Dec. 29, 1970 J. J. FOUQUART 3,550,311

INTERENGAGEABLE CONSTRUCTION ELEMENTS WITH RESILIENT CLUTCHING PARTS

Filed Sept. 20, 1967 2 Sheets-Sheet 1

FIG. 1

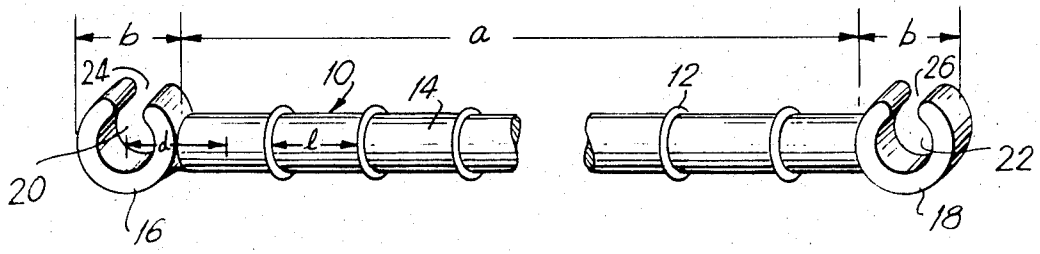


FIG. 2a

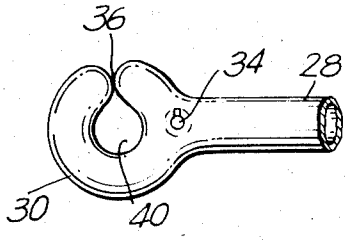


FIG. 2b

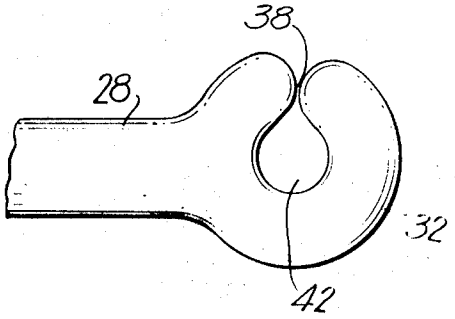
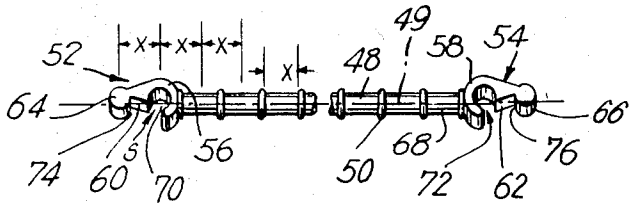


FIG. 3



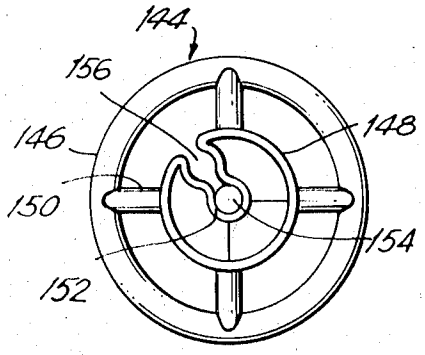


FIG. 5

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INTERENGAGEABLE CONSTRUCTION ELEMENTS WITH RESILIENT CLUTCHING PARTS

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FIG. 4a

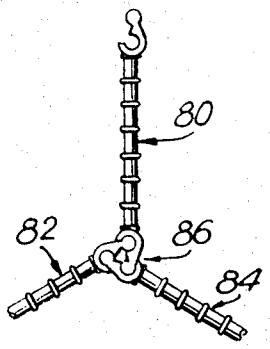


FIG. 4c

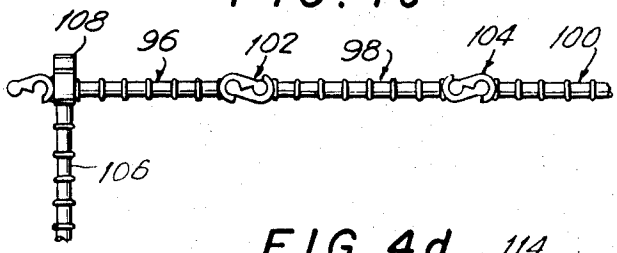


FIG. 4d

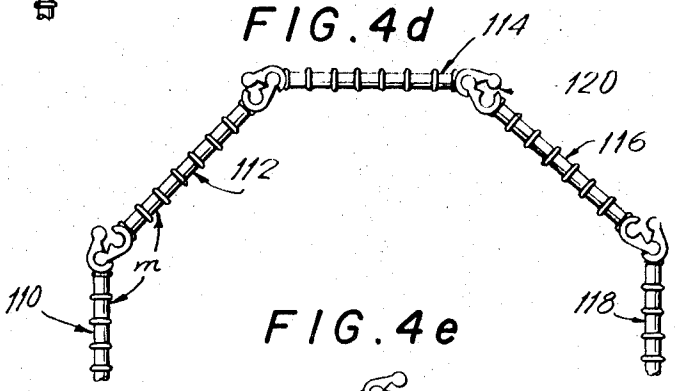


FIG. 4b

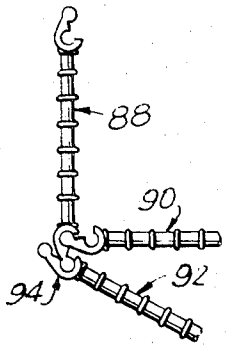


FIG. 4e

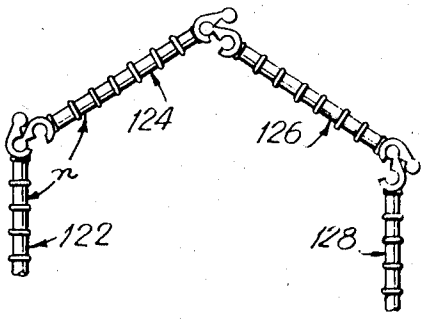


FIG. 4f

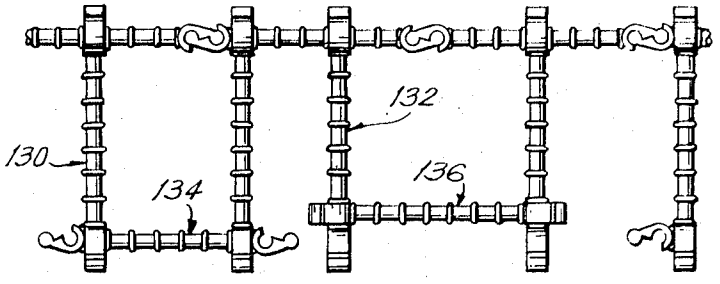
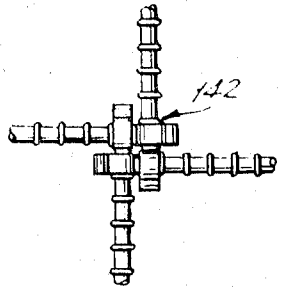


FIG. 4h



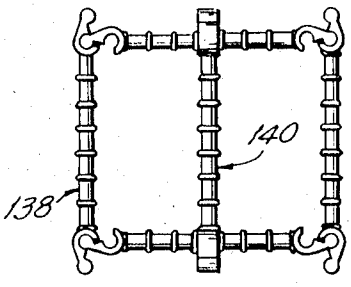


FIG. 4g

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INTERENGAGEABLE CONSTRUCTION ELEMENTS WITH RESILIENT CLUTCHING PARTS

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Int. Cl. A63h 33/08
U.S. Cl. 46—28 8 Claims

ABSTRACT OF THE DISCLOSURE

Interengageable construction elements, particularly suited for children but also useful in regular constructions, each such element being made in the form of an elongated body having resiliently engageable clutching elements at the ends thereof. This body is provided with spaced annular ribs and the clutching elements thereon form extensions of the body terminating in a cylindrical extremity. Also, each clutching element has a circular opening to receive the extremity of another clutching element.

DRAWING

FIG. 1 is a perspective view, partially broken away, of a construction element provided in accordance with one embodiment of the invention;

FIGS. 2*a* and *b* show the opposite ends, on two different scales, of a second embodiment;

FIG. 3 is a perspective view of a third embodiment;

FIGS. 4*a–h* illustrate different combinations of the constructional elements of FIG. 3; and

FIG. 5 illustrates a wheel in engagement with one of the elements of FIGS. 1–3.

DETAILED DESCRIPTION

This invention relates to construction elements particularly suitable for children's entertainment, but which can also be used for structure research, models, and useful constructions such as lattice-work for creeping plants, safety rafts, or the like.

The principle of the element of the invention is quite simple. It can be manufactured from a semi-rigid material, there being provided a cylindrical body with a half-open grip at each end. The outer diameter of the body is equal to the inner diameter of the grips so that each element can clutch the body of any other element. Both grips are open sidewards preferably on the same side in order, firstly, to enable the easy clutching of an element on a previously made construction (a median of a rectangle for instance) and, secondly, to prevent any disconnection, by a lengthwise traction, of clutched elements. The body of the element can be provided with shoulders or ribs defining a number of grooves in which new elements can be clutched in any position without any possibility of sidewards movements.

This simple design enables a wide variety of assemblies. In two dimensions all kinds of rigid or articulated lattice-work are possible; in three dimensions, a complete range of square- or rectangular- or polygonal-based assemblies, articulated or rigid are possible as well. Rigidity is obtained by clutching diagonal elements, or by opposing under a 90° angle the direction of the grips of some elements of the construction.

The size of the elements may vary from a few inches to several feet, depending upon the chosen material. The very simple design of the element is specially convenient for the production of plastic or rubber-inflated elements, the latter being provided with a small air valve. Indeed, the welding of air-proof plastics or rubber sheets is quite easy to effect, particularly when using the heating properties of high electric or acoustic frequencies, and the welding profile, corresponding with the development of the cylindrical body and of the round grips can be realized in a single plane. The stiffness of the grips will depend on the inner air pressure. It can be easily sufficient to insure a good grasp of the different elements on each other and to enable the assembly of all kinds of out-doors constructions, mattresses, safety or rest rafts and so forth.

Large elements can be manufactured as well out of semi-rigid or rigid expanded materials such as rubber, polyurethane or polystyrene foam, by the cutting of boards, or by the convenient molding of foam cells.

The element is preferably produced in a small size, and manufactured by the injection molding of a thermoplastic material. The range of the available materials is wide enough to offer every quality of stiffness and grasping strength which may be useful. Moreover, this last technique enables some interesting improvements of the outlines of the element, thus offering very advantageous possibilities of construction.

With more particular reference to the drawing, one embodiment of the invention is illustrated in FIG. 1. This embodiment comprises an elongated body or cylindrical rod **10** of a length *a* and on which are mounted a plurality of concentric annular rings **12** integral with said rod. These rings divide the rod into a plurality of segments **14**, the total of which is preferably odd in number so that one of the segments constitutes the exact center of the rod. At the ends of the rod **10** are clutching elements or grippers **16** and **18** having centrally located openings **20** and **22**, the diameters of which approximate that of the rod **10**. Slots **24** and **26** are provided by means of which openings **20** and **22** open outwardly to the same side of the rod **10**. The slots **24** and **26** are of a dimension which is less than the diameter of the rod **10** so that another similar constructional element can be engaged by forcing the same through the slots **24** and **26** to a position of accommodation within the openings **20** and **22**. The outer diameter *b* of each of the clutching elements is equal to the length *l* of the segments **14**. The distance *d* from the center of the openings to the center of the segment next adjacent each of the clutching elements is preferably equal to the length *l* of the segments.

The above construction may preferably be fabricated of a monolithic structure of plastic or rubber or the like but can alternatively be fabricated, for example, such that the rod is made of metal and clutching elements **16** and **18** are made of plastic or rubber and affixed to said rod. Suitable plastics include, but are not limited to, polyethylene, polystyrene, polyurethane and so forth.

In the embodiment of the invention illustrated in FIGS. 2*a* and 2*b*, a structure is shown formed of inflatable rubber. In this embodiment of the invention a center rod **28** is provided at the ends of which are formed clutching elements **30** and **32**. Conveniently disposed on this construction is a one-way valve **34** capable of admitting a pneumatic medium into the structure to enable the latter to assume its useful form. Known techniques for welding plastics or rubber sheets in hermetically sealed manner involve the use, as has been indicated above, of conventional high-frequency welding techniques. The rigidity of the grips or clutching elements will depend upon the pressure of the pneumatic medium and there will be an inherent resiliency such as will permit the insertion of the elements to be gripped through slots **36** and **38** into openings **40** and **42**. Annular ribs may, of course, be provided on center rod **28** in the manner as has been indicated above with respect to FIG. 1.

A more sophisticated version of a construction element provided in accordance with the invention appears in FIG. 3. This construction is generally the same as has been discussed above and employs the circular rings or ribs defining an uneven number of grooves or segments as has

already been discussed. In addition, the clutching elements have been modified in order to enable a linear assembly of construction elements without interruption of the regular succession of segments or grooves. In fact, the spacing of the succession of grooves is maintained from one element to the next in the succession so that the advantageous possibilities of construction present with the single element are also present in the assembly.

More particularly, in this embodiment of the invention there is included a center cylindrical rod or elongated body **48** having longitudinal axis **49**. Body **48** has rings **50** thereon with coupling means **52** and **54** disposed on the ends thereof and extending in rectilinear alignment therewith. Between said rings, the body **48** is of at least substantially uniform cross-section. The coupling means includes clutching elements which consist of C-shaped portions **56** and **58** connected by saw-tooth elements **60** and **62** to cylindrical elements **64** and **66**. As indicated by dimensions *x*, the common length of the sections **68** is equal to the distance between the center of openings **70** and **72** to the centers of the next adjacent sections **68**. These dimensions in turn are equal to the distances between the centers of openings **70** and **72** to the centers of cylindrical sections **64** and **66**. The purpose of maintaining these dimensions will become apparent when viewed with respect to the various possible assemblies as will be discussed hereinafter.

In addition to the above dimensions, it will be noted that the diameters of cylindrical elements **64** and **66** are equal to the diameters of openings **70** and **72** which have laterally opening slots S of smaller dimensions. It will also be noted that sawtooth element **60** defines with cylindrical element **64** a saw-tooth opening **74** of a shape corresponding to that of saw-tooth element **60**. A similar relationship is provided as between saw-tooth element **62** and cylindrical element **66** and the saw-tooth opening **76** defined therebetween.

The axes of the cylindrical elements **64** and **66** are parallel with the axes of openings **70** and **72**. As will be shown, the C-shaped portions or clutching elements **56** and **58** are so dimensioned with respect to saw-tooth elements **60** and **62** as to permit other construction elements engaged in openings **70** and **72** to pivot between a 90 and 120° relationship with respect to rod **48**. This will also be discussed hereinafter. 135 to 144° relationships are also permissible as will be shown.

FIGS. *4a–g* illustrate various assemblies permissible with the construction element of FIG. 3. In FIG. *4a* is shown a three-spoke arrangement consisting of construction elements **80**, **82** and **84** with a hub **86** being formed of three interengaged clutching elements as have been described above. FIG. *4b* shows another arrangement of three-construction elements **88**, **90** and **92** wherein elements **90** and **92** are pivotable in respect of hub **94**. FIG. *4c* illustrates a rectilinear alignment of construction elements **96**, **98** and **100** with clutching element assemblies **102** and **104** connecting said construction elements together. Assemblies **102** and **104** illustrate how the clutching elements are placed into mating engagement especially in respect of the mating saw-tooth openings and teeth. Also of particular interest in FIG. *4c* is the perpendicular arrangement of a fourth construction element **106** whose clutching **108** is of such a width as to fit exactly onto one of the segments of construction element **96**.

FIG. *4d* illustrates the possibility of assuming angle *m* between construction elements **110** and **112**, angle *m* being equal to 135°, the same relationship being developed between construction elements **114**, **116** and **118**. In this arrangement it will be noted that the extremities **120** of the clutching elements come into abutting or nearly abutting relationship. The angle *n* in FIG. *4e* illustrates the development of the 120° relationship between construction elements **122**, **124**, **126** and **128**.

FIG. *4f* illustrates a lattice arrangement, two forms thereof being illustrated at **130** and **132**, dependent upon the location of the transverse elements **134** and **136**. FIG. *4g* illustrates a further lattice network **138** partitioned by a center member **140**.

FIG. *4h* illustrates a further possible arrangement consisting of an interengaged quadrilateral hub **142**.

The constructions noted above can be supplemented by various accessories such as wheels, pulleys, panels and so forth to permit a wider latitude of usage. There is illustrated in FIG. *5*, for example, a wheel **144** consisting of a rim **146**, a hub **148** and spokes **150**. The hub is provided with a central opening **152** in which the central rod **154** appears, the latter having been inserted via slot **156**, the dimensions of which permit the rod to be inserted with force and locked in said opening. The resiliency of the materials employed will permit the insertion of the rod. Preferably, the diameter of spokes **150** is equal to the diameter of rim **146** which is equal to the diameter of the opening **152**.

Quite generally there has been discussed above an elongated body having resiliently openable clutching elements mounted on the spaced ends thereof. The clutching elements are preferably provided with openings which open to the same side of the associated body which preferably includes evenly spaced annular ribs longitudinally distributed along the body. The openings are at least substantially of the same size as the body so as to be able to accommodate the insertion of construction elements of like configuration.

Such construction elements as has been noted may be of a one-piece construction, an inflatable construction or an assembly of different elements. Accessories of the various types can be provided.

The clutching elements can be developed to permit a rectilinear alignment of a plurality of construction elements.

There will now be obvious to those skilled in the art many modifications and variations of the construction set forth hereinabove.

What is claimed is:

1. A construction element comprising an elongated body having a longitudinal axis and spaced ends and coupling means including resiliently openable clutching elements on said ends, said clutching elements being provided with openings having laterally directed slots which open to the same side of said body, said body including evenly spaced annular ribs longitudinally distributed along said body, said body being of at least substantially uniform cross-section between said ribs, said openings and body being of the same complementary shape, said coupling means being adapted to clutch the body of a similar construction element, each said clutching element defining a circular opening constituting one of the first said openings and said coupling means further including extensions extending away from said body in general alignment with the longitudinal axis thereof, each said extension including a cylindrical extremity rectilinearly aligned with the associated circular opening and longitudinal axis for fitting in mating relationship with an opening of a similar construction element to pivotally connect two such elements.

2. An element as claimed in claim **1**, wherein the body and elements are of a one-piece plastic construction.

3. An element as claimed in claim **1** comprising a wheel including a rim, a hub, and spokes connecting said rim and hub, said hub being provided with a central opening and a slot smaller than said body and through which said body is resiliently forced into said opening.

4. An element as claimed in claim **1**, wherein said ribs divide said body into an odd number of equal sections and wherein, with respect to each clutching element, the distance between the center of the next adjacent section of the body and the center of the circular opening is equal to the distance between the latter said center and the outer of the cylindrical extremity.

5. An element as claimed in claim **4**, wherein the cylindrical extremities and the circular openings have parallel axes, each said clutching element further including a saw-

tooth element between the associated circular opening and cylindrical extremity.

6. An element as claimed in claim 5, wherein each saw-tooth element and associated cylindrical extremity define a saw-tooth opening corresponding in shape to the saw-tooth element.

7. An element as claimed in claim 6, wherein the opening of each clutching element opens outwardly through a passage so dimensioned that, with the cylindrical extension of a second construction element engaged therein, the latter said element can pivot either between a 90° and 120° or 135° and 144° relationship with the first said construction element.

8. A construction element comprising an elongated body having a longitudinal axis and spaced ends and coupling means including resiliently openable clutching elements on said ends, said clutching elements being provided with openings having laterally directed slots which open to the same side of said body, said body having segments of at least substantially uniform cross-section between said ends, said openings and body segments being of the same complementary shape, said coupling means being adapted to clutch the body of a similar construction element, each said clutching element defining a circular opening constituting one of the first said openings and said coupling means further including extensions extending away from said body in general alignment with the longitudinal axis thereof, each said extension including a cylindrical extremity rectilinearly aligned with the associated circular opening and longitudinal axis for fitting in mating relationship with an opening of a similar construction element to pivotally connect two such elements.

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F. BARRY SHAY, Primary Examiner

U.S. Cl. XR.

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