

Sept. 2, 1969

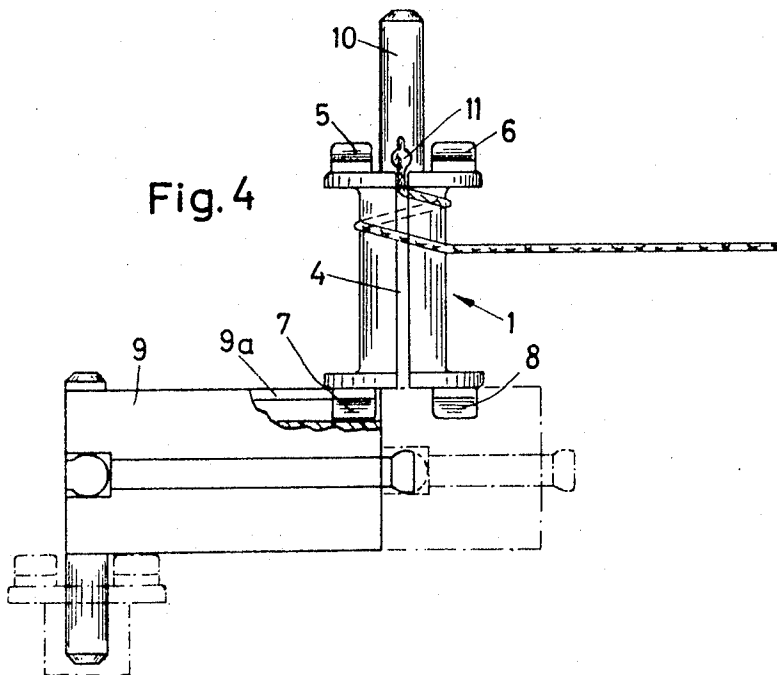
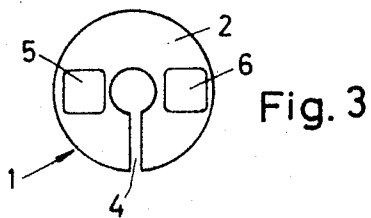
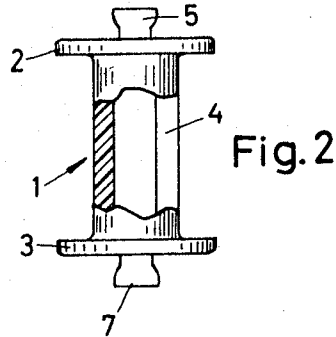
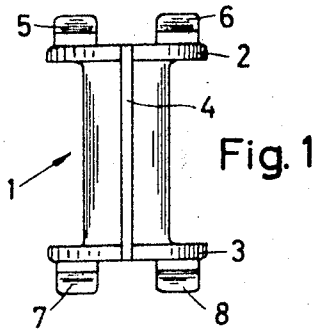
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STRUCTURAL ELEMENT FOR A TOY ASSEMBLY KIT

Filed Sept. 19, 1966

3 Sheets-Sheet 1



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Fig. 11

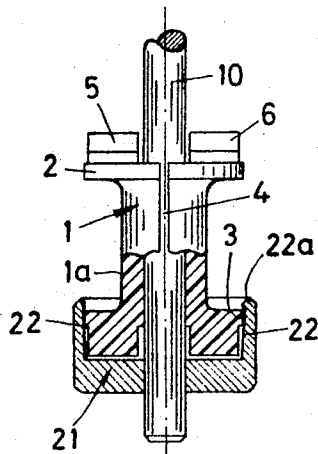


Fig. 12

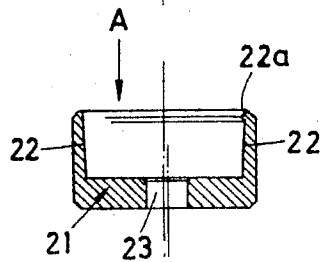
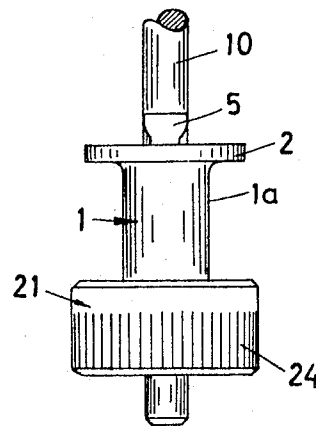


Fig. 13

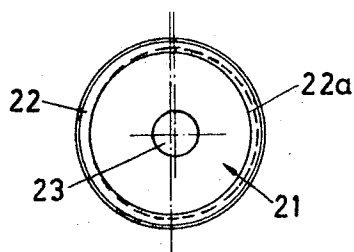


Fig. 14

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## STRUCTURAL ELEMENT FOR A TOY ASSEMBLY KIT

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F 49,205

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15 Claims

### ABSTRACT OF THE DISCLOSURE

My invention resides in the provision of a pulley member in an assembly kit of the type which comprises building blocks provided with at least one undercut elongated groove. Such pulley member comprises a tubular center portion and radially extending flange portions at opposite ends of the tubular center portion. The radially extending flange portions are provided with oppositely directed axial end faces. At least one of the axial end faces is provided with a connecting head which extends in axial direction beyond this end face and is adapted to be at least partly received in an undercut groove of a building block to which the pulley member is to be secured. The head comprises a neck portion which is rigid with the axial end face in question and securing means which includes a securing portion of a cross-section greater than the neck portion.

The present invention relates to an assembly kit and, more particularly, to a structural element used in an assembly kit of the type comprising building blocks provided with at least one undercut elongated groove.

Building blocks are known from my prior applications which are provided in one or more faces thereof with elongated undercut grooves, that is with grooves which diverge inwardly from the respective face in which they are formed. Such blocks are connected to one another and to auxiliary building elements by means of connecting heads, frequently integral with the blocks or the auxiliary building elements, which are configured in a manner complementary to the cross-section of the grooves, i.e. which have a relatively narrow neck portion connected to a building block or an auxiliary building element and a wider head portion which is received in one of the grooves of another block with the narrow neck portion extending outwardly beyond the groove. While kits utilizing such building blocks can be employed in the construction of many and diverse projects, such as buildings, trucks, and the like the versatility of such kits can be further increased if they are provided with one or more pulleys for ropes which are to be used for motion-transmitting purposes.

It is therefore a general object of the present invention to increase further the versatility of assembly kits of the general type outlined above and known from some of my prior applications.

A more specific object of the invention is to provide a pulley member which can be utilized in assembly kits of the above-mentioned type.

A further object of the invention is to provide such a pulley member which can be rigidly but releasably secured to other building blocks or elements in the assembly kit.

A concomitant object of the invention is to provide a pulley member of the type described which can be reliably secured to a shaft, or which can have a shaft reliably

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secured thereto, without axial shifting of one relative to the other or rotational displacement of one relative to the other.

Briefly stated, one feature of my invention resides in the provision of a pulley member in an assembly kit of the type which comprises building blocks provided with at least one undercut elongated groove. Such pulley member comprises a tubular center portion and radially extending flange portions at opposite ends of the tubular center portion. The radially extending flange portions are provided with oppositely directed axial end faces. At least one of the axial end faces is provided with a connecting head which extends in axial direction beyond this end face and is adapted to be at least partly received in an undercut groove of a building block to which the pulley member is to be secured. The head comprises a neck portion which is rigid with the axial end face in question and securing means which includes a securing portion of a cross-section greater than the neck portion.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a top-plan view of a pulley member in accordance with the present invention;

FIG. 2 is a view similar to that of FIG. 1, but rotated through 90°;

FIG. 3 is an end view of the embodiment shown in FIG. 1;

FIG. 4 shows the embodiment of FIG. 1 in conjunction with a shaft member and secured to auxiliary building blocks;

FIG. 5 is a view similar to FIG. 1, but showing another embodiment of the invention;

FIG. 6 is a view similar to FIG. 3 but of the embodiment shown in FIG. 5;

FIG. 7 is a view substantially similar to that of FIG. 2, but again showing the embodiment of FIG. 5;

FIG. 8 shows a pulley in accordance with the present invention in another embodiment and connected to a building block;

FIG. 9 is a view showing the embodiment of FIG. 5 connected to a building block and disconnected therefrom;

FIG. 10 is a top view of the illustration shown in FIG. 9;

FIG. 11 is a partially sectioned view of another embodiment of the invention, showing a compressing means in cooperation with a pulley member as shown in the preceding drawings;

FIG. 12 is a view similar to that of FIG. 11 but rotated through 90°;

FIG. 13 is an axial view through the compressing means shown in FIG. 11; and

FIG. 14 is a view of the embodiment of FIG. 13 as seen in the direction of the arrow A.

Discussing now the drawing in detail, and firstly FIG. 1 thereof, it will be seen that there is shown therein and having at the opposite ends thereof respective a pulley member 1 having a tubular central portion flanges 2 and 3. One of the flanges, namely in the illustration flange 3 is provided with a slot 4 which extends over the entire length of the tubular central portion also. Each of the flanges 2, 3 is provided with two diametrically opposite connecting heads 5, 6 and 7, 8 having a configuration as shown in FIG. 2, that is being undercut in the sense that a wider portion located spaced

from the respective flange is connected to the same by a narrower neck portion. These connecting heads can be utilized to secure the pulley member 1, which is shown in FIG. 3 in an end view of the embodiment in FIG. 1 to building blocks of the type which are provided with longitudinally extending grooves having a cross section complementary to that of the heads 5, 6 and 7, 8. So connected, as for instance illustrated in FIG. 4 the pulley member is secured against forces tending to separate it from the respective building blocks and acting in a direction transversely of the elongation of the respective groove.

FIG. 4 shows by way of an example how a building block 9 is secured to one of the heads, namely the head 7 of the pulley member and it will be seen that the head 7 is engaged in the undercut groove 9a of the building block 9. As indicated in chain lines, an additional building block can be connected to the building block 9 by way of similar connecting heads provided on the respective building blocks. This is indicated only for information as it does not form a part of the present invention. A shaft 10 is inserted through the center opening of the pulley member 1 and this is simplified by the provision of the slot 4 which permits resilient deflection of the material of pulley member 1. As shown, slot 4 simultaneously serves for fastening the end of the rope or belt 11 which is connected to the pulley member 1.

Since it is under some circumstances not possible, for instance because of a lack of space, to insert the connecting head properly into the groove of another building block, such as the block 9, or for cases in which a greater spacing is to be maintained between the pulley member and the building block than would be possible with the embodiment of FIG. 1, the embodiment of FIG. 5 shows a modification of the inventive concept. The pulley member shown in FIG. 5 is designated with reference numeral 101 and is provided again with the connecting heads 102, this designation having been utilized to designate all of the connecting heads in this embodiment. Each of the connecting heads in this embodiment, however, is provided with a projection 103 which extends in axial direction of the pulley member 101. It will be noted that the projections 103 have a cross-section which does not exceed the cross-section of the neck portion of the connecting head 102 so that the connecting portions 103 can be received in the narrower part of the grooves 105 (see FIG. 8) of building blocks to which the pulley member 101 is to be secured, in the same manner in which the neck portion of the connecting head 102 is normally received in these grooves 105. Thus, these portions 103 can be inserted into the grooves 105 transversely of the elongation thereof to hold the pulley member 101 to any other auxiliary element or building block provided with such grooves. The connecting head 102 then abuts the face of the respective building block to which it is to be secured with the shoulders 110 formed at the base of the projection 103. The latter, it should be noted, is of a depth as seen in axial direction of the pulley member 101 so that it, together with the depth of the connecting head 102 seen in the same direction, is still receivable in the grooves 105 if the connection is to be made in the manner described with reference to the embodiment of FIGS. 1-4. FIGS. 6 and 7 show different views of the embodiment of FIG. 5 for purposes of explanation.

The embodiment of FIG. 8 differs from that of FIG. 5 in that the projection 103 is undercut in a T-shape as indicated with reference numeral 111. This serves to provide a better retention of the projection 103 in the respective groove 105 against forces acting in axial direction of the pulley member 101 and tending to remove projection 103 from the groove 105. Of course, this arrangement will not be able to withstand forces of such magnitude as the embodiment of FIGS. 1-4.

FIGS. 4 and 5 illustrate, by way of example, how the embodiment of FIGS. 5-7 can be utilized in constructing certain building elements. The shaft on which the pulley member 101 is mounted is designated with reference numeral 104 whereas the building blocks 107 are shown to be provided with undercut grooves 105. A rotary handle connected to the shaft 104 on a side of the building blocks 107 opposite that on which the pulley member 101 is located, is designated with reference numeral 109 and provided with a peripheral annular groove 108. Obviously, if the pulley member 101 is disengaged from one of the grooves 105, as shown in the full-line position of FIG. 9, that is if it is moved towards the right as indicated by the double-headed arrow a, turning of the handle 109 will cause rotation of the pulley member 101. On the other hand, if the pulley member 101 is moved to the left in the direction indicated by the double-headed arrow a and the projections 103 engage in the respective groove 105, then such rotation is made impossible and the pulley member 101 is then arrested. FIG. 10 shows a top view of the embodiment of FIG. 9 for greater clarity.

The preceding embodiments are highly advantageous, and particularly the provision of slots 4 and 104, respectively, makes possible a resilient deflection of the material of the pulley member 1 and 101, respectively, on insertion of a shaft member therethrough. However, it has been found that on occasion axial shifting of the pulley member relative to the shaft member or even rotational displacement of the two members relative to one another takes place. To overcome this I provide, in accordance with the embodiment shown in FIGS. 11-14, a compressing means for use in conjunction with the pulley member 1. Reference numerals 2 and 3 again indicate the respective flanges provided on the pulley member, reference numeral 4 indicates the axial slot, reference numerals 5 and 6 indicate the connecting heads carried by one of the flanges, namely the flange indicated with reference numeral 2. To compress the pulley member 1 and to thereby decrease the width of the slot 4 and cause the material of the pulley member 1 to engage the shaft 10 more firmly so as to prevent axial or rotation slippage, a compressing member 21 is provided of generally annular configuration having a through-going center bore and a larger-diameter portion concentric with the center bore. As shown in FIG. 13 the peripheral wall surrounding the larger-diameter bore tapers inwardly in the direction away from the open end of the member 21; that is, the cross-section of the larger-diameter bore converges in the direction towards the smaller-diameter bore 23 through which the shaft 10 passes. Obviously, when the member 21 is placed over one of the flanges, in the embodiment of FIG. 11 the flange 3, the material of member 1 will be compressed in such a manner that the slot 4 will decrease in width and the member 1 will engage the shaft 10 more intimately to prevent axial or rotational slippage relative thereto.

As indicated particularly in FIG. 14 the compressive action can be increased further if the smaller-diameter opening 23 for passage of the shaft 10 is located slightly eccentrically. To provide a better engagement of the inner surface of the member 21 with the outer peripheral face of the respective flanges 2 and 3, the member 21 may be provided with a collar 22a at the open end of the larger-diameter bore and this increases frictional engagement with the respective flange and when the member 21 has been placed over such flange and completely encloses the same, snaps into position to prevent undesired removal of the member 21. The outer peripheral face of the member 21 can be knurled, as indicated with reference numeral 24, to provide a better grip.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of assembly kits differing from the types described above.

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While the invention has been illustrated and described as embodied in an assembly kit, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, constitute fairly the essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a toy assembly kit comprising building blocks each block including an undercut elongated groove, a pulley member comprising a tubular center portion; radially extending flange portions at opposite ends of said tubular center portion and provided with oppositely directed axial end faces; and a one connecting head provided on at least one of said axial end faces and extending in axial direction therebeyond, said connecting head being at least partly received in an undercut groove of a building block to which said pulley member is to be secured and comprising a neck portion rigid with said one axial end face and securing means including a securing portion of a cross-section greater than said neck portion.
2. A structure as defined in claim 1, wherein at least said connecting head consists of synthetic plastic material.
3. A structure as defined in claim 1; and further comprising an additional connecting head provided on the other of said axial end faces and similar to the first-mentioned connecting head.
4. A structure as defined in claim 1; said securing means further comprising a projection extending from said securing portion in axial direction of said pulley member and away from said axial end face thereof.
5. A structure as defined in claim 4, wherein said projection has a maximum cross-sectional dimension substantially corresponding to the cross-section of said neck portion.
6. A structure as defined in claim 4, wherein said projection is undercut and is of substantially T-shaped cross-sectional configuration.
7. A structure as defined in claim 4, wherein said projection has an end face spaced from said securing portion, the spacing between said one axial end face and

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said end face of said projection not exceeding the depth of an undercut groove in a building block to which said pulley member is to be secured as seen in direction transversely of the elongation of such groove.

8. A structure as defined in claim 1, wherein said pulley member is provided with an axial slit in one of said flanges and extending into said tubular center portion.

9. A structure as defined in claim 8, wherein said slit extends from one to said other axial end face.

10. A structure as defined in claim 8; and further comprising compressing means for radially compressing said one flange so as to reduce the width of said slit.

11. A structure as defined in claim 10, wherein said compressing means is a disk-shaped member provided with an axial opening having a smaller-diameter first portion extending from one toward the other axial end face, and a larger-diameter second portion extending from the other toward said one axial end face and communicating with said first portion, the cross-sectional diameter of said second portion at most approaching the cross-sectional diameter of the respective flanges.

12. A structure as defined in claim 11, wherein said first portion is eccentric with reference to said second portion.

13. A structure as defined in claim 11, wherein the cross-sectional area of said larger-diameter second portion tapers in the direction toward said first portion.

14. A structure as defined in claim 11; and further comprising a radially inwardly extending collar portion at that axial end of said member which is located remote from said first portion of said opening.

15. A structure as defined in claim 11, wherein said disk-shaped member has an outer circumferential face, and wherein said outer circumferential face is knurled for facilitating gripping of said member by the hand of an operator.

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