 are example of integral inter-block connectors.

[047] In the example of Figure 1A, each example partial connector 162 is a portion of a spherical annular connector of the female type. When complementary portions of a spherical annular connector of the female type are mechanically connected together with their split surfaces opposite facing each other or with their split surfaces in juxtaposition, a complete spherical annular connector of the female type is formed.

[048] The example partial connector 1621 extends between the peripheral wall 162 and the first panel 124 and forms as a cut-out portion on a corner formed by the peripheral wall 162 and the first panel 124. The example partial connector 1622 extends between the peripheral wall 162 and the second panel 144 and forms as a cut-out portion on a corner formed by the peripheral wall 162 and the second panel 144. In other words, the first panel 124 and the peripheral wall 162 cooperate to define an internal peripheral wall of a connector receptacle of the partial female connector 1621, and the second panel 144 and the peripheral wall 162 cooperate to define an internal peripheral wall of a connector receptacle of the partial female connector 1622.

[049] The example partial connector 1621, 1622 is a half spherical annular connector (or semi-spherical annular connector) of the female type. The half spherical annular connector of the female type comprises a partial connector receptacle which is a split portion of a spherical annular connector with a split surface extending along the coupling direction and containing the connector axis of the spherical annular connector. The partial connector receptacle is shaped and sized to
receive a portion of a spherical annular male connector and has a receptacle volume of about a
quart of a sphere. The connector receptacle of the partial connector 1621, 1622 is adapted for
closely fitted reception of an inter-block connector when mechanically connected in abutment with
another partial connector.

[050] Referring to Figure 1B, an example building block 100A is stacked on an example building
block 100B to form an example building block assembly 10. Each one of the building blocks 100A
and 100B is identical to the example building block 100 but is given a different numeral for ease
of reference. The description in relation to the example building block 100 is incorporated herein
and is to apply mutatis mutandis to the building blocks 100A and 100B, with corresponding
numerals appended with the alphabets “A” and “B” to correspond respectively to the building
blocks 100A and 100B.

[051] An assembled inter-block connector 164 is formed when the two matched partial connectors
1621 B, 1622A are brought together so that their split surfaces are opposite facing and in close
proximity, preferably in abutment contact, following mechanical interconnection of the component
building blocks 100A and 100B. When the two matched partial connectors 1621 B, 1622A are so
brought together, they are mechanically connected in this manner and the second coupling
surface of the first building block 100A and the first coupling surface of the first building block
100B are in abutment contact.

[052] The assembled inter-block connector formed by mechanical inter-connection of the two
adjacent partial connectors 1621B, 1622A is a discrete inter-block connector having a connector
axis defining a third coupling direction, the third direction being orthogonal to the peripheral wall
on which the partial connector 1621 B, 1622A is formed. In this example building block assembly,
the third coupling direction is orthogonal to the first coupling direction Z.

[053] The split surface of the partial connector 1622A on the example building block 100A is on
the second coupling surface 140A of the example building block 100A and is flush with the second
coupling surface 140A. The split surface of the partial connector 1621 B on the example building
block 100B is on the first coupling surface 120B of the example building block 100B and is flush
with the first coupling surface 120B. The split surface of the partial connector 1622A is in abutment
contact with the split surface of the partial connector 1621 B.

[054] In some embodiments, the building blocks 100A and 100B are mechanically interconnected
such that the building blocks 100A and 100B are placed side-by-side and the outward facing
surfaces of adjacent peripheral walls 160A, 160B are opposite facing, in abutment contact and in
juxtaposition, the split surfaces of the partial connectors are respectively on the abutting adjacent peripheral walls 160A, 160B. When the building blocks 100A and 100B are mechanically interconnected in the side-by-side manner, the connector axis of the resulting assembled inter-block connector is parallel to the first coupling direction.

[055] In general, the split surface of a partial connector extends in a direction along the connector axis and the coupling direction. In some embodiments such as the present, the partial connector has a second characteristic connector axis and also extend in a direction orthogonal to the coupling direction.

[056] In general, the split surface is parallel to the characteristic connector axis of the assembled inter-block connector and can be considered as a surface formed when an inter-block connector is split by a splitting plane extending in a direction parallel to the connector axis. In some embodiments, the splitting plane contains the connector axis, for example, when the split connector is a half or bisected inter-block connector.

[057] An example building block 100' comprises a first coupling surface 120', a plurality of connectors 122' formed on the first coupling surface 120', a second coupling surface 140', a plurality of connectors 142' formed on the second coupling surface 140', a plurality of peripheral walls 160' interconnecting the first coupling surface 120' and the second coupling surface 140', and a plurality of partial connectors 162' formed on the peripheral walls 160', as depicted in Figures 1A' and 1A1'. The building block 100' has the same features of the building block 100 except that a plurality of male-type partial connectors 162' is formed on the peripheral wall 160'. In addition, the plurality of male-type partial connectors 162' comprises at least one partial connector having a split surface which is flush with the peripheral wall 162', at least one partial connector having a split surface which is flush with the first coupling surface 120', and at least one partial connector having a split surface which is flush with the first coupling surface 140'. As the other features of the building block 100' have the same description as corresponding features of the building block 100, the specific and general description in relation to the building block 100 is incorporated herein by reference, with corresponding numerals appended with an apostrophe sign.

[058] An example building block 100C comprises a first coupling surface 120C, a plurality of integrally formed connectors 122C on the first coupling surface 120C, a second coupling surface 140C, a plurality of integrally formed connectors 142C on the second coupling surface 140C, a plurality of peripheral walls 160C interconnecting the first coupling surface 120C and the second coupling surface 140C, and a plurality of partial connectors 162C formed on the peripheral walls
160C, as depicted in Figure 1C. The building block 100C has the same features of the building block 100 plus a plurality of female type inter-block connectors on the peripheral wall 160C. As the other features of the building block 100C have the same features and the same description as corresponding features of the building block 100, the specific and general description in relation to the building block 100 is incorporated herein by reference, with corresponding numerals appended with the alphabetical sign "C".

[059] An example building block 100D comprises a first coupling surface 120D, a plurality of integrally formed connectors 122D formed on the first coupling surface 120D, a second coupling surface 140D, a plurality of integrally formed connectors 142D formed on the second coupling surface 140D, a plurality of peripheral walls 160D interconnecting the first coupling surface 120D and the second coupling surface 140D, and a plurality of partial connectors 162D formed on the peripheral walls 160D, as depicted in Figure 1D. The building block 100D has the same features of the building block 100 plus a plurality of female type inter-block connectors on the peripheral wall 160D. As the other features of the building block 100D are the same and have the same description as corresponding features of the building block 100, the specific and general description in relation to the building block 100 is incorporated herein by reference, with numerals appended with the alphabetical sign "D".

[060] When a building block 100C and a building block 100D are interconnected in a side-by-side manner as depicted in Figures 1D1 and 1D2 such that there peripheral surfaces are opposition facing and in abutting juxtaposition, an assembled inter-block connector 164CD thus formed has a connector axis which is orthogonal to the first coupling surface or the first coupling direction.

[061] An inter-block connector which is formed by detachable mechanical joining of discrete partial connectors 162, 162', 162C, 162D of Figures 1A, 1A', 1C and 1D has a smaller effective functional size than the effective functional size of an example integral connector 122, 142 on a coupling surface and is therefore not compatible in size therewith.

[062] In some embodiments, a partial connector formed on the peripheral wall has an effective functional size which is compatible with the effective functional size of an integral connector on the coupling surfaces, as depicted in Figure 1E.

[063] An example building block 100E depicted in Figures 1E, 1E1 and 1E2 comprises a first coupling surface 120E, a plurality of connectors 122E formed on the first coupling surface 120E, a second coupling surface 140E, a plurality of connectors 142E formed on the second coupling surface 140E, a plurality of peripheral walls 160E interconnecting the first coupling surface 120E
and the second coupling surface 140E, and a plurality of partial connectors 162E formed on the peripheral walls 160E.

[064] The building block 100E has the same features of the building block 100, except that each of the partial connectors 160E is compatible in size with an integrally formed connector 122E, 142E on a coupling surface and the integral connectors 142E, 144E are distributed on the corners of a rectangle. As the other features of the building block 100E are the same and have the same description as corresponding features of the building block 100, the specific and general description in relation to the building block 100 is incorporated herein by reference, with corresponding numerals appended with the alphabetical sign Ε-. In some variations, the integral connectors 142E, 144E are distributed on the corners of a square without loss of generality.

[065] In some embodiments, the building block comprises one row or more than one row of connectors on a coupling surface, and one column or more than one column of connectors on the coupling surface. For most toy applications, a building block may have up to 20 rows and 20 columns of connectors on a coupling surface, although the more basic building blocks usually have between one to ten rows and between one to ten columns of connectors on a coupling surface. The outermost rows and the outermost columns on a coupling surface may cooperate to define a triangular boundary, a square boundary, a rectangular boundary, or other polygonal-shaped boundary, whether regular or non-regular, or a rounded boundary such as an oval-shaped boundary or a circular boundary without loss of generality.

[066] In some embodiments, the first panel may have a triangular boundary, a square boundary, a rectangular boundary, or other polygonal-shaped boundary, whether regular or non-regular; or a rounded boundary such as an oval shaped boundary or a circular boundary without loss of generality. As the peripheral wall is to follow the outer boundary of the first panel, the peripheral walls will follow the shape of the first panel. When the panel has an oval or circular shape, the building block may have a single peripheral wall without loss of generality.

[067] In some embodiments, the connectors are arranged such that adjacent connectors in a row and adjacent connectors in a column on the same coupling surface are on corners of a rectangle. An example building block 200 comprises a first coupling surface 220, a plurality of connectors 222 formed on the first coupling surface 220, a plurality of connectors 242 defining a second coupling surface 240, a plurality of peripheral walls 260 extending between the first coupling surface 220 and the second coupling surface 240, and a plurality of partial connectors 262 formed on the peripheral walls 260, as depicted in Figures 2A and 2A1 to 2A5.
[069] The connectors 222 on the first coupling surface 220 are integrally formed on a first panel 224, and the connectors 242 are also integrally formed on the first panel 224.

[070] The plurality of peripheral walls 260 cooperates with the first panel 224 to define a main body 270 and a hollow internal compartment 280 of the building block. Similar to the building block 100, the main body 270 is formed of a hard and impact-resistant thermoplastic material with a small degree of resilience, such as acrylonitrile butadiene styrene ("ABS") or metal. The first panel 224, the connectors 222, the connectors 242, the peripheral walls 260, and the partial connectors 262 on the peripheral walls 260 are integrally formed as a single piece, for example by injection molding or 3-D printing.

[071] The example connector 2221, 2222, 2223, 2224 on the first coupling surface 220 is a male-type inter-block connector. The example connector 2221, 2222 has a connector axis WA1-WA1', WA2-WA2'. The connector axis WA1-WA1', WA2-WA2' defines a coupling axis and a coupling direction W. The coupling axes of the example plurality of connectors 2221, 2222 on the first coupling surface are parallel and offset from each other and the coupling directions of all the example plurality of connectors 2221, 2222, 2223, 2224 on the first coupling surface are the same. As the plurality of connectors 2221, 2222, 2223, 2224 has a common coupling direction, the first coupling surface 220 has a characteristic first coupling direction W which is defined by the plurality of connectors 222 on the first coupling surface and which is parallel to the connector axis WA1-WA1', WA2-WA2'.

[072] Each one of the example connectors 2421, 2422, 2423, 2424 on the first coupling surface 240 is a female-type inter-block connector. The example connector 2421, 2422 has a connector axis WB1-WB1', WB2-WB2'. The connector axis WB1-WB1', WB2-WB2' defines a coupling axis and a coupling direction. The coupling axes of the example plurality of connectors 2421, 2422, 2423, 2424 on the second coupling surface are parallel and offset from each other and the coupling directions of all the example plurality of connectors 2421, 2422, 2423, 2424 are the same. As the plurality of connectors 242 has a common coupling direction, the second coupling surface 240 has a characteristic second coupling direction which is defined by the plurality of connectors 242 on the second coupling surface and which is parallel to the connector axis WB1-WB1', WB2-WB2'. In this example, the second coupling direction is parallel and opposite to the first coupling direction W.

[073] Each of the connectors 222, 242 is an annular snap connector. The connector 222 on the first coupling surface is a male-type annular snap connector and the connector 242 on the second coupling surface is a female type annular snap-connector which is complementary and compatible
to the male-type annular snap-connector 222. More specifically, each one of the connector 222, 242 is a cylindrical annular snap connector. The connector 222 on the first coupling surface is a male-type cylindrical annular snap connector in the shape of a cylindrical slab or a circular coin and having a rippled-shaped side to facilitate snap-fit engagement. The connector 242 on the second coupling surface is a female-type cylindrical annular snap connector having a receptacle body defining a connector receptacle compartment to facilitate snap-fit engagement with a complementary and compatible connector, such as an inter-block connector having the mating feature dimension of the connector 222 on the first coupling surface. To facilitate snap-fit coupled engagement, the connector receptacle compartment has a substantially cylindrical shaped connector receptacle having an internal profile following the outline of the shape of a cylindrical slab or a circular coin having a rippled-shaped side.

[074] Each connector 222 is an integral inter-block connector which is adapted for facilitating detachable or releasable mechanical interlocking of the example building block 200 with a counterpart building block having a complementary counterpart coupling surface.

[075] Each connector 242 is an integral inter-block connector which is adapted for facilitating detachable or releasable mechanical interlocking of the example building block 200 with a counterpart building block having a complementary counterpart coupling surface.

[076] Apart from the differences that the integral inter-block connector 222, 224 is a cylindrical annular snap connector while the connector 122, 124 is a spherical annular snap connector and that the connector 124 is integrally formed on the first panel member, the main body and other aspects of the integral connectors are substantially identical and the description in relation thereto is incorporated herein by reference for succinctness and to apply mutatis mutandis where possible and appropriate or where the context permits, with corresponding numerals increased by 100.

[077] In this example, each example connector 222 on the first coupling surface is a male type inter-block connector which projects orthogonally away from the first coupling surface 220 and away from the second coupling surface 240. More specifically, each example connector 222 comprises a cylindrical protruding body which protrudes from the first coupling surface 220 to form a male-type inter-block connector, and more specifically, a male-type cylindrical annular snap connector.

[078] In this example, each example connector 242 is a female type inter-block connector which projects orthogonally away from the first coupling surface 220 and extends towards the second coupling surface 240. More specifically, each example connector 242 comprises a hollow
protruding body which protrudes from the first coupling surface 220 and extends towards the second coupling to form a female-type inter-block connector. The hollow protruding body defines a connector receptacle for closely fitted reception of a complementary and compatible male-type inter-block connector.

[079] The example plurality of connectors 222 comprises an example plurality of four connectors, and the four connectors are arranged into an array form having two rows and two columns, with a column and a row being orthogonal to each other. The separation distance between adjacent connectors 222 in a row and the separation distance between adjacent connectors 222 in a column are the same. More specifically, the connector axes of the plurality of four connectors are disposed at corners of a square.

[080] The example first panel 224 has a square shape defining a square boundary. The peripheral walls 260 extend along the outer boundaries of the first panel 224 and projects orthogonally towards the second coupling surface 240 to define the depth or thickness of the main body 270 of the building block 200. The peripheral walls 260 extends in a direction which is orthogonal to the first coupling surface 220 to define an internal compartment 280 having the shape of a rectangular cuboid. In some embodiments such as the present, the peripheral walls 260 have a uniform depth or thickness. In some embodiment, the peripheral walls 160 may have non-uniform depth or thickness. The example building block 200 comprises an example plurality of four peripheral walls 260 since the example first panel 224 is a four-sided polygon.

[081] An example plurality of eight partial connectors 262 is formed on the peripheral walls 260. The example plurality of partial connectors 262 on the peripheral walls 260 comprises an example plurality of four male partial connectors 262a and an example plurality of four female partial connectors 162b. Each partial connector 262 is an axially split cylindrical annular snap connector having a split surface extending along the cylindrical axis of a cylinder defining the cylindrical shape of the cylindrical annular snap connector.

[082] Each example partial connector 262a, 262b is a partial cylindrical annular snap connector having its split surface on or containing the cylindrical center axis, and with the split surface flush with, opposite facing and/or in close proximity to the second coupling surface 240.

[083] An assembled inter-block connector formed by mechanical joining of a pair of matched counterpart partial connectors has a connector axis which is also the cylindrical axis of the assembled cylindrical annular snap connector.
[084] In this example, the connector axis of a partial connector 262a, 262b or the connector axis of an assembled cylindrical annular snap connector formed from the partial connector defining the coupling direction of the assembled inter-block connector and a line Y1, Y2 joining the center axes of a plurality of integral connectors on the first coupling surface and/or on the second coupling surface intersecting the connector axis of a partial connector 262a, 262b cooperate to define an orthogonal plane which is orthogonal to the first coupling surface, as depicted in Figures 2A2, 2A3 and 2A4. The orthogonal plane is a bisecting plane of the partial connector, the assembled connector and the integral connectors along the line. With such a disposition, the partial connectors are part of a 3-dimensional array containing the integral connectors. In other words, the partial connectors are aligned with the array formed by the integral connectors.

[085] Apart from the afore-mentioned differences that the partial connector 262 is a partial cylindrical annular snap connector while the partial connector 162 is a partial spherical annular snap connector, the specific array relationship and that the split surfaces of the partial connectors are in flush with or proximal the second coupling surface, other aspects of the partial connectors are substantially identical and the description in relation thereto is incorporated herein by reference for succinctness and to apply mutatis mutandis where possible and appropriate or where the context permits, with corresponding numerals increased by 100.


[087] Each example partial connector 262aB, 262bB is a partial cylindrical annular snap connector having its split surface on or containing the cylindrical center axis, and with the split surface flush with, opposite facing and/or in close proximity to the first coupling surface 220B.

[088] Apart from the afore-mentioned differences that the split surface flush with, opposite facing and/or in close proximity to the first coupling surface 220B, other aspects of the partial connectors are substantially identical to those of the building block 200 and the description in relation thereto is incorporated herein by reference for succinctness and to apply mutatis mutandis where possible and appropriate or where the context permits, with corresponding numerals appended with an alphabetical sign B where appropriate or necessary.
An example building block 200C comprises a first coupling surface 220C, a plurality of connectors 222C formed on the first coupling surface 220C, a plurality of connectors 242C defining a second coupling surface 240C, a plurality of peripheral walls 260C extending between the first coupling surface 220C and the second coupling surface 240C, and a plurality of partial connectors 262C formed on the peripheral walls 260C, as depicted in Figures 2C and 2C1 to 2C6.

In the example building block 200C, an example plurality of two integral connectors is formed on each of the first coupling surface and the second coupling surface and that the panel has a rectangular shape.

Apart from the afore-mentioned differences, other aspects of the partial connectors are substantially identical to those of the building block 200 and the description in relation thereto is incorporated herein by reference for succinctness and to apply mutatis mutandis where possible and appropriate or where the context permits.

An example building block 200D comprises a first coupling surface 220D, a plurality of connectors 222D formed on the first coupling surface 220D, a plurality of connectors 242D defining a second coupling surface 240D, a plurality of peripheral walls 260D extending between the first coupling surface 220D and the second coupling surface 240D, and a plurality of partial connectors 262D formed on the peripheral walls 260D, as depicted in Figures 2D1 and 2Ds.

In the example building block 200D, an example plurality of two integral connectors is formed on each of the first coupling surface and the second coupling surface and that the panel has a rectangular shape.

Apart from the afore-mentioned differences, other aspects of the partial connectors are substantially identical to those of the building block 200B and the description in relation thereto is incorporated herein by reference for succinctness and to apply mutatis mutandis where possible and appropriate or where the context permits.

Examples of building block assemblies constructed according to the present disclosure are depicted in Figure 3A, 3B, 3C, 4A, 4B.

While the disclosure has been described with reference to examples and embodiments, the examples and examples and embodiments are not intended to restrict and should not be used to limit or restrict the scope of disclosure.
For example, while annular snap connector and spherical annular snap connector have been used in the example building blocks, the inter-block connectors can be snap-fit or non-snap-fit fasteners or without loss of generality.

Table of numerals

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**Claims**

1. A building block comprising a first coupling surface on a first side of a main body, a second coupling surface on a second side of the main body, one peripheral wall or a plurality of peripheral wall extending between the first coupling surface and the second coupling surface and defining a lateral boundary of the main body; wherein one inter-block connector or a plurality of inter-block connectors defining a first coupling direction and the first coupling surface is formed on the first side of the main body, one inter-block connector or a plurality of inter-block connectors defining a second coupling direction and the second coupling surface is formed on the second side of the main body, and one partial connector or a plurality of partial connectors is formed on a peripheral wall; wherein the partial connector is an axially split portion of a discrete inter-block connector and comprises an axially extending split surface, the discrete inter-block connector having a connector axis defining a coupling direction and the split surface extending along a splitting direction which is parallel to the connector axis of the discrete inter-block connector; and wherein the inter-block connector on the first coupling surface and the inter-block connector on the second coupling surfaces are compatible inter-block connectors having mating features of compatible mating feature dimensions.

2. The building block according to Claim 1, wherein the partial connector and/or a discrete inter-block connector formed thereby has mating features which are compatible in mating feature dimensions with the inter-block connectors on the first coupling surface and/or the second coupling surface.

3. The building block according to Claims 1 or 2, wherein the partial connector and/or a discrete inter-block connector formed thereby is adapted for entering into inter-block connection along the splitting direction, the splitting direction defining a third coupling direction which is parallel or orthogonal to the first coupling direction.

4. The building block according to any preceding Claim, wherein the split surface of a partial connector on a peripheral surface is flush with or proximal to the first coupling surface or the second coupling surface.

5. The building block according to any preceding Claim, wherein the split connector is an axially bisected half of the discrete inter-block connector, and the connector axis of the discrete inter-block connector is on or proximal the first coupling surface or the second coupling surface.
6. The building block according to any preceding Claim, wherein the partial connector is a split portion of a male-type inter-block connector, and the partial connector projects away from the peripheral wall on which it is formed; and wherein the split surface projects tangentially away from the first coupling surface or the second coupling surface.

7. The building block according to any preceding Claim, wherein the discrete inter-block connector is an annular snap connector which is adapted for making snap-fit interconnection with a matched counterpart snap connector having a complementary mating feature gender and compatible mating feature dimensions.

8. The building block according to Claim 7, wherein the partial connector is a semi-annular snap connector, and the split surface passes through center of the annular snap connector.

9. The building block according to any preceding Claim, wherein an inter-block connector on the first coupling surface has a first connector axis extending along the first coupling direction, and an inter-block connector on the second coupling surface has a second connector axis extending along the second coupling direction; wherein an inter-block connector on the first coupling surface has a corresponding inter-block connector on the second coupling surface; and wherein the first connector axis and the second connector axis are aligned or where the inter-block connector on the first coupling surface and the inter-block connector on the second coupling surface are co-axially or connector axes aligned.

10. The building block according to any preceding Claim, wherein the inter-block connector on the first coupling surface is an integrally formed male-type connector having a connector height, and wherein the partial connector on the peripheral wall is a female-type partial connector having a connector receptacle defining a receptacle depth which is equal to or slightly larger than the connector height of the male-type connector on the first coupling surface; and/or wherein the inter-block connector on the first coupling surface is an integrally formed male-type connector having a connector height, and wherein the partial connector on the peripheral wall is a male-type partial connector having a connector height which is approximately equal to the connector height of the male-type connector on the first coupling surface.

11. The building block according to any preceding Claim, wherein the connector axis of the partial connector and/or the connector axis of a discrete inter-block connector formed by the partial connector intersects with the first connector axis or the second connector axis.
12. The building block according to any preceding Claim, wherein first coupling surface and the
second coupling surface are opposite facing and parallel.

13. The building block according to any preceding Claim, wherein the first coupling surface is
an outward facing surface of a first panel member and the first panel member and the
peripheral wall cooperate to define a hollow internal compartment.

14. The building block according to Claim 13, wherein the inter-block connector defining the
second coupling surface is a female connector which is integrally formed on the first panel
member and extends orthogonally away from the first panel member to define the second
coupling surface.

15. The building block according to any preceding Claim, wherein the partial connector is a
female-type partial connector comprising a partial receptacle body defining a partial
connector receptacle, and wherein the partial receptacle body and the partial connector
receptacle cuts through and spans between the first coupling surface and the peripheral
wall or between the second coupling surface and the peripheral wall.

16. The building block according to any preceding Claim, wherein the partial connector is a
female-type partial spherical annular connector having a first characteristics connector axis
and a second characteristics connector axis orthogonal to the first characteristics connector
axis.

17. The building block according to Claim 16, wherein the partial connector is to form an
assembled inter-block connector with a matched and compatible partial connector on a
counterpart building block when the building block and the counterpart building block are
interconnected with their peripheral walls opposite facing and/or in abutting juxtaposition
and with the connector axes of the partial connectors aligned.

18. The building block according to Claim 16, wherein the partial connector is to form an
assembled inter-block connector with a first matched and compatible partial connector on a
first counterpart building block when the building block and the first counterpart building
block are interconnected with their peripheral walls opposite facing and/or in abutting
juxtaposition and with the first characteristics connector axis of the partial connector aligned
with a connector axis of the first matched and compatible partial connector and with a
second matched and compatible partial connector on a second counterpart building block
when the building block and the first counterpart building block are interconnected with their
first and/or second coupling surfaces opposite facing and/or in abutting juxtaposition and
with the second characteristics connector axis of the partial connector aligned with a connector axis of the second matched and compatible partial connector.

19. The building block according to any one of the preceding Claims 1-15, wherein the inter-block connector on the first coupling surface is an integrally formed male-type cylindrical annular connector, the inter-block connector defining the second coupling surface is an integrally formed female-type cylindrical annular connector, and the partial connector is a split portion of an assembled cylindrical annular connector having a characteristic connection axis defining a characteristic coupling direction; wherein the partial connector has a split surface extending along the characteristic coupling direction; and wherein the split surface is flush with or in proximity with either the first coupling surface or the second coupling surface and has same facing direction with the coupling surface with which the split surface is flush with or in proximity with.

20. The building block according to Claim 19, wherein the partial connector is an aligned part of a 3-dimensional array comprising the inter-block connectors on the first coupling surface and/or the inter-block connectors on the second coupling surface.
INTERNATIONAL SEARCH REPORT

PCT/IB2017/054369

A. CLASSIFICATION OF SUBJECT MATTER

A63H 33/08(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63H33/08 A63H33/06 A63H33/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS,CNTXT,CNKI,DWPI,SIPOABS ; * *,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*,*...
## INTERNATIONAL SEARCH REPORT

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