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Description

This invention relates to a building block for building models, especially to building block toys, according to the introductory category of Claim 1.

Building blocks of this type are known, for example, from Swiss Patent No. 362 354, wherein a wall is equipped, on its one side, with at least one row of coupling studs and, on its other side, with counter-coupling organs for connection with the coupling studs of an adjacent building block. It is furthermore known from Swiss Patent No. 455 606 that at least some of the coupling studs have electrically conducting surfaces or that, on the side of the wall equipped with the counter-coupling organs, electrically conducting contact elements are disposed, which are intended for making an electrical contact with the conducting surfaces of the adjacent, coupled building block when two building blocks are mechanically coupled together.

These known building blocks for the construction of electrical circuits are complicated and expensive to manufacture, cannot be used universally with other building blocks of the same building block system, and demand of the user at least an elementary knowledge of electrical technology in regard to current flows.

From published German Patent Application DE-A-25 52 587, a clamping building block with electrical connecting facility is known, in which, by means of the contact areas of the raised and depressed zones of the block, an

/electrical

(39)

electrical connection can be made through contact sites provided at these areas by pushing the blocks together, special attention being given to avoiding an electrical short-circuit as the blocks are brought together. How these contact surfaces are to be applied onto the blocks for this purpose is, however, not explained in that patent application.

It is an object of the present invention to provide a building block of the initially named type, the electrical contacting means of which shall be adaptable to the coupling studs and counter-coupling organs of any building block system, which furthermore can be combined with building blocks of the same building block system possessing no contact zones, and the contact-making ability of which with a similar building block shall be clearly definable in position.

According to this invention, the building block possesses the features listed in the characterization portion of claim 1.

As a result of the fact that the surfaces of the coupling studs possess electrically insulating and electrically conducting regions, it is possible, when the building block is coupled to another building block possessing contact elements parallel to the row of its coupling studs, for an electrical connection to be established, or not to be established, between the conducting coupling studs of the one building block and the contact element of the other building block or the conducting regions of its coupling studs that are connected with the contact element, in certain relative positions of the two building blocks.

/Preferably,

Preferably, the electrically conducting regions of the coupling studs are situated at least on lateral surfaces of the coupling studs that are perpendicular to a common plane of the coupling studs, the contact element possessing a conducting surface extending in the direction of the row of coupling studs and perpendicular to the aforementioned common plane. As a result, when two building blocks are coupled together, a reliable electrical contact can be obtained between the conducting regions of the coupling studs of the one building block and the contact element of the other building block.

It is especially advantageous if the electrically conducting regions extend on the coupling studs through an angular range exceeding 90^{o} and less than 270^{o} about the longitudinal axes of the coupling studs, and for the coupling studs of the same row to be of the same construction and arrangement. In this manner, when two building blocks are coupled together, a contact-making facility clearly defined in respect of position is obtained between the two building blocks, that is to say in one specific relative position contact-making takes place, while in a position rotated by 90^{o} therefrom, no contact is made.

If, in such a form of embodiment, the building blocks possess two rows of coupling studs lying in pairs adjacent to each other, the conducting surfaces of these studs in the one row being in an angular zone which is at 180^{o} to that of the other row, and if the side of the building block equipped with the counter-coupling elements has one contact strip for each of the two rows of coupling studs, the contact strips being electrically

/conductingly

conductingly connected with the conducting surfaces of the associated rows of coupling studs, then regardless of the manner in which the two building blocks are coupled together, the same association of electrical connections, that is to say having the correct polarity, will always be obtained.

Preferably, each contacting element is constructed as an electrically conducting contact bar, which extends along the associated row of coupling studs on their opposite side and is connected with the electrically conducting regions of the coupling studs of this row. In the case of a building block consisting of a hollow object having side walls parallel to each other in pairs and a wall perpendicular thereto and equipped with coupling studs, a conducting contact bar can be arranged either along two parallel side walls of the hollow object or on both sides of and along a centre-line equidistant from two parallel side walls of the hollow object. By means of these two variants, it is possible to provide contact bars in building blocks of virtually any kind.

Examples of embodiment of the subject of this invention are now explained with reference to the drawings. The figures in the drawings show:

Fig. 1 a plan on the upper face of a building block having two rows each comprising six coupling studs, the lateral surfaces of which are partly electrically conducting,

Fig. 2 a view on the lower face of the building block of Fig. 1 possessing contact strips,

/Fig. 3

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Fig. 3 a section along the line III-III in Fig. 1,

Fig. 4 a plan on a contacting device of the building block of Figures 1 to 3,

Fig. 5 a plan on the upper face of a building block having one row of six coupling studs, the lateral surfaces of which are partly electrically conducting,

Fig. 6 a view on the lower face of the building block of Fig. 5 with one contact strip,

Fig. 7 a plan on a contacting device of the building block of figures 5 and 6,

Fig. 8 an illustration of two building blocks according to figures 1 to 3, coupled together,

Fig. 9 an illustration of two building blocks according to figures 5 and 6, coupled together,

Fig. 10 a plan on the upper face of a further form of embodiment of a building block possessing two rows each of six coupling studs,

Fig. 11 a view on the lower face of the building block of Fig. 10,

Fig. 12 a perspective view on the upper face of a part of a building block according to Fig. 1, in which the conducting regions of the coupling studs are of resilient construction,

Fig. 13 a perspective view on the lower face of a building block similar to Fig. 2, in which the contact strips are of resilient construction,

Fig. 14 a plan on a further building block possessing conducting regions of the lateral surfaces of its coupling studs,

/Fig. 15

Fig. 15 a view on the lower face of the building block of Fig. 14,

Fig. 16 a longitudinal section through the building block of Fig. 14 and 15 along the lines XVI-XVI,

Fig. 17 a perspective view of a single-piece contacting device for the building block of figures 14 to 16,

Figs. 18 to 29, schematic illustrations of building blocks having two rows of coupling studs, figures 18a to 29a showing the straight-line coupling of a building block to a like building block and figures 18b to 29b showing the coupling of the building block to a like building block at a right angle,

Fig. 30 a perspective view on the upper face of a building block according to Fig. 1, wherein the coupling studs, however, are constructed also as contact sleeves or sockets,

Fig. 31 and Fig. 32 perspective views on the upper face of plate-type building blocks, possessing a plurality of rows of coupling studs,

Fig. 33 a perspective view of a box-shaped building block having four coupling studs, for receiving electronic and/or electrical components,

Fig. 34 a perspective view of a cubic building block having coupling studs disposed on two mutually adjacent faces,

Fig. 35 a perspective view of a building block of fairly great height, equipped with two coupling studs, and possessing additional plug bores or sockets,

/Fig. 36

Fig. 36 a perspective view of a box-shaped building block, intended for receiving electronic and/or electrical components, having a counter-coupling tube and contact strips,

Fig. 37 a perspective view of a building block similarly to Fig. 32, but with interrupted contact strips, and

Fig. 38 a perspective view of a cubic building block, which possesses on one surface coupling studs and on another, adjacent surface a counter-coupling tube and contact strips.

The toy building block illustrated in figures 1 to 3 has, in a manner known for example from Swiss Patent Specification 362 354, a box-shaped hollow object 1, made of an electrically insulating plastics material, having end walls 2, side walls 3 and a base wall 4, perpendicular to the end and side walls. On the outer face of the base wall 4, the building block possesses cylindrical coupling studs 5. In the interior of the hollow object 1, counter-coupling elements having a clamping action are formed, which consist of cylindrical tubes 6, projecting from the base wall 4 of the hollow object 1.

In the example of embodiment illustrated, the building block possesses two rows each of six coupling studs 5 situated in pairs adjacent to each other, and also five counter-coupling tubes 6. When two building blocks according to figures 1 to 3 or corresponding blocks of different lengths are coupled together, the coupling studs 5 of the one building block,

/within the

within the overlapping parts of the two building blocks, are firmly clamped each between two counter-coupling tubes 6 and one side wall 3 or between one counter-coupling tube 6, one side wall 3 and one end wall 2. Nothing further needs to be said in detail about this firm but releasable, mechanical type of connection, since it is sufficiently well known.

In the example of embodiment illustrated in Figures 1 to 3 of the building block, the lateral surfaces or cylindrical faces of the coupling studs 5 possess an electrically conducting surface in the form of a metallic coating 7. In figures 1 and 3, these conducting coatings are illustrated with thick, full lines, but in Fig. 2 with thick, broken lines, since they are not visible.

The conducting coatings 7 do not extend on the coupling studs 5 over their entire circumference, but only through an angular region of about 180°. This angular region can, however, be smaller or larger, namely down to about 90° and up to about 270°. It can also be seen from Fig. 1 that an imaginary separating plane between the part equipped with the conducting coating 7 and the remaining, insulating part 8 of each coupling stud 5 is at an angle of approximately 45° relative to the lateral walls 3. Due to this extent and orientation of the conducting coating 7 of each coupling stud 5, the result is obtained that, of the four planes parallel to the end walls 2 and the side walls 3 and perpendicular to one another which can be placed against each of the coupling studs, two planes will always bear against the conducting coating 7 and two against the insulating

/surface portion

surface portion 8 of the coupling stud 5. The angular regions of the conducting coatings 7 are all at the same orientation. The angular regions in the one row of coupling studs are, however, at 180° to those in the other row.

Furthermore, the conducting coatings 7 together with the insulating surface portions 8 constitute one smooth cylindrical face, so that the present coupling studs 5 are exactly the same, in respect of form and dimensions, as the standard, completely insulating coupling studs of similar building blocks.

From figures 1 to 3 it is also possible to see that an electrically conducting, metallic, band-shaped strip 9 is disposed along each of the two lateral walls 3 in the internal space of the hollow block, these strips being hereinafter termed contact strips. In figures 2 and 3, these contact strips 9 are shown with thick, full lines, while in Fig. 1 they are shown with thick, broken lines, since they are not visible.

There is accordingly associated with each longitudinal row of coupling studs 5 one contact strip 9, which furthermore is electrically conductingly connected with all the conducting coatings 7 of the coupling studs 5 of the relevant row. The side walls 3 are of such a thickness that, together with the associated contact strips 9 bearing against them (see Fig. 3), they make up a wall thickness which is equal to that of the standard, fully insulating side walls of like building blocks.

/An example

An example of embodiment for the manufacture and layout of the conducting layers 7 and the contact strips 9 is shown in Fig. 4. According to this, the conducting layers 7 consist of bent sheet metal pieces, which are electrically and mechanically firmly connected to the associated band-shaped contact strip 9. Preferably, the conducting layers 7 and contact strips 9 are made in one piece, in that a sheet metal strip having a width equal to the height of the building block including coupling stud 5 is cut into at appropriate points down to a width corresponding to the height of the coupling studs 5 (Fig. 3) and the cut portions are then bent out according to Fig. 4 from the remaining part of the sheet metal strip in stepped manner (Fig. 3). This can be carried out in a punching operation. The insertion of the unit shown in Fig. 4 comprising conducting layers 7 and contact strip 9 into the preformed plastics hollow object 1 is made possible by corresponding slit-shaped openings in the base wall 4.

It can be seen that when two identical building blocks are placed on one another and coupled together according to Fig. 1 to 3, whether completely or only partly overlapping in the longitudinal direction, the conducting layers 7 of the one row of coupling studs 5 of the one building block come into electrical contact with the one contact strip 9 of the other building block, and that this applies also for the conducting layers of the other row of coupling studs and the other contact strip. But even if the one building block is not placed in the same longitudinal direction upon the other building block and coupled to it, but is placed in a mutually

/perpendicular

(48)

perpendicular position, the electrical circuits associated with the two rows of coupling studs are retained and separated, which is now explained below with reference to Fig. 8.

According to Fig. 8, a first building block 10 is coupled to a second building block 11 by placing the first upon the second perpendicularly to each other according to the arrow 12. The conducting layers 7, 7' of the coupling studs 5 of building block 11 and the contact strips 9, 9' of building block 10 participate in the electrical contacting operation. In the overlapping zones of the building blocks 10 and 11, the coupling studs 5 are illustrated as if transparent. It can be seen that the one contact strip 9 of building block 10 comes into electrical contact with the conducting layer 7 of one of the coupling studs 5 of the one row 13 of building block 11, but not with any conducting layer 7' of a coupling stud 5 of the other row 14. The corresponding is also the case for the other contact strip 9' of building block 10, which comes into electrical contact exclusively with the conducting layer 7' of one of the coupling studs 5 of the other row 14 of building block 11. Thus in both building blocks 10 and 11, the two rows of coupling studs electrically connected with one another by the associated contact strips remain electrically separated, no matter in what way the one building block 10 is coupled to the other building block 11 and vice versa. Electrical connections can accordingly be made by coupling the present building blocks even by completely unskilled laypersons, such as children, without any risk of a short-circuit.

/The toy

The toy building block illustrated in Figures 5 and 6 also has a box-shaped hollow object 1, with end walls 2, side walls 3 and a base wall 4. The building block has, however, only a single row of cylindrical coupling studs 5 (Fig. 5), while inside the hollow block 1 as counter-coupling element, cylindrical studs 15 are formed in the base wall 4 (Fig. 6). The conducting surface extending over a portion of the lateral surface of each coupling stud 5 is, in this building block, formed by each coupling stud 5 being composed of a metallic portion 16 and of an insulating portion 17, formed in the base wall 4, the parts 16 and 17 bearing against one another along a diametral parting plane inclined at 45° to the lateral walls 3 and thus forming a lateral surface of the coupling stud 5 which is conducting over 180° and insulating over 180°. The metallic parts 16 pass through the base wall 4 (Fig. 6) and are connected, for example soldered, to the one flange 18, bearing against the base wall 4, of a metallic angle bar 19. The other flange 20 of the angle bar 19 constitutes a contact strip extending along the one lateral wall 3. The contacting element consisting of the angle bar 19 with the flanges 18 and 20 and of the metallic parts 16 of the coupling studs fixed to the flange 18 is illustrated in Fig. 7.

It is self-evident that, with the building block of Fig. 5 and 6, by contrast to the building block of Figures 1 and 2, only a single-pole electrical connection can be made. However, it in turn makes possible the simple making of an electrical connection with a further building block possessing like contacting devices and is also capable of being combined

/in any

(50)

in any way with a standard building block, consisting exclusively of insulating plastics material. Furthermore, with the building block of figures 5 and 6, a switching action can be achieved, as is explained below with reference to Fig. 9.

According to Fig. 9, a first building block 21 is coupled perpendicularly to a second building block 22 by placing the first upon the second according to arrow 23, as already described for the building blocks 1 and 2 with reference to Fig. 8. This brings the contact strip 20 of building block 21 into electrical contact with the metallic part 16 of coupling stud 5 of building block 22, on which the building block 21 has been placed. Thus an electrical connection exists between the conducting parts 16 of the coupling studs 5 of the two building blocks and between their contact strips 20. If the placed-on building block 21 is now rotated through 90^{o} clockwise or building block 22 is rotated through 90^{o} counter-clockwise, the contact 20 of building block 21 comes into bearing against the insulating part 17 of the coupling stud 5 of building block 22. This causes the aforementioned electrical contact to be broken.

In Figures 10 and 11, a further toy building block is shown, the hollow object 1 of which differs from that of figures 1 and 2 in that, inside the internal space of the hollow object, two parallel longitudinal walls 24 are formed against the inner surface of the base wall 4 and the end wall 2, as counter-coupling elements for the coupling studs 5, which are present in two rows. In this case it is advantageous to arrange the two contact strips 9, equipped according to Fig. 4 with the conducting layers 7 for

/the coupling

(51)

the coupling studs 5, each along the parallel walls 24, that is to say on opposite sides of and along a centre-line equidistant from the two parallel lateral walls 3 of the hollow object 1, to be electrically separated from each other. In other respects, the same application and effects are obtained with the building block of figures 10 and 11 as with the described building block of figures 1 and 2.

It should also be noted that the contact elements illustrated in figures 4 and 7 may be used alternatively for building blocks according to figures 1 and 2, 5 and 6, as wellas for 10 and 11.

Although, normally, due to the elastic lateral walls of the building block, a contact pressure is automatically produced, in figures 12 and 13 the upper and lower faces respectively of a building block are shown, in which the conducting surfaces 7 of the coupling studs 5 and the contact strips 9 are of resilient construction. For this purpose, the conducting surfaces of the coupling studs 5 extend only at the intended contact zones as fingers 25 over the entire height of the coupling studs (Fig. 12) and the contact strips as fingers 26 over the entire height of the lateral walls 3 (Fig. 13). By the fingers 25 and 26, a resilient contact-making action is obtained.

In figures 14 to 16, a further form of embodiment of the building block of this invention is shown, the single-piece contacting device of which is shown in perspective in figure 17. This building block, once again, has a box-shaped hollow object 1 consisting of an electrically insulating plastics material and having end walls 2 (only one end wall shown),

/lateral wall

(52)

lateral walls 3, a base wall 4 perpendicular to the end and lateral walls and, in the present example, two rows of cylindrical coupling studs 5. In the interior of the hollow object 1 counter-coupling elements having a clamping action are formed, which consist as shown in Fig. 2 of cylindrical tubes or sleeves 6.

As can be seen from figures 14 and 16, the coupling studs 5, made of an electrically insulating material, possess an electrically conducting cylindrical surface zone 27 extending here through an angular region α of approximately 110° to 120°, which has the same orientation in respect of the end and lateral walls 2, 3 of the hollow object 1 for the coupling studs 5 of the same row. Furthermore, the building block possesses, in the interior of the hollow object 1, a contact strip 28 extending along the one lateral wall 3, which is in electrical connection with the conducting regions 27 of the coupling studs 5 in a manner to be described below. Thus the general construction of the building block shown and its general manner of functioning, apart from the size of the building block and the number of the coupling studs, are in agreement with the examples of embodiment already described, for example in relation to figures 5 and 6.

The present building block consists of two single-piece parts, namely one part of plastics material constituting the hollow object 1 (Fig. 15, 16) and one part 29 (Fig. 17) of metal, constituting a coherent contacting device, which is inserted into the hollow object 1. As can be seen especially

/from Fig. 16,

from Fig. 16, the coupling studs 5 are hollow and are also cut out at their cylindrical surfaces at the positions referenced 30. The lateral walls 3 are equipped, on their inner surface, with narrow recesses 31.

The contacting device 29 (Fig. 17), which is made by deep-drawing, punching and bending in one piece out of a part of sheet metal, for example brass sheet or nickel silver sheet, is composed, according to the number of coupling studs in a row, of a plurality of substantially hollow cylindrical contacting components 32, a common contact bar 33 and connecting components 34 between the contacting components 32 and the contact bar 33. The contacting components 32 possess a hollow cylindrical region 35 having a smaller radius and a hollow cylindrical region 36 having a larger radius. The first-mentioned region 35 is intended for bearing against the inner face of the hollow coupling stud 5 (Fig. 15, 16), while the second mentioned region 36 is intended for forming, in the cut-out of the coupling stud 5 at the position 30, the electrically conducting surface region 27 (Fig. 14, 16). On the upper face of the contacting component 32, a flange rim 37 is formed, for anchoring the contacting device 29 to the two hollow coupling studs 5. The contact bar 33 is furnished, at the position of the contacting components 32, with openings or passages 38 and, between them, with slits 39. Beadings 40 reinforce the connecting components 34 weakened by the slits 39.

For manufacturing the building block of figures 14 to 16, a start is made from a plastics material hollow object 1, in which the inner faces of the end surfaces of the coupling studs have a truncated conical (or cylindrical)

/projection 41

(54)

projection 41, illustrated in broken line in fig. 15, the external diameter of which is smaller than the aperture diameter of the flange rim 37 of the contacting component 32 (Fig. 17). Into the internal space of this hollow object 1, the contacting device 29 of Fig. 17 is inserted (Fig. 15), the counter-coupling tubes 6 holding the contacting device 29 firmly against the adjacent lateral wall 3. By means of an ultrasonic tool, ultrasonic energy is then applied onto the projections 41 under axial pressure, so that the projections spread out radially and, after they have cooled, hold the contacting device 29 firmly.

When two like building blocks are coupled together, the regions of the contact bar 33 equipped with the apertures 38 and separated by the slits 40 can yield resiliently into the recesses 31 of the relevant lateral wall 3, so that secure contact making is achieved with the conducting zones of the coupling studs 5 of the coupled building block.

The recess 42 in the end wall 2 shown in Fig. 16 simply serves for facilitating the separating of two building blocks which have been placed flush upon one another. The contacting device 29 according to Fig. 17 is preferably made in the form of a long strip having numerous contacting components 32. From this strip, sections having the required contacting components 32 are then simply cut off for each building block. Building blocks having only one row of coupling studs 5 can, of course, also be equipped with contacting devices according to Fig. 17.

Both the conducting layers and also the contact strips of the described

/contacting devices

(55)

contacting devices, especially those of figure 4, can be adapted in their form in a simple manner to the particular form of the counter-coupling elements of the building blocks of virtually all known systems. This will now be explained briefly with reference to the schematic views shown in figures 18 to 29.

In each of the schematic views of figures 18 to 29, the coupling studs 5 are represented by circles or squares for two coupled-together building blocks, each possessing two rows of coupling studs, the conducting lateral surfaces 7 of the coupling studs, extending over about 180°, being indicated for the one building block by black areas. The contact strips 9 of the other building block are indicated by thin lines. Figures 18, 20, 22, 24, 26 and 28 each show two contact strips which extend substantially along the two lateral walls of the hollow object. In the building blocks of figures 19, 21, 23, 25, 27 and 29, the contact strips are located on either side of a centre-line of the hollow object. Finally, in each of figures 18a to 29a, two longitudianlly coupled building blocks with the participating contacting elements are illustrated, whereas in figures 18b to 29b, two building blocks coupled perpendicularly to each other of the same type are illustrated with the participating contacting elements.

Figures 18a and 18b correspond to figures 1 and 2 and 8 respectively and need no further explanation. Fig. 19a corresponds to two building blocks of figures 10 and 11 with longitudinal coupling, while 19b shows the making of contact in the coupling together of two building blocks of

/Fig. 10 and 11

Fig. 10 and 11 perpendicularly to each other.

Toy building blocks are known, which instead of cylindrical coupling studs, have studs of square cross-section. In these building blocks also, contacting devices of the present kind may be provided, as illustrated in figures 20 and 21. Each two lateral surfaces of these coupling studs are here equipped in the described manner with conducting surfaces which are in electrical connection with straight contact strips disposed in the interior of the hollow object. Here again, the conducting surface extends on the coupling studs through an angular zone of 180°.

The further arrangements of contacting devices illustrated in figures 21 to 29 make use of contact strips which are bent several times. This is done having regard to particular forms of construction of the counter-coupling elements of the relevant building blocks. Instead of counter-coupling tubes or sleeves according to fig. 2, for example, relatively thin pins formed in large numbers are known, which may be solid or slit. According to the forms of embodiment of figures 24 to 27, the separating plane between the conducting and the insulating lateral surfaces of each coupling stud is at an angle of 45° to the lateral surfaces of the hollow object, as in the embddimentsof figures 1 to 7. In the forms of embodiment of figures 22, 23, 28 and 29, this separating plane lies, however, perpendicularly to the lateral walls of the hollow object, having regard to the form of bending of the contact strips.

/In Fig.

In Fig. 30, a toy building block in the manner of the building block of Fig. 1 is partly illustrated in perspective external view. In this building block, the coupling studs 5 not only have conducting external surfaces 7 extending over a portion of the lateral surfaces, but also each have a central bore, which possesses, in the angular regions of the conducting outer surface 7, also a conducting inner surface 43, which is electrically connected with the conducting surface 7 over the end face of the coupling stud 5. Preferably, therefore, the conducting part of the coupling stud 5 consists of a metal piece, analogously to the metallic component 16 of the building block according to figures 5 and 6. A plug pin can be introduced into the bore of the coupling stud 5, in order to supply electricity to the building block or to tap it from the building block.

Contacting devices of the present type can also be provided in the case of plate-shaped building blocks possessing a larger number of rows of coupling studs , in order to supply electricity to or to tap electricity from a building block of this type. As an example, Fig. 31 shows a building block of this type, which possesses two rows 44 and 45 of coupling studs equipped with conducting surfaces 7, these two rows being separated by a row 46 of completely insulating coupling studs 47. In the case of the building block of Fig. 32, in two adjacent rows 48 and 49, in each of them only the two edge coupling studs are equipped with conducting surfaces 7. In both the building blocks shown, the conducting surfaces 7 of the coupling studs of each row 44, 45, 48, 49 are electrically

/connected with

connected with one another, for example by contact strips, not shown, disposed on the hollow lower face of the building blocks.

The contact elements described, namely conducting surfaces on the coupling studs and contact strips in a hollow space containing counter-coupling elements, may also be provided individually in building blocks of specific form and having specific functions. In figures 33 to 38, corresponding examples of embodiment are illustrated in perspective.

In Fig. 33, a box-shaped building block having no contacts on its lower surface, not shown, is illustrated, which is intended for receiving an electronic or electrical component. For the two-pole electricity supply of this component, the upper face of the building block possesses four coupling studs 5, which have conducting partial lateral surfaces 7 orientated at 180° from one another in two rows, as has already been described, for example with reference to Fig. 1. The conducting lateral surfaces of each row are connected with terminal elements disposed in the interior of the building block for the component to be housed. The electricity supply takes place by means of a further building block possessing two contact strips, for example according to figures 1 and 2, which is pushed on in any manner onto the coupling studs. It has already been explained that the forming of a short-circuit is impossible in this operation.

The building block of Fig. 34 exhibits a similar construction, which however has coupling studs 5, some of them furnished with conducting

/lateral surfaces

(59)

lateral surfaces 7, on two lateral walls of the building block. Thus an electricity supply to the component to be housed inside the building block may be effected, as desired, from either of two mutually perpendicular planes, or the conductors may be continued onwards while at the same time supplying the component.

In Fig. 35, a toy building block is shown, which serves as a wall element for building models. The building block possesses, on its upper end face, two coupling studs 5, which are equipped with conducting lateral surfaces 7 rotated through 180° from each other. The lower, invisible end face of the building block contains two contact strips, each of which is connected with the conducting surface 7 of one of the coupling studs 5, so that a plurality of building blocks of the type shown can be placed one upon another and two-pole connections, proof against short-circuit, can at the same time be produced. The building block illustrated possesses, in addition, two bores 50 furnished with conducting internal surfaces, the conducting internal surface of each bore being connected with one of the two contact strips. Terminal plug pins of a toy lamp or the like may be pushed into the bores 50.

Fig. 36, like Fig. 33, shows a box-shaped building block, which however is equipped on its upper face with a depression having a counter-coupling tube 6 and two compact strips 9. This building block serves also for seating an electronic or electrical component, which is supplied electrically through two poles via the contact strips 9, namely via coupling studs possessing conducting partial lateral surfaces of a

/connecting

connecting building block pushed onto it.

A similar building block is illustrated in Fig. 37, in which the one contact strip 9 has an interruption 51. A switch may be connected to the two separate parts of this contact strip, the switch being incorporated into the same building block.

Finally, in Fig. 38, a box-shaped building block is shown, which combines on two mutually perpendicular faces the arrangement of coupling studs 5 according to figures 33 and 34 respectively with the arrangement of contact strips 9.

It can be seen that the building block according to this invention may have numerous forms, sizes and variants of arrangement in its contacting devices, the making of electrical connections with these building blocks being carried out without problems, without instruction and technical knowledge and without risk of short-circuits. One advantageous application of the building block of this invention consists also in the electrical connection of a baseplate equipped with coupling studs to a further, similar baseplate or to an electrical source equipped with coupling studs, in which baseplate certain coupling studs, at least adjacent to the edges of the baseplate, are electrically conducting and are electrically connected with one another to form one or more electrical circuits.

/Claims

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* C L M S *

(61)

Claims

1. Building block for building models, especially building block toys, comprising at least one row of coupling studs (5) and electrical contact elements (9 ; 19; 29), associated with the coupling studs, characterized in that the surfaces of a plurality of coupling studs (5) of the same row possess similar electrically insulating and electrically conducting regions (18, 17 ; 7, 16, 27) and that the electrically conducting regions (7; 16; 27) are connected with at least one contact element (9; 19; 29) parallel to this row of coupling studs, which (contact element)is constructed for being in electrical contact with the electrically conducting regions of the coupling studs of an adjacent, coupled building block.

2. Building block according to claim 1, characterized in that the electrically conducting regions (7; 16; 27) of the coupling studs (5) are situated at least on lateral surfaces to the coupling studs perpendicular to a common plane of the coupling studs, and that the contact element (9; 19; 29) has a conducting contact surface extending in the direction of the row of coupling studs and perpendicular to the aforementioned common plane of the coupling studs.

3. Building block according to claim 1 or 2, characterized in that the electrically conducting regions (7; 16; 27) extend, on the coupling studs (5), around an angular region of more than 90° and less than 270° about the longitudinal axes of the coupling studs and are constructed and arranged in like manner for the coupling studs of the same row.

/4.

* C L M S *

4. Building block according to claim 3, comprising two rows of coupling studs situated adjacent to one another in pairs, characterized in that the angle regions containing the electrically conducting regions (7; 27) of the coupling studs (5) of the one row of coupling studs are rotated with respect to the angle regions of the other row through 180°.

5. Building block according to one of claims 1 to 4, characterized in that the contact element (9; 19; 29) is strip-shaped or bar-shaped.

6. Building block according to claim 5, with lateral walls (3) and a wall (4) extending perpendicularly thereto, which has on its one side two rows of coupling studs (5) situated in pairs adjacent to one another and, on its opposite side, counter-coupling elements (6), characterized in that, on the side of the counter-coupling elements (6), a strip-shaped or bar-shaped contact element (9; 19; 29) is disposed along each of two parallel side walls (3).

7. Building block according to claim 5, comprising side walls (3) and a wall (4) perpendicular thereto, which has on its one side two rows of coupling studs (5) situated in pairs adjacent to one another and, on its opposite side, counter-coupling elements (6), characterized in that, on the side of the counter-coupling elements (6), a strip-shaped or bar-shaped contact element (9) is disposed on each side of and along a centre line located at equal distances from two parallel lateral walls (3).

/8.

8. Building block according to claim 6 or 7, characterized in that the contact elements (29) are shaped, e.g. bent, according to the form and position of the counter-coupling elements (6).

9. Building block according to one of claims 1 to 8, characterized in that the conducting regions (7) of the coupling studs (5) and/or the conducting surfaces of the contact elements (9) are of resilient construction, e.g. are constructed as contact fingers (25, 26).

10. Building block according to one of claims 1 to 8, characterized in that a radially set-back region, extending around the aforementioned angle region, of the lateral surface of each insulating coupling stud (5) is equipped with a conducting wallpiece (16), and that the wall pieces of all the coupling studs of the same row are connected with the associated contact element (19).

11. Building block according to claim 10, characterized in that the wall pieces (16) and the associated contact elements (19) are formed in one piece, and are inset into the insulating material of the building block.

12. Building block according to one of claims 1 to 8, characterized in that each coupling stud (5) consists of an insulating part and of a conducting part (8; 7), separated from this first part in a plane perpendicular to the aforementioned perpendicular wall (4), wherein the conducting part (7) passes through said wall, and that an angle bar (9) is provided, the one arm of which bears against the inner end faces of the

/conducting parts

conducting parts of the coupling studs of the same row and is conductingly connected with them and the other arm of which constitutes the contact element.

13. Building block according to claim 12, characterized in that the separating planes perpendicular to said wall (4) of the insulating and conducting parts of the coupling studs (5) make an angle of at least approximately 45^{o} with the lateral walls (3).

14. Building block according to one of claims 1 to 8, characterized in that the cylindrical coupling studs (5), made of an insulating material, are hollow and are cut out in a portion of their cylindrical wall, and that a sleeve-shaped metal piece (32) is set into the hollow space of each coupling stud, which (metal piece) has a region (35) of smaller radius which bears against the inner face of the cylindrical wall, and also has a region (36) of larger radius, which bears in and against the cut-out cylindrical wall part.

15. Building block according to claim 14, characterized in that the sleeve-shaped metal piece (32) has, at its end adjacent to the end wall of the coupling stud (5), an annular internal flange (37), into the opening of which an inner projection (41) of the coupling stud engages in order to anchor the sleeve-shaped metal piece in the coupling stud.

16. Building block according to claim 14 or 15, characterized in that a common angle bar (28) is integrally formed onto the sleeve-shaped metal pieces (32) of a row of coupling studs (5), the cranked flange (34) of which angle bar constitutes the contact element for the row of

/coupling studs.

coupling studs.

17. Building block according to claim 1, characterized in that it has a box-shaped hollow object for seating at least one electronic or electrical component, and that, for the purpose of electrical supply to the component, at least one wall of the hollow object is equipped, on its external face, with coupling studs (5) possessing conducting surfaces (7) or with conducting contact strips (9) disposed in a recess.