Dec. 10, 1968 AUGUST-WILHELM HÖWE 3,415,007

TOY BUILDING SET

Filed July 20, 1964 3 Sheets-Sheet 1

FIG. 1a

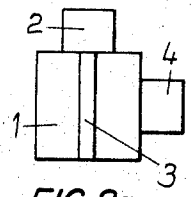


FIG. 1b

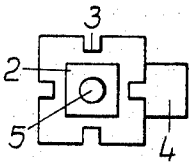


FIG. 1c

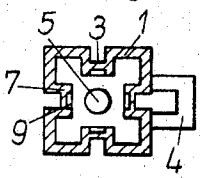


FIG. 1d

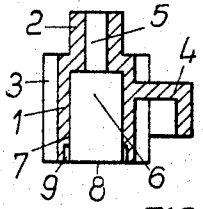


FIG. 2a

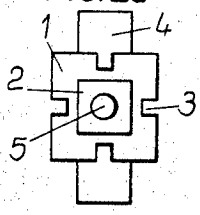


FIG. 2b

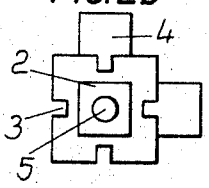


FIG. 2c

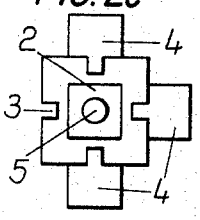


FIG. 2d

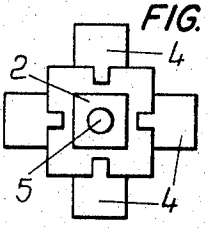


FIG. 3a

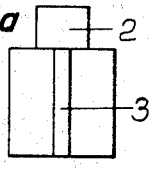


FIG. 3b

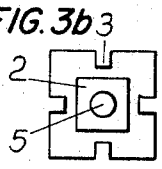


FIG. 5a

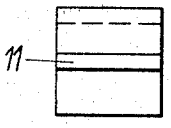


FIG. 5b

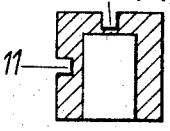


FIG. 7a

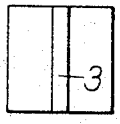


FIG. 7b

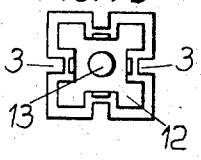


FIG. 7c

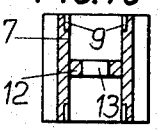


FIG. 8

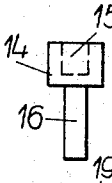


FIG. 9

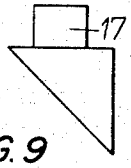


FIG. 10a

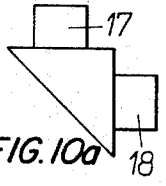


FIG. 10b

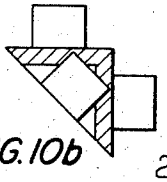


FIG. 10c

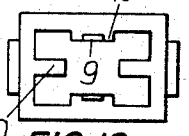


FIG. 4a

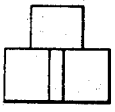


FIG. 4b

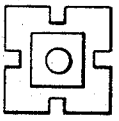


FIG. 6a

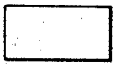


FIG. 6b

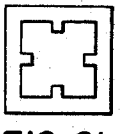


FIG. 12a

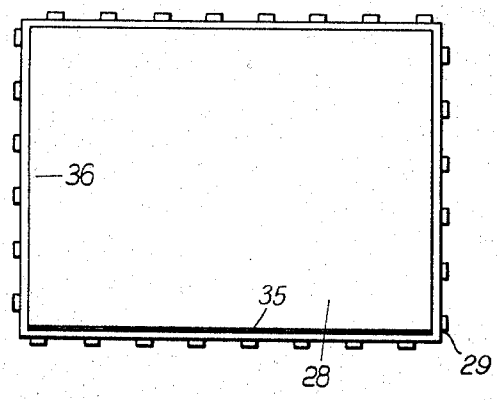


FIG. 12b

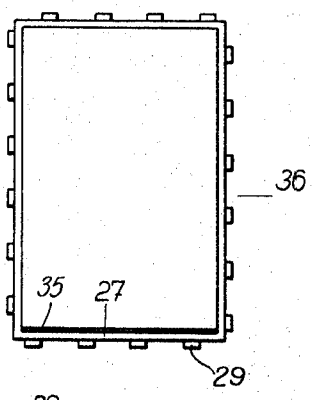


FIG. 11b

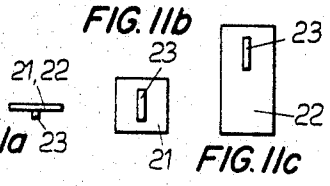
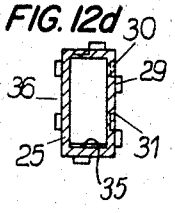


FIG. 11a FIG. 11c

FIG. 12d



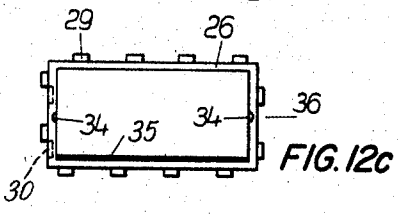


FIG. 12c

FIG. 14a

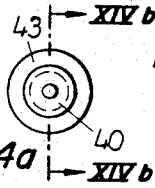


FIG. 14b

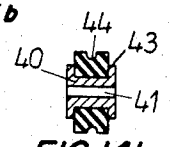


FIG. 15a

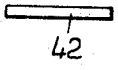


FIG. 15b

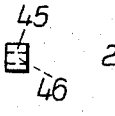


FIG. 13

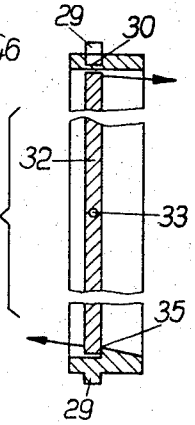


FIG. 16a

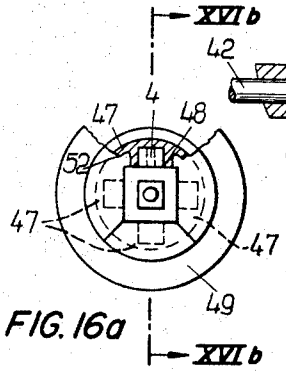


FIG. 16b

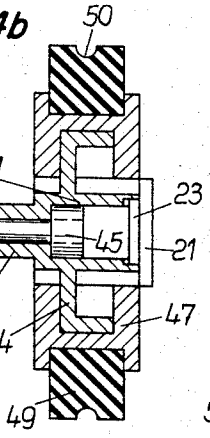
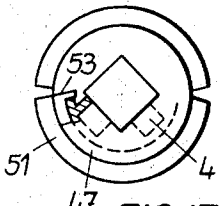


FIG. 17



Dec. 10, 1968 AUGUST-WILHELM HÖWE 3,415,007

TOY BUILDING SET

Filed July 20, 1964 3 Sheets-Sheet 3

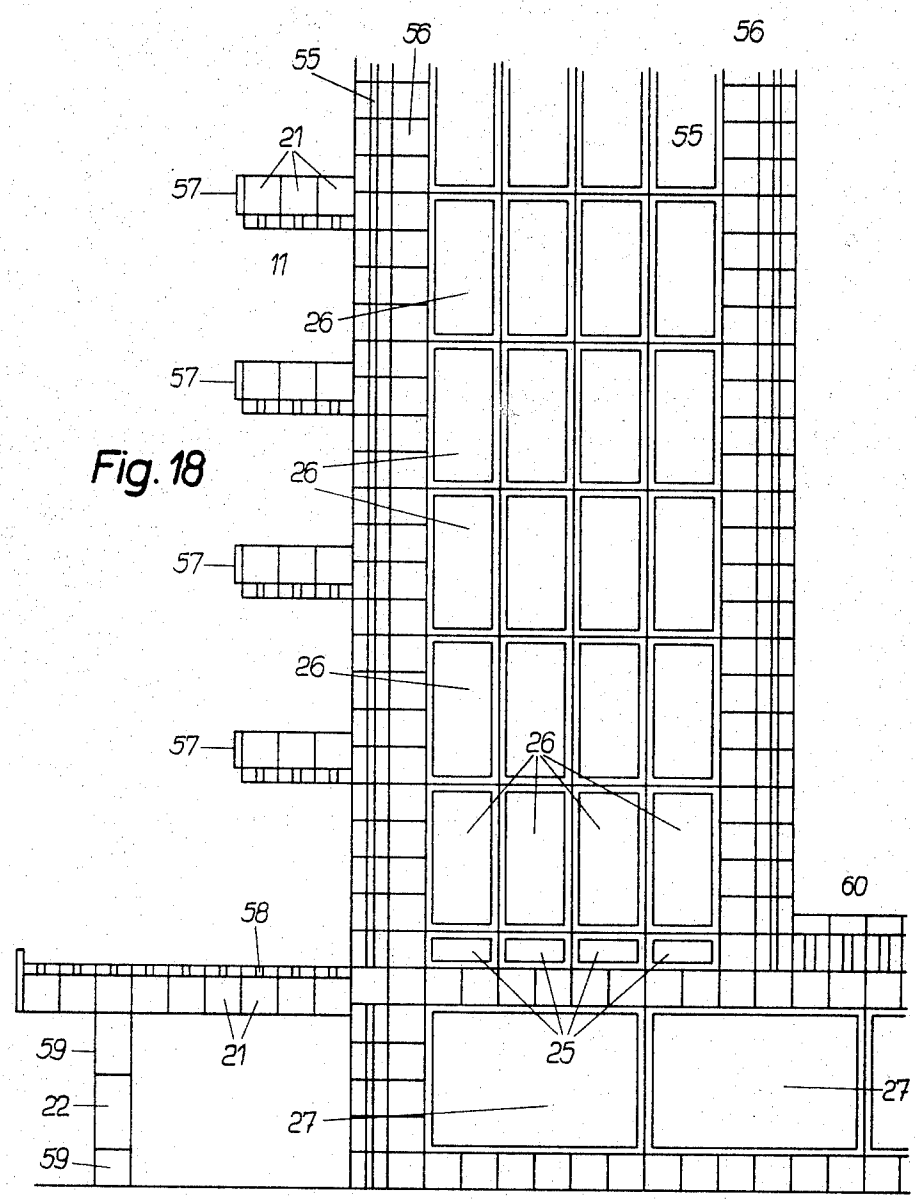


Fig. 18

United States Patent Office 3,415,007 Patented Dec. 10, 1968

3,415,007

TOY BUILDING SET

August-Wilhelm Höwe, 8 Gottelmannstrasse, Mainz (Rhine), Germany

Filed July 20, 1964, Ser. No. 383,597
Claims priority, application Germany, July 26, 1963, H 49,842
11 Claims. (Cl. 46—19)

ABSTRACT OF THE DISCLOSURE

Toy building set with basic construction elements of cubic shape having a socket in one face and one or more complementary plugs in other faces, the plugs opposite the socket having a throughgoing bore for the insertion of a pin, the corresponding pin head or a ring tightly fitted onto the pin being receivable in the socket while an end of the pin shank projects beyond the plug; other elements include frames of staggered sizes with interfitting peripheral formations, and wheel-forming sectors connectable via lateral plugs with a central element serving as a hub, and with rim ports.

The invention relates to a toy building set with brick-like elements in the form of a right prism with square cross-section.

Many different toy buiding sets are known with building elements of this kind, these being divided substantially into two groups according to their basic characteristics. In one group of such toy building sets the brick-like elements are basically constructed to a great extent like wall bricks. As connecting elements these building elements have on one side, that is on the top or bottom side, a male coupling member in the form of a plug or a group of plugs, while the opposite side is provided with a complementary female coupling member in the form of sockets or apertures for receiving this plug or group of plugs. Such toy building sets can only be built up to represent solid masonry or brickwork, whereas reproductions of buildings of modern architecture, for example steel buildings, bridge structures and the like and particularly reproductions of machines built up therefrom are extremely clumsy and unsightly. It has already been attempted to improve these known toy building sets to some extent by providing the brick-like building elements with a central vertical slot in one end face in order, when building door or window apertures, to produce a continuous vertical groove for inserting a door or window frame. However, the provision of such a groove does not make it possible to reproduce frame-like constructions such as are general, for example in modern architecture, in engineering works and above all in machine building.

In this group of toy building sets bricks are also known which have dove-tail interengaging connecting elements on their vertical end faces. These toy building sets also only enable the building of solid constructions with the only difference, as compared with brickwork or masonry, that the dovetailing is not horizontal but vertical.

The second group of the known toy building sets is characterized by the use of beam-like building elements which are connected either directly or through the intermediary of tube like building elements by plugs or pins. These known toy building sets enable practically only the reproduction of framework buildings and timber structures. It is not possible to reproduce modern architectural buildings, for example steel structures or engineering works and machinery with these known toy building sets.

Besides these main groups, toy building sets are also known in which substantially cube-shaped bricks are provided with a plug-like projection on one side of the cube and with an opening for receiving this plug on another side of the cube. Even when this brick is supplemented by bricks varying as regards the number and arrangement of the plugs and openings, these known toy buildings sets only enable limited reproduction of buildings and the like in framework construction. It is also known to supplement such toy building sets with elongated brick-shaped elements. It is not possible with these known toy building sets to reproduce buildings such as steel constructions, engineering works, machinery and the like.

Finally a toy building set is also known for reproducing for example technical constructions, especially machinery in which tubular building elements are connected by means of socket sleeves. The tubular building elements can also be in the form of elbows, T's and the like. These known toy building sets are, however, not suitable for reproducing buildings either in solid construction, or engineering construction or framework construction.

The object of the invention is to produce a toy building set with which practically all kinds of buildings and structures can be reproduced so that the imagination and interest of the child playing with the set can be freely developed and not, as heretofore, be confined from the outset to a certain type of building owing to the nature of the set.

This object is attained according to the invention by a toy building set which is based on brick-like building elements in the form of a straight or right prism with square cross-section, which has a socket on one side of the block (this side being referred to hereinafter, for convenience, as the bottom face) and has on the opposite side (i.e. the top face) a plug corresponding to the dimensions of the socket for fitting the building elements together and is characterized in that on at least one of the four remaining outer walls or side faces of the brick a secondary plug is provided corresponding to the opening in the one side of the square and on at least one of the four remaining outer walls a groove is provided extending centrally in the plug-in direction, that is from the open side of the cube to the top face carrying the main plug. Thus, the plug and socket constitute coupling means for the interconnection of similar blocks or bricks forming part of the set.

The effect attained by the invention is that not only a closed structure, that is a construction composed of brickwork, but also a framework or lattice-like construction can be produced with a very small number of suitable building elements capable of being assembled in many ways. Furthermore, the invention also renders it possible to build mobile models as well as movable technical equipments. The large range of building possibilities already attainable by the invention can be still further extended by making the building elements oneself in a very simple manner, for example by cutting out from cardborad, and incorporating them in the set.

In a preferred embodiment of the invention the height of the prism and the side edges of the base surface square are of the same dimension or half or multiples of each other. With the toy building set according to the invention it is therefore possible not only to use selectively one or other type of building but also to change over from one type to another in a single model so that a universally practical sequence of assembly results. It has been found particularly advantageous to provide each of the four remaining outer walls of the bricks with a central groove extending in the direction of engagement. The plugs of the bricks can be advantageously made angu-

lar. These angular plugs or some other suitable device constitute a guide for the assembled bricks so that they cannot turn in relation to each other and as a result their slots always register accurately. The slots or grooves can be extended as desired by fitting the bricks together and also be continued at the corners without interruption. Self-made building plates do not therefore need to be cut away at the corners.

Ribs for guiding and clamping the plugs may also be formed in the interior of the prism constituting the brick and extend in the same direction as the grooves formed in the outer side up to the open side of the prism. In addition to affording a particularly favorable and reliable guide for the plug in the interior of the opening in the brick, these ribs also make it possible to construct the bricks with great stability and light weight. The ribs can also have recesses of about the same width as the grooves in the region of the open square side. These recesses thus take over on the open side of the brick the function of the grooves on one or other outer side of the brick.

The main plug of the brick may be open at the top. This gives the brick a continuous opening in one direction and it can therefore receive appropriate rods or pins as a bearing or hub.

In addition to the basic bricks, the toy building set according to the invention may also include different auxiliary elements, chiefly auxiliary bricks with the same dimensions as the basic or main bricks, with a groove in at least one of the four other outer walls and possibly supplementary or secondary plugs on at least one of the four remaining outer walls, in which however the side of the prism opposite the open side of the prism is closed without plug or open. These auxiliary bricks can be introduced selectively as connecting elements at any place either in a closed building or in a framework building.

A ring which can be inserted in the interior of the brick and a pin guided in said ring are provided according to the invention as auxiliary elements for forming bearings for rotatable shafts and the like. An abutment shoulder can be provided for the insert ring in the interior of the prismic brick at such a distance from the open side thereof that the inserted ring leaves sufficient space for inserting the plug of another brick into the open side of the prism. Pin and insert ring are suitable for building bearings of any kind. For building a wheel bearing, for example, the pin is inserted through the hole in the main plug and held in the brick by the inserted ring.

Cover plates can also be provided according to the invention as further auxiliary elements. These plates are the same width as the main bricks and have on their rear side a holder for insertion in the groove or the rib recesses of the bricks. Any undesired gaps can be covered by these cover plates. The cover plates can, however, also be used for closing the open side of the bricks or for producing special color effects. A particular advantage of these cover plates is that they can be fitted as projections, partitions, thin walls and the like. In the known toy building sets, these last-mentioned elements are far too clumsy and large as compared with the other parts of the model and consequently detract from the appearance so that in many cases parapets, balconies, partition walls and the like are frequently introduced in the toy-building sets as auxiliary elements, with the result that in the known sets variety of construction is lost.

Another auxiliary element may be provided in the form of a bolt for producing particularly strong connections between two bricks. This bolt has a head with the same dimensions as the plug of the bricks and a shank to be inserted and held firmly by friction in the opening of the main plug. With the aid of this bolt (or plug extension) the clamping effect between two bricks is increased considerably. Thus a particularly rigid connection of parts and sections can be produced such as is frequently necessary in working models. Finally, in the case of the toy-building set according to the invention a frame may be provided as an auxiliary element, all the sides of which are of a length corresponding to the height of the basic brick or a multiple thereof; such frame is provided on its periphery with projections for engagement in grooves or rib recesses in the bricks. It is particularly advantageous and in accordance with the general build-up of the building set to provide a set of frames of different sizes adapted to each other and which have on their peripheral surfaces arrangements for direct interconnection. These frames can be introduced both in models of solid construction and also in models of framework or lattice construction and conform particularly to the basic principle of the building set according to the invention in that both their relative dimensions and also their connecting elements enable them to be used both for massive or solid-wall building or masonry-type construction and also for framework or skeleton building either directly with one another or with other bricks and auxiliary elements of the toy-building set. The connecting means for the frames may also consist of a uniform series of lug-like projections and corresponding recesses in the peripheral surfaces of the frames, the length of such a series, including any possible intermediate sections with smooth surface between two series, being adapted to the shortest side of all frames. The mutual adaptation in size of the frames should be based on the length of the shorter sides of the smallest frame or be a multiple thereof, that is the longer side of each frame should be longer by this amount than the shorter side of the same frame, but equal to the shortest side of the next larger frame.

Rotatable parts, for example wheels, pulleys, flywheels and the like can be built up from the bricks with the aid of a few auxiliary elements. A set of wheels can, for example, be composed of a basic brick with four secondary plugs as wheel hub, an insert ring with pin as wheel bearing, four sector-shaped wheel bricks to be fitted on the secondary plugs of the basic brick and together forming the rim, and a tire casing to be drawn over the wheel bricks.

Further features and advantages of the invention will become apparent from the following description of the embodiments of the invention illustrated by way of example in the accompanying drawings, in which

FIG. 1*a* is a side-elevational view of the main or basic brick with a lateral plug;

FIG. 1*b* is a top plan view thereof;

FIG. 1*c* is a bottom plan view thereof, partly in cross-section;

FIG. 1*d* is a vertical section of the brick of FIGS. 1*a*–1*c*;

FIG. 2 is an elevational view of a main or basic brick of modified construction, namely, with two opposite secondary plugs;

FIG. 2*b* is a similar view of a brick with two plugs at right angles to each other;

FIG. 2*c* is an elevational view of a main block wtih three plugs;

FIG. 2*d* represents a similar view of a variant;

FIG. 3*a* is a side-elevational view of an auxiliary brick without secondary plugs;

FIG. 3*b* is a top plan view thereof;

FIG. 4*a* is a side elevation of an auxiliary brick similar to but half the height of that shown in FIGS. 3*a* and 3*b*;

FIG. 4*b* is a top-plan view of the latter brick;

FIGS. 5*a* and 5*b* are, respectively, side-elevational and vertical sectional views of an auxiliary brick with grooves extending transversely to the plug-in direction;

FIGS. 6*a* and 6*b* are side-elevational and bottom-plan views of a brick cap according to the invention;

FIG. 7*a* is a side-elevational view of an auxiliary brick without main plug and secondary plugs;

FIG. 7*b* shows this element in top-plan view;

FIG. 7*c* represents the element of FIG. 7*b* in vertical section;

FIG. 8 is an elevational view of a supplementary plug-in bolt;

FIG. 9 is an elevational view of a triangular auxiliary brick with one plug;

FIG. 10*a* is a side-elevational view of a triangular auxiliary brick similar to that illustrated in FIG. 9 but with two plugs;

FIG. 10*b* is a view of the building element in vertical section;

FIG. 10*c* is a front elevation of the element;

FIGS. 11*a* and 11*b* are, respectively, rear elevational and side elevational views of a cover plate according to this invention;

FIG. 11*c* is a rear-elevational view of another cover plate;

FIGS. 12*a*, 12*b* and 12*c* are side-elevational views of frame structures incorporated in the set;

FIG. 12*d* is a cross-sectional view of a frame member of somewhat smaller size;

FIG. 13 is a cross-sectional view of a frame of this type provided with a panel;

FIG. 14*a* is a plan view of a wheel suitable for use with the toy building set;

FIG. 14*b* is a cross-sectional view taken along the line XIV*b*—XIV*b* of FIG. 14*a*;

FIG. 15*a* is an elevational view of a pin serving as an axle for the wheel;

FIG. 15*b* is an elevational view of a ring forming a journal for this axle and receivable in the standard coupling element;

FIG. 16*a* is a plan view partly in section of a larger wheel for use in the building construction;

FIG. 16*b* is a cross-sectional view taken along the line XVI*b*—XVI*b* of FIG. 16*a*;

FIG. 17 is a plan view, partly in section of the fly wheel for use with the set; and

FIG. 18 is a partial elevational view of a building constructed therewith.

In the embodiments illustrated in the drawing the toy building set according to the invention comprises substantially five kinds of main bricks and three additional main groups of auxiliary elements.

The main bricks shown in FIGS. 1*a*–1*d* and 2*a*–2*d* have a cubic body **1**, open on the underside and closed on the upper side, where it carries a main plug **2** which can be plugged into the open under side of a similar brick to which it is to be fitted. At least one of the four remaining sides of the cube is provided with a continuous groove **3** extending in the plug-in direction, that is in the direction of the main plug **2** on the upper side of the cubic body **1**, and at least one of these four remaining sides carries a secondary plug **4**, whereby this secondary plug **4** and the groove **3** may be arranged on the same one of the four remaining sides. In the embodiment illustrated in the drawing, all four of the remaining sides of the brick body **1** are each provided with a groove **3** and there may be one, two, three or four secondary plugs **4**. In the case of main bricks with two secondary plugs **4**, these plugs may be on opposite sides or at right angles to each other.

The main bricks and the most important auxiliary bricks have a number of other common features:

The main plug **2** has a cylindrical vertical opening or bore **5** which can serve as guide for a pin, especially a rotatable axle pin. This axle pin, which will be described later, can be secured by an insert ring to be fitted in the space **6** of the brick so that the main brick and some of the auxiliary bricks can be used simultaneously as an axle bearing. The main plug **2** of the main brick and also of the auxiliary bricks in as far as they have such a plug, are of square cross-section so that when the bricks are fitted together the grooves **3** come one above the other and form an extension of each other. By constructing the main plug in this manner the bricks are positively prevented from turning in relation to each other.

For guiding the plugs in the open side of the bricks, guide ribs **7** are provided which enable the bricks to be fitted together and taken apart easily without canting. In the vicinity of the opening **8** these ribs **7** have recesses **9** which are the same width as the grooves **3**. These recesses **9** enable cover plates, which will be subsequently described, to be fitted with the aid of holding lugs in the open under side of the bricks.

The secondary plugs **4** are, as shown in FIG. 1*d*, made in one piece with the brick body **1**. To save weight, these secondary plugs **4** are made hollow and of plastic material to facilitate manufacture.

In the example illustrated the main bricks are supplemented by a group of auxiliary bricks which are illustrated in FIGS. 3*a* to 11*c*.

The auxiliary brick shown in FIGS. 3*a*, 3*b* is of similar construction to the main bricks but without secondary plugs and is used primarily at places where no lateral or transverse connections are desired, that is, for example, for the construction of columns and the like. To enable spaces which are smaller than the height of a brick to be filled, the half brick shown in FIGS. 4*a*, 4*b*, which differs from the auxiliary brick shown in FIGS. 3*a*, 3*b* only in that the brick body is only half the height.

For finishing off a row of bricks in models, two different finishing bricks are provided. FIGS. 5*a*, 5*b* show a full-height finishing brick which has, in the example illustrated, a groove **11** extending transversely to the plug-in direction on one side and on the top surface. FIGS. 6*a*, 6*b* show a finishing cap which is only half the length of a brick body and smooth on all its surfaces, that is, is constructed without any grooves.

FIGS. 7*a*, 7*b*, 7*c* show a connecting brick which is open on its top and bottom sides and there has the cross-section shown in FIG. 7*b*. On its remaining outer surfaces the connecting brick has grooves **3** as do the main bricks. For reinforcing purposes this brick is provided with a horizontal middle wall **12** as shown in FIG. 7*c*. This middle wall **12**, like the main plug **2** of the main brick has a bore **13**.

With the aid of the insert bolt shown in FIG. 8 (which is also a plug extension) the clamping effect between two bricks is considerably increased. The bolt is used in the case of individual structural parts subjected to exceptional loading or for building parts rotating at a high speed. This insert bolt has a head **14** whose diameter is slightly larger than the edge length of the base of the main plug **2**. The head **14** of the insert bolt is provided with a bore **15** in its end face which corresponds to the bore in the main plug but does not extend right through. A shank **16** extends from the under end face of the head **14** and this shank fits tightly in the bore **5** of the main plug **2**. The insert bolt may be made of yieldable material and will then hold firmly in the connection to be strengthened. FIGS. 9 and 10*a*, 10*b*, 10*c* show auxiliary bricks with triangular side surfaces and their main object is to enable the fitting of inclined elements, for example stays for supporting masts, machine frames and the like. These triangular auxiliary bricks may be provided with one or two secondary plugs **17**. On the sloping surface an opening is provided with guide lugs **19** and **20** for inserting the plugs of a neighbouring brick. The guide lugs may in turn have recesses **9** to enable the opening in these triangular bricks to be covered with a cover plate as shown in FIGS. 11*a*–11*c*, having a rib **23** whose ends are receivable in these recesses (cf. FIG. 16*b*).

The auxiliary elements shown in FIGS. 11*a* to 17 and the model building illustrated in FIG. 18 are drawn to half the scale of the elements shown on a larger scale in the preceding figures.

The cover plates illustrated in FIGS. 11*a*, 11*b*, 11*c* are

made of such size that they either correspond to the cube face surface of a brick, as in the case of the plate **21**, or correspond to the rectangular surface formed by two bricks fitted together, as in the case of the plate **22**. On its rear side each cover plate **21** or **22** has a holding lug **23** which corresponds in width to the grooves **11** and **3** respectively in the bricks, while this lug **23** corresponds in length to the space produced by the recesses **9**. Consequently the cover plate can be fitted either in a groove **3** or **11** or in the recesses **9** with the aid of its lug **23**. Moreover the cover plate **21** or **22** can be of a thickness corresponding to the width of the grooves **3**, **11** so that the side edges of the cover plate can be inserted in the grooves **3** and **11**. Undesired gaps can be covered with the cover plates **21**, **22**. As a result the open side of the bricks can be closed, projections and thin walls can be built and colored effects produced in a simple manner.

The second group of auxiliary elements for the toy building set according to the invention consists of a set of frames illustrated in FIGS. 12*a*–12*d* and 13. In the example illustrated this set is composed of four plastic frames **25**, **26**, **27**, **28** of different sizes which are so dimensioned that they can be built up in any combination with the bricks or inserted in the gaps between them via plug members **29** and sockets **30**. In the example illustrated these frames **25**, **26**, **27**, **28** are so dimensioned in relation to each other that the longer side of the frame **25** is two times as long as its shorter side and the longer sides of the frames **26**, **27**, **28** are in each case longer than their shorter sides by an amount equal to twice the length of the shorter side of the smallest frame. The longer side of each frame is therefore equal to the shorter side of the next larger frame. The shorter side of the smallest frame **25** is at the same time the same length as the edge length of the cube-shaped building element or brick. This mutual adaptation of the length of the long side and short side of each frame and of the frames of different sizes to each other enable the frames to be used not only selectively either on edge or in horizontal position but also chiefly for building a large variety of surface structures exclusively with frames directly fitted together via their complementarily located and shaped plugs and sockets **29**, **30** and within the base frame formed with the bricks.

The frames **25**, **26**, **27**, **28** can be constructed as shown in FIGS. 12 and 13 for pivotally mounting a filling plate **32**. These filling plates **32** can be either transparent or opaque and colored. For fitting the filling plates **32** in the frames **25**, **26**, **27**, **28** a small projection **33** is provided on each of the side edges of the filling plate and these projections **33** engage in corresponding recesses **34** in the inner side of the frames **25**, **26**, **27**, **28**. An abutment shoulder **35** is formed on the under surface of the frames and offers a firm support for a filling plate **32** pivotable about an axis **36**—**36** when in normal position. The pivotable, fixable arrangement of the filling plates **32** within the frames **25**, **26**, **27** and **28** enables not only tilting windows to be reproduced in architectural models but also the building of inclined flat surfaces such as feeding funnels which are necessary for the function of mechanical models. Fitting the filling plates **32** in the frames **25**, **26**, **27**, **28** in the manner above described also presents the advantage that the filling plates **32** can easily be removed and exchanged or the frames **25**, **26**, **27**, **28** can be used selectively with or without filling plate **32**.

The set of frames above described is moreover only an example of frame-shaped auxiliary elements which is particularly advantageous in combination with the invention. However, it is also quite possible for example to cut pieces of cardboard in the shape of surfaces to be covered and to build the above-described bricks around the edges of these cardboad pieces in such a manner that the edges of the cardboard are held in the grooves **3** or **11** of the bricks.

The third group of auxiliary elements is intended chiefly for building mechanical models. A few examples are illustrated in FIGS. 14*a* to 17, particularly for rotatable elements such as wheels, pulleys and flywheels.

FIGS. 14*a*, 14*b* show a small wheel whose bearing and hub **40** are in one piece, the bore **41** being formed for firmly holding an axle pin **42**. The periphery of the hub **40** is also constructed as a rim in which a raceway **43** made of soft plastic, rubber or some other yieldable material can be inserted. The raceway **43** has a groove **44** in the middle of its peripheral surface for receiving a transmission cord so that the wheel **40** fitted with the raceway **43** can be used as running wheel or pulley. It can also be used as pulley without the raceway.

As shown in FIGS. 15*a* and 15*b* a pin **42** is provided as a shaft element. It is of such thickness that it can be fitted friction-tight in the bore **41** of the small wheel **40** but rotatable in the bore **5** in the bricks. A sleeve ring **45** is provided for this pin **42**, the external diameter of this ring being so chosen that it can rotate in the space **6** in the bricks while its bore **46** is so dimensioned that it can be mounted friction-tight on the pin **42**. Thus a bearing which is rotatable yet secured against axial displacement is possible for the pin **42** in the bore **5** of the bricks, as shown in section in FIGS. 16*a*, 16*b*. Furthermore the sleeve ring can also be used for joining several pins **42** to form longer shafts.

As can be seen from FIGS. 16*a*, 16*b* and 17 special wheel bricks **47** may be provided for building wheels and flywheels of larger diameter. This brick **47** in the example illustrated is constructed as a quarter hub and provided with a radial opening **48** corresponding substantially to the opening in the bricks and consequently the wheel bricks **47** can be mounted on the secondary plugs **4** of the main bricks. As can be seen from FIG. 16*a*, a wheel body can be produced in a very simple manner with four wheel bricks **47** fitted on the four secondary plugs **4** of the main brick shown in FIG. 2*d*. The rim **49** is then mounted on the hub. A rim constructed in this manner can be used for various purposes, for example as a driving wheel as shown in FIGS. 16*a*, 16*b*, in which case a raceway hoop or ring **49** is fitted which may also have a cord groove **50**. As bearing, an axle pin **42** with sleeve ring **45** is mounted in the main brick and guided outside the bore **5** of the main plug **2** in a similar bore in a neighbouring main brick in which it is secured by a second sleeve ring. The bearing thus produced is closed on the outer side by a cover plate **23**. This wheel can also be used as driving wheel or belt pulley.

Instead of the raceway ring **49**, a flyweight **51** made of lead or iron can be used, which engages over half a rim formed by two bricks. For fixing this flywheel weight a recess **52** is formed on the inner side of the rim of the wheel bricks **47** in which pins, screws or catches **53** (one shown) on the flywheel weight engage. The diagonal section, viewed from the square of the normal brick, results in that the secondary plugs **4** of the normal brick dovetail each in one of the halves of the rim. Consequently the metallic hoop sections extending over 180° cannot possibly fly off.

The wheels **40** or **47**, **49** are so dimensioned that a friction drive can be built up with the aid of the bricks. In the example illustrated the diameter of the small wheel **40** with the raceway ring **43** is slightly larger than 1½ times and the diameter of the wheel **47** fitted with the tire ring slightly more than 3½ times the length of a cube edge of the main bricks. For the friction drive it will therefore be necessary to insert a half brick according to FIG. 4 in the respective machine frames to space properly the axles of the two wheels in contact. It is however also possible to make the diameter of the wheels an integral multiple of the length of a cube edge of the main bricks in order to enable the proper machine frame between the two wheels of a friction gear built exclusively with normal bricks, while wheels running close together yet clear

of each other require the insertion of a half brick according to FIG. 4*a*.

To supplement the rings **43**, **49**, other rings provided with teeth can be included in the set, as well as other specially constructed rings.

The model building illustrated in FIG. 18 might be a reproduction of a tall hotel with a row of shops on the ground floor. The example shows the very many possible ways of employing frames. The outer rows of bricks **55** can here be formed with main bricks according to FIG. 2*c*, while the inner vertical rows of bricks **56** can be produced with auxiliary bricks according to FIGS. 5*a*, 5*b* which are fitted on the secondary plugs **4** of the main bricks according to FIG. 2*b* and receive the frames **26** in the grooves **11** in their top sides. The platforms for the balconies **57** may be formed from main bricks which in turn carry auxiliary bricks according to FIGS. 5*a*, 5*b* around the perpiphery of the platform. Cover plates **21** are inserted in the grooves of these auxiliary bricks in such a manner that they can form the surrounding wall of the balcony. Similarly, a portico **58** can be built from auxiliary bricks according to FIGS. 3*a*, 3*b* and covered with plates **22** or **21**. The parapet wall **60** of the hotel garden can be formed by cover plates according to FIGS. 11*a*–11*c*.

The model building shown in FIG. 18 is to scale if the basic measurement of the toy building set, that is the length of the edges of the cube of the main bricks is taken as 1 centimeter. This choice is particularly favorable because the construction of models to scale is thereby considerably simplified.

As FIG. 18 shows, the toy building set according to the invention is particularly suitable for almost realistic and well proportioned reproduction of buildings, especially those of modern architecture. Models of engineering works and also models of mechanical nature in particular can be produced just as well.

All the features of the subject matter of the application set forth in the foregoing description and in the following claims as well as illustrated in the accompanying drawings can, either individually or in any imaginable combinations, be of considerable importance for the invention.

What is claimed is:

1. In a toy building set comprising a multiplicity of identical, matingly interconnectable basic construction elements, the improvement wherein each of said basic elements comprises a prismatic body with top, bottom and side faces, said body having coupling means for connecting same with a similar body, said coupling means including a plug projecting centrally from the top face and a complementary socket on the bottom face of the body, said set further including a multiplicity of bolt elements each having a shank portion and an enlarged head portion, said plug being formed with a throughgoing cylindrical axial bore of a size to receive said shank portion with close fit, said head portion being of a size to fit snugly into said socket with said shank portion projecting endwise beyond said plug.

2. The improvement defined in claim **1** wherein said head portion is provided with a blind bore of a cross-sectional dimension substantially corresponding to that of said shank portion.

3. The improvement defined in claim **1** wherein said socket has a depth substantially exceeding the height of said head whereby the plug of another basic element is insertable into said socket behind said head.

4. In a toy building set comprising a multiplicity of identical, matingly interconnectable basic construction elements, the improvement wherein each of said basic elements comprises a prismatic body with top, bottom and side faces, said body having coupling means for connecting same with a similar body, said coupling means including a plug projecting centrally from the top face and a complementary socket on the bottom face of the body, said set further including a multiplicity of rings and a multiplicity of pins of a size to fit tightly into said rings, said plug being formed with a throughgoing cylindrical axial bore of a size to receive rotatably any of said pins, each of said rings being of a size to fit rotatably into said socket, each of said pins being long enough to project endwise beyond said plug upon traversing said bore while having an end fitted into a ring received in said socket.

5. The improvement defined in claim **4** wherein said socket has a depth substantially exceeding the height of any of said rings whereby the plug of another basic element is insertable into said socket behind such ring.

6. In a toy building set comprising a multiplicity of identical, matingly interconnectable basic construction elements, the improvement wherein each of said basic elements comprises a prismatic body with top, bottom and side faces, said body having coupling means for connecting same with a similar body, said coupling means including a plug projecting centrally from the top face and a complementary socket on the bottom face of the body, at least one of said faces being provided with a central groove, said set further including a multiplicity of cover plates each having major surfaces substantially equal in area to said one of said faces and provided on one of said major surfaces with a projection of a size to be tightly received in said groove.

7. The improvement defined in claim **6** wherein said body is formed at said bottom face with a pair of recesses confronting each other across said socket, said recesses having a width equal to that of said groove, said projection being a rib of a size to be tightly received in said recesses.

8. In a toy building set comprising a multiplicity of identical, matingly interconnectable basic construction elements, the improvement wherein each of said basic elements comprises a prismatic body with top, bottom and side faces, said body having coupling means for connecting same with a similar body, said coupling means including a plug projecting centrally from the top face and a complementary socket on the bottom face of the body, said body being formed at said bottom face with a pair of recesses confronting each other across said socket, said set further including a multiplicity of other elements each having a projecting rib with ends dimensioned to fit tightly into said recesses, at least one side face of said body being formed with a groove having the same width as said recesses for close-fitting engagement by said rib.

9. In a toy building set comprising a multiplicity of identical, matingly interconnectable basic construction elements, the improvement wherein each of said basic elements comprises a prismatic body with top, bottom and side faces, said body having coupling means for connecting same with a similar body, said coupling means including a plug projecting centrally from the top face and a complementary socket on the bottom face of the body, said set further including a hub member of polygonal outline having studs radially projecting from respective sides of the polygon and further having a plug and a socket conforming to those of said basic elements and alignedly disposed on an axis transverse to the plane of said polygon, and wheel-forming means comprising a plurality of generally sectoral auxiliary members having sockets of a size to be snugly engaged by said studs, said auxiliary members having shapes complementing one another to form a substantially continuous wheel about said hub member.

10. The improvement defined in claim **9** wherein said set further includes hoop-forming means engageable with said auxiliary members to constitute an annular rim around said wheel.

11. The improvement defined in claim **10** wherein said polygon is a square and said hub member is provided with four of said studs spaced 90° apart, said hoop-forming means including two rim segments each extending

over an arc of substantially 180° and being shaped to engage a pair of said auxiliary members.

References Cited

UNITED STATES PATENTS

1,329,850	2/1920	Pye.	
1,894,061	1/1933	Sanders	46—25
2,093,341	9/1937	Reiche	46—19 X
2,780,028	2/1957	McNeill	46—19
2,861,388	11/1958	Favaretto	46—19 X
2,968,118	1/1961	Paulson	46—19

3,080,674	3/1963	Amici	46—19 X
3,234,683	2/1966	Christiansen	46—25

FOREIGN PATENTS

110,453	1917	Great Britain.
202,983	11/1924	Great Britain.
607,376	8/1948	Great Britain.

F. BARRY SHAY, *Primary Examiner.*

U.S. Cl. X.R.

46—25, 30