RODS HAVING MEANS FOR DIRECT CROSS-CONNECTING, COMBINED WITH SEPARATE ELEMENTS FOR CONNECTING SAME

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ABSTRACT

A structural toy which comprises a plurality of flat rods equipped with grooves along the longitudinal edges having widths corresponding with the thickness of the flat rods and depths corresponding with a quarter of their width. The flat rods have first perforations disposed along their longitudinal axis, adapted for receiving the ends of crosswise connectable further flat rods. The first perforations comprise three at least partly circular sections passing into each other and having diameters and center spacings corresponding with one half of the width of the flat rods. The flat rods have circular second perforations at a distance from their ends corresponding with one half of the width of the flat rods which have a diameter corresponding with one half of the width of the flat rods for the reception of coupling members, and the coupling members have at least one projection adjusted to the diameter of the first and second perforations in the flat rods.

5 Claims, 17 Drawing Figures
Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

A

T = A/2
D = A
B = 2A
G = 4A
L = 8A
N = S
RODS HAVING MEANS FOR DIRECT CROSS-CONNECTING, COMBINED WITH SEPARATE ELEMENTS FOR CONNECTING SAME

The present invention relates to a structural toy with flat rods having marginal recesses and perforations and complementary coupling elements. The basic concept of the present invention is disclosed in the German Pat. Nos. 207,086 and 670,756 which represent the status of the prior art, in which the individual possibilities of playing are already inviting, yet still comparatively limited. This applies also for several variations of the structural toy disclosed in the mentioned German Pat. No. 207,086.

It is one object of the present invention to provide a structural toy, in which the possibilities of playing of the known systems are combined together and are extensively expanded by flat rods designed in accordance with the present invention, as well as by the addition of coupling elements adjusted to the flat rods and by complementary parts.

It is another object of the present invention to provide a structural toy which is characterized essentially by the combination of the following features which are partly known:

a. The flat rods are equipped with grooves in the longitudinal edges, the width of which corresponds with the thickness of the flat rods and the depth of which corresponds with about a quarter of the width of the flat rods.

b. The flat rods are equipped with perforations disposed on their longitudinal axis for the reception of the ends of cross-wise connectable further flat rods, which reception is brought about by insertion and rotation. The further flat rods have preferably three partly circular sections which extend into each other with diameters corresponding with about the half of the flat rod width and center distances.

c. The flat rods contain circular perforations at a distance from their ends corresponding with about the half width of the rods and with diameters corresponding with about the half width of the flat rods for the reception of coupling elements, which have at least one projection adjacent to the diameter of the perforations in the flat rods.

By the design of the flat rods in accordance with the feature (a), it is brought about, that the flat rods can be united together merely by gripping into each other with their marginal grooves, whereby the flat rods inserted into the grooves are disposed higher for about a half width of the flat rods, than the first flat rods. Due to the design of the flat rods in accordance with the feature (b) either one, two or three flat rods can be joined in equal height at a right angle into a fourth rod by insertion and rotation for 90°. The circular perforations at the ends of the flat rods, in accordance with the feature (c), permit, jointly with the perforations in accordance with the feature (b), to connect together simultaneously up to five flat rods in the same direction or at a right angle to each other with the assistance of the complementary coupling elements.

In an advantageous embodiment of the structural toy designed in accordance with the present invention the coupling elements comprise joint bars with a projection capable of being caught resiliently snapper-like in the circular perforations of the flat rods and a circular perforation with a diameter equal to that of the perforations in the flat rods, whereby the projection and the perforation have a center spacing corresponding with about the double spacing of the end perforations in the flat rods. This manner of using the coupling elements always in pairs results due to double joint bars a particularly stable connection of the flat rods, first of all in the direction cross-wise to the plane of the flat rods, yet is also particularly well suitable for the reception of tie forces in the longitudinal direction of the rod axis.

Due to the snapper-like resilient formation of the projections, the coupling elements can be easily inserted and released again without resorting to any tool. In addition four of these coupling elements can unite together three or four flat rods such, because they are inserted at a right angle towards each other.

For many connection places coupling elements suffice, however, in form of joint bars to be used individually only with two projections capable of being caught resiliently snap-like in the circular perforations of the flat rods, which projections have a center spacing corresponding with the double marginal distance of the end perforations in the flat rods. This embodiment of the connection parts can be applied or released, and in particular in a still simpler manner, as the above described double joint bars, since only one coupling element is required for one connection.

The grooves and perforations, as well as the projections on the flat rods, coupling elements, supplement- and connection-parts in accordance with a raster system.

In a further development of the present invention, advantageously, also supplement-flat rods of the same width and strength, however with deviating lengths, which correspond the multiple of the raster measure, and with a different arrangement of the marginal grooves and perforations are used. In particular a rod with half of the length of the basic flat rod is suitable, both pairs of grooves have half of the normal distance. The ends of the flat rods can form a right angle, yet can be designed also of half-circular shape. While the rectangular ends permit only straight or a right angle connection of further rods by means of the coupling members, rods with round ends result in the possibility of connections at any chosen angles, as well as in swingable connections.

Finally, it is within the scope of the present invention to provide connection parts with the same strength of the flat rods, which are formed as junction members with three or more circular perforations with diameters corresponding with the half width of the flat rods and with marginal spacings corresponding with the half width of the flat rods. By means of such junction members flat rods can be built to frames and frameworks with a great carrying capacity.

It is to be understood that the structural toy in accordance with the present invention can be supplemented by the use of round rods or tubes as axes and shafts, running wheels, gears and the like, in order to create also movable models of any type, whereby the possibilities of playing are multiplied. As a further advantageous possibility of design, the flat rods can be used as ties for railway systems.

With these and other objects in view, which will become apparent in the following detailed description,
the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a flat rod designed in accordance with the present invention with two complementary coupling elements provided one-sided at the ends, whereby one coupling element extends in the axis of the rod and the other coupling element extends at a right angle to the axis of the rod;

FIG. 2 is a section along the lines II—II of FIG. 1;

FIG. 3 is a side elevation of coupling elements to be used in pairs in a position for connection of the ends of two flat rods;

FIG. 4 is a section along the lines IV—IV of FIG. 3;

FIG. 5 is a perspective view of two flat rods, which are connected perpendicularly toward each other by insertion of the end of one flat rod into the center recess of the other flat rod and following rotation for 90°.

FIG. 6 is a perspective view of three flat rods connected by insertion and rotation of the end of two flat rods in both lateral sections of the center recess of the third flat rod;

FIGS. 7 to 13 are side elevations of seven different complementary flat rods of equal cross-sections, yet of different lengths and in the arrangement of the recesses and perforations; and

FIGS. 14 to 17 are side elevations of four different connection parts formed as junction members.

Referring now to the drawings, and in particular to FIGS. 1–4, the structural toy, designed in accordance with the present invention, comprises substantially flat rods 1, 1' and 1" and coupling elements 5a and 5b. The flat rods 1, having the length L and the width B, are equipped in accordance with the plan shown in the drawings with grooves 2 and 2' at the distance 2A from the rod ends at the longitudinal edges, a center recess 3 with three partly circular sections 3', 3" and 3"' and leading into each other and two further circular perforations 4 and 4' at the distance A from the rod ends. As it appears from the plan, all circular perforations 3', 3", 3"', 4 and 4' have a diameter D which is equal with the basic measure A, and the circular perforations 3', 3", 3"' have center spacings equal to A. Grooves 2 and center recesses 3 serve as connecting means for directly connecting the flat rods to one another. The grooves 2 and 2' have the same width N, as well as the rod thickness S and a depth T corresponding with the half of the measure A/2. As means for coupling of the ends of flat rods 1, 1', 1" etc. extending in the same direction or perpendicularly to each other, two differently formed coupling elements 5a and 5b are provided. The coupling elements 5a shown in FIGS. 1 and 2 are designed as joint bars to be inserted from one side and equipped with two snap-type, resilient projections 6 and 6' capable of being inserted into the circular perforations of the flat rods with a center distance 2A corresponding with the double edge distance of the perforations 4 and 4' from the rod ends. The coupling elements 5b to be used always in pairs and shown in FIGS. 3 and 4 in its operative position have however only one projection 6 capable of being inserted resiliently snap-like into the perforations of the flat rods and has a circular recess 7 which has the same diameter (D = A) as the perforations in the flat rods, whereby the center distance between the projection 6 and the passage 7 corresponds likewise the double edge distance 2A of the end perforations 4 and 4' in the flat rods.

FIGS. 5 and 6 show in perspective views two possibilities for selective connection of either one flat rod 1' or two flat rods 1' and 1" by feeding one rod end into the center-perforation 3' to 3"' and rotation with the grooves 2, 2' for 90° either in the center part 3' or into the two outer parts 3' and 3"' of the perforation 3 in the flat rod 1. The supplementary-flat rods 7, 8, 9, 10, 11, 12 and 13 shown in FIGS. 7–13 have all the same cross-section dimensions B and S as the flat rods 1. Their lengths correspond multiply of the basic measure (A = L/B), while the arrangement and the number of the recesses 18 and perforations 19 with equal dimensions N and T and D, respectively, as with the flat rods 1 corresponding with their special uses can deviate from those of the flat rod 1. Thus the supplementary-flat rods 7 and 8 with the heights A and 2A determined essentially for the production of individual play connections between two flat rods 1. Of the supplementary flat rods 9 and 10 with the length 4A equal with the half length of the normal flat rods 1 with the length L = 8A serve the rods 9 mainly for the production of straight outer edges of walls, which consist of normal flat rods disposed standing on top of each other and set off in the unit. The supplementary-flat rods 10 permit an additional building on the free ends of two normal flat rods 1, which have entered with one end into the two outer parts 3' and 3"' of a recess in a normal flat rod 1. By joining of two normal flat rods 1 and supplementary-flat rods 10 in a direction perpendicular to each other wall-like and tower-like structural works of rectangular cross-section and comparatively small distance of the longitudinal wall can be formed.

The supplementary-flat rods 11 with a different distance 2A and 4A of the grooves in both length-sides can be advantageously used for the connection of normal flat rods 1 and supplementary-flat rods 10. The supplementary flat rods 12 of 1 1/2 length 12A of the normal flat rods 1 have fields disposed adjacent to each other with three adjacent partly circular perforations 20', 20" and 20"' each with a diameter D and make possible thereby the rotation of up to six further flat rods extending in the same plane perpendicularly to the supplementary-rod 12. They are suitable further for the simple bridging over of smaller openings in structural bodies of any type. FIG. 13 shows by example a further supplementary-flat rod 13, the ends of which are rounded with radii R = 1/2 A about the center of the perforation 19 with the diameter D and thus make possible the connection with other flat rods with the use of coupling elements 5a or 5b at any angles.

In FIGS. 14–17 finally by example four connection parts having a thickness S equal with that of the flat rods and with three or more circular or partly circular perforations 21 and 22, respectively, with equal diameter D of the perforations in the flat rods and center distances 2A as well as, under circumstances a number of edge grooves 18 with equal dimensions N and T as in the flat rods 1 at locations determined by the raster dimension A. In the connection part 16 the upper two of the five perforations 21 are disposed at the center
between the three lower perforations. The perforations having all equal center distances 2A in this connection part make possible the erection of frame-work units with diagonals forming triangles with equal arms. All connection parts can be inserted as point of junction between the flat rods and make possible thereby the erection of larger spacious frame-works from the flat rods 1 and under circumstances supplementary-flat rods in frame- or frame-work-units with correspondingly high carrying capacity in the form of towers and doors, bridges, cranes or the like.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense.

I claim:

1. A structural toy comprising
   a plurality of flat rods equipped with connecting means including marginal recesses as well as perforations,
   at least two of said flat rods being each equipped with grooves along the longitudinal edges constituting said marginal recesses,
   the width of said grooves corresponding with the thickness of said flat rods and the depth thereof corresponding with a quarter of the width of said flat rods,
   said perforations including first perforations disposed along the longitudinal axis of each of said two rods, said perforations being adapted for receiving the ends of further flat rods for connection by means of said grooves,
   said first perforations comprising three at least partly circular sections passing into each other and having diameters and center spacings corresponding with one half of the width of said flat rods,
   said flat rods having circular second perforations at a distance from their ends corresponding with one half of the width of said flat rods,
   said second perforations having a diameter corresponding with one half of the width of said flat rods for the reception of coupling elements, and separate means for coupling said rods, said means constituting said coupling elements, each of said coupling elements having at least one projection adjusted to the diameter of said first and second perforations in said flat rods.

2. The structural toy, as set forth in claim 1, wherein said coupling elements comprise joint bars including said one projection,
   the latter is snapper-like resiliently insertable into said circular perforations of said flat rods, and
   said coupling elements have in addition a circular perforation of a diameter equal with that of said perforations in said flat rods, whereby said projection and said perforation has a center distance corresponding with the double edge distance of said second perforations in said flat rods.

3. The structural toy, as set forth in claim 1, wherein said coupling elements comprise joint bars including two of said projections,
   the latter are snapper-like resiliently insertable into said circular perforations of said flat rods, and
   said projections have a center distance corresponding with the double edge distance of said second perforations in said flat rods.

4. The structural toy, as set forth in claim 1, which includes
   a plurality of supplementary flat rods of equal width and thickness, yet of different lengths, which correspond with total multiples of a basic measure, and with a different arrangement of edge grooves and perforations.

5. The structural toy, as set forth in claim 1, which includes
   connection members of a thickness equal with that of said flat rods in form of junction members with at least three perforations with diameters corresponding with one half of the width of said flat rods and with marginal distances corresponding with one half of the width of said flat rods.

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