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(54) TOY BUILDING SET AND CONNECTOR THEREFOR

(71) I, ARTHUR FISCHER, a German citizen, of 7241 Tumlingen, Altheimer Strasse 219, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a toy-building set and a connector therefor.

It is known to connect building components such as lattice elements to one another by means of nut-and-bolt connections. However, establishing such connections is a complicated operation and requires a degree of skill which a small child may not be able to master. Moreover, the connection points must be accessible from both sides, to enable the nut to be placed on the bolt when the latter has been introduced into holes in the lattice elements and projects from the other side. In addition, it is often necessary to hold the nut with a spanner to prevent it from rotating. Yet, in many lattice structures, for example crane jibs, there is often insufficient space to allow the nut to be placed easily by hand or with the aid of a spanner.

While it is possible to firmly to connect lattice elements by nut-and-bolt connections in a non-rotatable manner, the resulting lattice structure acquires its rigidity by tightening alone and not necessarily by the arrangement and coordination of the individual lattice elements. This need not be a disadvantage in the completed lattice construction, but the playing child would then be prevented from acquiring a feel for the best way to arrange the members of a lattice structure which imparts to this structure the required rigidity in the same way as this is accomplished in the real-life pattern

which the child imitates. Thus, the child will not be able to recognise with any certainty the need for diagonal struts used in order to achieve the necessary rigidity if the lattice structure becomes rigid without struts, merely because the nut-and-bolt connections have been tightened. In this connection, attention should be drawn to the fact that modern mechanical instruction in schools today aims at letting the child acquire an understanding about technical facts and needs by discovering them as a result of his own initiative.

According to the present invention there is provided a toy building set including first and second building components and a connector comprising a head portion, a locking portion and an intermediate neck portion, the connector being rotatably engageable with a bore in the first building component with its head portion in contact with a stop associated with the bore and with its neck portion projecting beyond the bore so that its locking portion is non-rotatably engageable with the second building component.

In one preferred embodiment the locking portion of the connector, in use, passes through a bore in the second building component prior to being non-rotatably engaged therewith. Advantageously, the locking portion of the connector is provided with at least one outwardly directed projection. Preferably the locking portion of the connector is provided with two outwardly directed projections, the locking portion of the connector being of substantially circular cross-section and the projections being diametrically opposed. In this case, the bore in the second building component is provided with a matching groove for each of the projections, the or each projection passing, in use,

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through the groove(s) prior to the locking portion being non-rotatably engaged with the second building component.

5 In order to prevent the projections of the locking portion being turned too far during the locking operation, so that they would coincide again with the grooves of the bore of the second building component, the second building component is provided with means, 10 in the region adjacent its bore, for limiting relative rotation between the connector and the second building component.

This construction results in a simple locking action. The connector which engages the first 15 building component with its head portion is inserted in the bore of the second building component in such a way that the projections provided on the circumference of the locking portion can slip through the grooves provided 20 in the bore of the second building component. Then the counter is turned so that the projections of the locking portion engage the second building component. Inadvertent detachment during the pivoting of one building component 25 relative to the other cannot occur, since the connector itself does not rotate, such rotation being prevented by the friction between the connector and the bore of the second building component. While the connector can still be 30 rotated even under these conditions, larger forces are necessary to do so than those which occur by the pivoting of one building component.

35 In another preferred embodiment the locking portion of the connector engages a re-entrant groove in the second building component. In this case diametrically opposed recesses are provided on the locking portion of the connector, the recesses being preferably at right 40 angles to the projections.

These diametrically opposed recesses enable the insertion of the locking portion of the connector in a re-entrant groove of a toy building 45 brick as the recesses may be shaped to match the re-entrant shape of the groove. The projections provided on the locking portion do not hinder insertion in a re-entrant groove; indeed they offer the advantage, due to being positioned at right angles to the recesses, of enabling 50 the alignment of the connector such that its locking portion can easily be inserted in the re-entrant groove of a toy brick. The only condition is that, on insertion of the connector, the diametrically opposed projections point in 55 the longitudinal direction of the re-entrant groove. This will ensure that the recesses occupy the correct position relative to this groove.

60 Preferably, the neck portion has a transverse cross-sectional area intermediate that of the head portion and the locking portion, the neck portion engaging, in use, the bore of the first building component and projecting slightly therefrom.

65 This prevents the two building components

from being pressed against one another by the connector, due to unfavourable tolerances or for other reasons, with such force that relative rotatability is prevented, as one building component can freely rotate in the region of the 70 neck portion, the other building component remaining unaffected by such movements.

To facilitate insertion of the connector in the bore of the second building component, the free end of the locking portion is advantageously conically pointed. 75

The connector is locked by being turned after insertion in the bores of the building components. If the building components form 80 part of a toy building set which also comprises toy bricks having connecting tenons of polygonal transverse cross-section, a recess matching the cross-section of the connecting tenon may be provided at the end face of the connector head portion. To turn the connector, the 85 connecting tenon of a brick is then inserted in the recess provided on the end face of the head portion, and the brick is turned. In this application, the toy brick serves as a sort of twisting tool. On the other hand, if a building 90 component in the shape of an angle element is connected to another building component in such a way that the head portion of the connector is situated on the inside of the angle element, it will no longer be possible to insert 95 the connecting tenon of a toy brick in the recess of the connector because the toy brick would foul the free leg of the angle element.

When the first building component is an angle element it is advantageous if the head 100 portion of the connector projects from one leg of the angle element to a height equivalent to the length of the other leg of the angle element. In this case, the head portion of the connector projects beyond the inner face of one 105 leg of the angle element to a sufficient extent for its face to be level with the edge of the other leg of the angle element. Here, the connecting tenon of a toy brick can easily be inserted in the recess provided on the end face 110 of the connector, and the connector can be turned without the toy brick touching the free leg of the angle element.

In a further development of this design, the head portion may be provided with a bore in 115 which a shaft can be supported. The length of the head portion, and thus the length of its bore, permits such an angle element to support a shaft by one end only. Up to now this was not possible because angle elements 120 usually have comparatively thin legs so that a shaft had to be supported at both its ends.

In cases where toy bricks with connecting tenons are not available the head portion is 125 preferably provided with a wing-like handle. Advantageously the bore of a least one of the building components is recessed so as to accommodate the head portion of the locking portion of the connector.

The wing-like handle provided on the head 130

portion can be easily gripped even by small children, so that the connection can be made without difficulty and without resorting to additional tools. Possibly, however, a handle projecting from one particular side of part of a toy model may be undesirable. The provision of the recessed bore of the first building component permits the connector to be slipped through the bore from the other side so that the projections of the locking portion of the connector are accommodated in the recess. No part of the connector will then project beyond the outer face of the first building component.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings in which:—

Figure 1 shows a cross-section of two connected lattice elements;

Figure 2 shows in a plan the two connected elements of Figure 1, viewed in the direction of arrow II;

Figure 3 shows a lattice element connected to a re-entrant groove of a toy brick;

Figure 4 shows a cross-section of two other connected lattice elements;

Figure 5 shows two lattice elements connected by a connector having a wing-like handle;

Figure 6 is a partial cross-section of two angle elements connected to one another by means of a different form of connector; and

Figure 7 shows a connector inserted in a re-entrant groove of a toy brick.

Referring to the drawings, Figure 1 shows two lattice elements, a strut 2 and an angle element 3, connected to one another by means of a connector 1. The strut 2 has a stepped bore 4, in which engages a head portion 5 and a neck portion 6 of the connector 1. A recess 8 is provided in the end face of the head portion 5 in which recess a tool may engage for the purpose of turning the connector 1. This recess 8 may be a screwdriver slot; however, it may also be of polygonal shape, so that a connecting tenon of a brick from a toy building set can engage therein. The neck portion 6 extends from the head portion 5 over such a distance that it projects slightly beyond the surface of the strut 2. The locking portion 9 frictionally engages a bore 11 in the angle element 3, part of the locking portion 9 projecting from that side of the angle element 3 opposite the strut 2. At its circumference the locking portion 9 is provided with two diametrically opposed projections 10.

To connect the two lattice elements 2, 3, the connector 1 is inserted into the bore 4 of the strut 2 and is slipped into the bore 11 of the angle element 3, the projections 10 passing through matching grooves 12 (Figure 2). Then the connector 1 is turned about its longitudinal axis and the projections 10 engage the angle element 3. In order to prevent further rotation of the connector 1 and thus the risk of the projections 10 coinciding again with the

recesses 12, a projection 13 is provided adjacent the bore 11 of the angle element 3 (Figure 2). To facilitate insertion, the locking portion 9 is conically pointed at 14.

In the embodiment of Figure 3 a strut 2 is connected to a toy building brick 17 by a connector 1. The head portion 5 and neck portion 6 of the connector 1 engage in a bore in the strut 2 in a similar manner to that of the embodiment of Figures 1 and 2. The locking portion 9 of the connector, however, is formed with recesses 15 so that it can engage a re-entrant groove 16 of the brick 17. The recesses 15 are arranged to be at right angles to the projections 10 so that after introduction into the groove 16 in the position shown in Figure 3, the connector 1 can be turned through 90° to lock itself against the walls of the groove 16.

Figure 4 shows a connector 1, identical to that shown in Figure 3, connecting two struts 2 and 3 together. The strut 3 is provided with a bore 11 and a recess 19, in which latter the projections 10 engage so that no part of the connector projects outwardly beyond the side faces of the struts 2 and 3.

The head portion 5 of the connector 1 of Figure 5 is provided with a wing-like handle 18 which may be used to turn the connector. Apart from this handle 18 and the projections to being of different shape this connector 1 is the same as that of Figs 3 and 4. If it is in the way on the outside of the lattice structure, the connector 1 is slipped into the bores 4, 11 from the inside of the lattice structure and is then locked. Here, the projections 10 may be accommodated in the recess 19 so that the locking portion 9 does not undesirably project beyond the outer surface.

In the arrangement illustrated in Figure 6, the head portion 5 of a connector 1 projects beyond the inner surface 20 of a leg 21 of an angle element 22 and extends as far as the edge 23 defining the end of the other leg 24 of the angle element 22. The locking portion 9 of the connector 1 projects beyond the surface 25 of the angle element 22, through the bore 11 of an angle element 3 and into locking engagement therewith.

Figure 7 shows a connector similar to that shown in Figure 6, the locking portion of which engages with its recesses 15 a re-entrant groove 16 of a toy brick, 17. The toy brick 17 has on its end face 27 a re-entrant connecting tenon 28 the cross-section of which matches the cross-section of a recess 8 provided in the end face of the head portion 5. A shaft 30 is supported in a bore 29 of the head portion 5. An angle element (not shown) can be fastened to the brick 17 in a similar manner to that in which the angle element 22 is connected to element 3 as described above with reference to Figure 6.

It will be apparent that, in the above described embodiments, the connector engages

rotatably one lattice element and is locked in the other. Thus, with this type of connection, one lattice element remains rotatable relative to the other even after the connection has been made. Whilst making a lattice structure, the playing child will, therefore, soon recognise that further lattice elements, for example diagonal struts, are necessary in order to make the structure rigid. The connection is, however, without play in the direction of the axis of the connector so that the risk of obtaining a crooked lattice structure is negligible.

It will be obvious that the scope of the invention is not limited to the details of the above described embodiments. It is possible, for example, to provide the locking portion with, instead of projections 10, a short thread to engage a matching thread in the bore of the element 3. In this case inadvertent detachment is prevented by tightening the threaded portions firmly.

WHAT I CLAIM IS:—

1. A toy building set including first and second building components and a connector comprising a head portion, a locking portion and an intermediate neck portion, the connector being rotatably engageable with a bore in the first building component with its head portion in contact with a stop associated with the bore and with its neck portion projecting beyond the bore so that its locking portion is non-rotatably engageable with the second building component.

2. A toy building set as claimed in claim 1, in which the locking portion of the connector, in use, passes through a bore in the second building component prior to being non-rotatably engaged therewith.

3. A toy building set as claimed in claim 1, in which the locking portion of the connector is engageable with a re-entrant groove in the second building component.

4. A toy building set as claimed in any one of claims 1—3, in which the locking portion of the connector is provided with at least one outwardly directed projection.

5. A toy building set as claimed in any one of claims 1—4, in which the locking portion of the connector is provided with two outwardly directed projections.

6. A toy building set as claimed in claim 5, in which the locking portion of the connector is of substantially circular cross-section and the projections are diametrically opposed.

7. A toy building set as claimed in any one of claims 4—6 when appendant to claim 2, in which the bore in the second building component is provided with a matching groove for

each of the projections, the or each projection passing, in use, through the groove(s) prior to the locking portion being non-rotatably engaged with the second building component.

8. A toy building set as claimed in claim 7 in which the second building component is provided with means, in the region adjacent its bore, for limiting relative rotation between the connector and the second building component.

9. A toy building set as claimed in any one of claims 1—8 in which the neck portion has a transverse cross-sectional area intermediate that of the head portion and the locking portion, the neck portion engaging, in use, the bore of the first building component and projecting slightly therefrom.

10. A toy building set as claimed in any one of claims 1—9, in which the free end of the locking portion of the connector is conically pointed.

11. A toy building set as claimed in any one of claims 1—10, in which the free end face of the head portion of the connector projects beyond that face of the first building component remote, in use, from the second building component.

12. A toy building set as claimed in claim 11, in which the first building component is an angle element and the head portion of the connector projects from one leg of the angle element to a height equivalent to the length of the other leg of the angle element.

13. A toy building set as claimed in claim 11 or claim 12, in which the head portion of the connector has a bore of supporting a shaft.

14. A toy building set as claimed in any one of claims 1—13 in which the head portion of the connector is provided with a wing-like handle.

15. A toy building set as claimed in any one of claims 1—14 in which the bore in the first building component is formed with a stepped portion so as to accommodate the head portion of the connector.

16. A toy building set as claimed in claim 2 or any one of claims 4—15, in which the bore in the second building component is so formed that, in use, the locking portion of the connector lies substantially flush therewith.

17. A toy building set as claimed in any one of claims 1—16, in which diametrically opposed recesses are provided on the locking portion of the connector.

18. A toy building set as claimed in claim 17 in which the recesses are at right angles to the projections.

19. A toy building set substantially as hereinbefore described with reference to, and as illustrated by, the accompanying drawings.



rotatably one lattice element and is locked in the other. Thus, with this type of connection, one lattice element remains rotatable relative to the other even after the connection has been made. Whilst making a lattice structure, the playing child will, therefore, soon recognise that further lattice elements, for example diagonal struts, are necessary in order to make the structure rigid. The connection is, however, without play in the direction of the axis of the connector so that the risk of obtaining a crooked lattice structure is negligible.

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3. A toy building set as claimed in claim 1, in which the locking portion of the connector is engageable with a re-entrant groove in the second building component.

4. A toy building set as claimed in any one of claims 1—3, in which the locking portion of the connector is provided with at least one outwardly directed projection.

5. A toy building set as claimed in any one of claims 1—4, in which the locking portion of the connector is provided with two outwardly directed projections.

6. A toy building set as claimed in claim 5, in which the locking portion of the connector is of substantially circular cross-section and the projections are diametrically opposed.

7. A toy building set as claimed in any one of claims 4—6 when appendant to claim 2, in which the bore in the second building component is provided with a matching groove for

each of the projections, the or each projection passing, in use, through the groove(s) prior to the locking portion being non-rotatably engaged with the second building component.

8. A toy building set as claimed in claim 7 in which the second building component is provided with means, in the region adjacent its bore, for limiting relative rotation between the connector and the second building component.

9. A toy building set as claimed in any one of claims 1—8 in which the neck portion has a transverse cross-sectional area intermediate that of the head portion and the locking portion, the neck portion engaging, in use, the bore of the first building component and projecting slightly therefrom.

10. A toy building set as claimed in any one of claims 1—9, in which the free end of the locking portion of the connector is conically pointed.

11. A toy building set as claimed in any one of claims 1—10, in which the free end face of the head portion of the connector projects beyond that face of the first building component remote, in use, from the second building component.

12. A toy building set as claimed in claim 11, in which the first building component is an angle element and the head portion of the connector projects from one leg of the angle element to a height equivalent to the length of the other leg of the angle element.

13. A toy building set as claimed in claim 11 or claim 12, in which the head portion of the connector has a bore of supporting a shaft.

14. A toy building set as claimed in any one of claims 1—13 in which the head portion of the connector is provided with a wing-like handle.

15. A toy building set as claimed in any one of claims 1—14 in which the bore in the first building component is formed with a stepped portion so as to accommodate the head portion of the connector.

16. A toy building set as claimed in claim 2 or any one of claims 4—15, in which the bore in the second building component is so formed that, in use, the locking portion of the connector lies substantially flush therewith.

17. A toy building set as claimed in any one of claims 1—16, in which diametrically opposed recesses are provided on the locking portion of the connector.

18. A toy building set as claimed in claim 17 in which the recesses are at right angles to the projections.

19. A toy building set substantially as hereinbefore described with reference to, and as illustrated by, the accompanying drawings.



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ABEL & IMRAY,
Chartered Patent Agents,
Northumberland House,
303—306 High Holborn,
London, W.C.1.

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