TUBULAR BUILDING STRUCTURE

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1 My invention has to do with building structures, particularly with structures in the nature of constructive and educational toys. It is a principal object of my invention to provide a structure simulating a log cabin in appearance, large enough to accommodate several children, and which may be constructed by a child solely from the materials provided, and without the aid of tools or other equipment.

My structure comprises in essence a plurality of wall forming tubular members notched to interlock with one another, gable forming members for each end of the structure and a roof. In my preferred embodiment for use as a constructive toy, substantially the entire structure may be manufactured from heavy grades of paperboard, the tubular members being formed in the same manner as ordinary mailing tubes. The entire structure is designed to be used for any length of time desired, and then, when the child tires of it, it may be dismantled and stored for future use. In this connection, it is another principal object of my invention to provide a novel container in which various parts may be transported and stored, the container itself being formed from component parts of the building structure.

While my invention is described in connection with a log cabin construction for children, it will be obvious as the description progresses that the novel features of my invention will find utility outside of the toy field. For example, if the tubular elements are formed from thin gauge metal or plastic material with appropriate gable and roof members, the structure may be used as a dog house, storage building, shelter or the like having permanent or semi-permanent characteristics.

It is an object of my invention to provide a prefabricated building structure which, once assembled, can be dismantled for storage or transportation to a new location.

It is another object of my invention to provide a completely prefabricated building structure which may be assembled and disassembled readily and which, when disassembled, may be packaged in a container formed from parts of the building itself.

It is an object of my invention to provide a building structure which can be manufactured from paperboard and which can be assembled without tools.

It is another object of my invention to provide a building structure comprising tubular wall members which can be made of paperboard by procedures analogous to those employed in making paperboard tubing, and which hence can be made at greatly reduced expense.

It is yet another object of my invention to form simulated logs by means of paperboard tubing and indenting portions of the tubing to form notches whereby members may be interlocked to form structures of various shapes, sizes and designs which may be constructed from a given number of elements.

Yet another object of my invention is to provide a building structure formed of paperboard elements suitably treated with water repellant and flame resistant materials so that the structure may be exposed to the elements for a considerable length of time without ill effects and which will not burst into flames should it be exposed to matches or open flame.

A still further object of my invention is the formation of spaced notches in tubular members whereby a plurality of members may be secured to one another and will remain in fixed position without any other form of attachment means; the notched portions being so arranged that when interlocked a wedging action occurs which retains the members in that relation.

These and other objects of my invention which will be set forth hereinafter or will be apparent upon reading these specifications, I accomplish by the arrangement of parts of which I shall now describe certain exemplary embodiments.

Reference is made to the accompanying drawings wherein:

Figure 1 is a perspective view showing the building structure packed for shipment.

Figure 2 is an exploded view showing in detail the manner in which the different parts are packed and showing the parts used to form the packing container.

Figure 3 is an exploded view of an end of the container illustrating how the gable elements of the structure form the ends of the container.

Figure 4 illustrates representative lengths of tubing used in the construction.

Figure 5 is a cross-section taken along line 5—5 of Figure 4 through a notched portion of the tube.

Figure 5a is a similar section illustrating an alternative form of notch.

Figure 6 is a perspective view of the end portion of a cut and indented tube.

Figure 7 is a cross-sectional view similar to Figure 5 and showing the indented portions riveted together.

Figure 8 is a perspective view of a partially erected cabin constructed in accordance with my invention.

Figure 9 is a partial perspective illustrating a step in the erection of the gable elements.

Figure 10 shows the type of peg used to fasten the gable elements together.

Figure 11 is a front elevation of the completed cabin.

Figure 12 is a fragmentary plan view of the cabin with a portion of the roof broken away.
to show the ridge pole attached to the gable elements. Figure 13 is a fragmentary perspective of a corner of the cabin with parts in exploded relation illustrating the manner in which the gable elements are fastened to the uppermost tubular members.

Figure 14 is a perspective of the ridge pole. Figure 15 is a cross-sectional view taken through a pair of interlocking notches with the members slightly separated to show more clearly the relation between the coating elements.

Figure 16 is a cross-sectional view illustrating a construction employing a tie-rod. Figure 17 shows an alternative container construction employing flexible material.

Figure 18 is a fragmentary perspective illustrating the fastening means used in conjunction with Figure 17.

Figure 19 illustrates novel means for weather-stripping the side wall members of my novel construction.

To construct the cabin, the tubular members are arranged one upon the other to form the body walls in usual log cabin fashion with alternate members placed at right angles to one another. When the body walls have been erected to the desired height, the gable elements, fitted with pegs for the purpose, are placed in position on top of the uppermost tubular members; the said gable members determining the pitch of the roof. A ridge pole may be provided to fit between the topmost points of the front and rear gable members to provide support for the roof. Once the ridge pole is attached, the roof may be lifted into place with its medial fold line positioned to overlap the ridge pole and with the panel elements extending outwardly and downwardly, resting upon the upper slanting edges of the gables.

To dismantle the structure, the erection process is simply reversed; which, incidently, makes it quite simple to repack the members since the roof, which is the first element removed, is used to form the body walls of the container. The gable elements are next to be removed and these, when placed back to back form the end walls of the container.

While in the description following, my invention is disclosed with reference to a four-sided, gabled roof cabin, it will be understood that other types and designs of structures may be assembled from the same elements and I do not wish to be limited to the particular embodiment herein after described. Size also is no limitation upon my invention. For example, it could be put up in a model size kit.

Referring to Figure 4, I have shown exemplary sizes of tubular members used in my construction comprising tubes 1 indented to form notches as indicated generally at 2. Since the tubes are hollow it is often desirable to close the ends of the tubes with suitable cap members 3 to extend the concept of simulating logs. The tubes may be formed from cardboard stock using the ordinary tubing machines now in general use in the industry and are cut to the desired lengths in the usual manner. The notched portions are formed by cutting pairs of transverse slits partially through the periphery of the tubes at spaced intervals and then depressing the portions 4 lying between the spaced pairs of cuts, as illustrated in cross-section in Figure 5 and Figure 6 in perspective. Care must be taken to obtain uniform notching of all of the tubes, for otherwise, perfect interlocks cannot be obtained and the structure will lose its rigidity.

In the ordinary log cabin made of logs rigidity is obtained by the sheer weight of the notched logs resting one on the other or else by means of nails, pegs or the like driven through the members to hold them firmly in place. In my novel structures, weight alone cannot be relied upon to impart rigidity because the structure, being of tubular construction, is inherently lightweight. Nor do I employ nails, pegs, clasps or the like to hold the members together. The rigidity of my structure is attained primarily by means of the novel manner in which notched tubular members interlock with one another. By accurately registering the interlocking notches each exerts a wedging or grasping action upon the other to retain it firmly in place. This wedging effect can be attributed to the resiliency of the tubular members and their ability to be slightly distorted when wedged together. By accurately cutting the tubes to form uniformly indented notches having a width slightly less than the diameter of the tubes, the members will have a wedging action due to the resiliency of the material and will coact with one another making it unnecessary under ordinary circumstances to apply other means to retain the tubes in interlocked condition.

The cuts should extend through approximately one-fourth of the diameter of the tube so that the tube may be notched on diametrically opposite sides and still have arcuate portions between each pair of notches. I have found that the notch forming or indented portion 4 lying between the pairs of cuts may be readily indentified by means of a press or by being struck a sharp blow with a hammer-like device or maul, the indented portions bending along lines defined by the ends of the pairs of transverse cuts. While the transverse cuts may be made perpendicular to the longitudinal axis of the tubes I have found it advantageous to incline the cuts inwardly toward one another whereby each pair of cuts when viewed in cross-section resembles a truncated pyramid. At the widest point, the cuts should be spaced a distance slightly less than the diameter of the tube and incline inwardly at an angle of approximately 15 degrees.

When two tubes are interlocked the cut portion of one tube will contact through its extent the arcuate portion of the other tube whereas if the cuts were parallel the contacting areas would be much smaller and consequently the members will not interlock as tightly.

In Figure 5a, I have illustrated a modification of my novel notch in which the portion of the tube lying between the lines of cut has been severed and removed. Figure 7 shows still another modification of the notch in which the indented portions 4 are riveted by means of a rivet 5 which strengthens the indented portions by resisting the distortion of the arcuate portion caused by the wedging action during the interlocking operation. The rivets may be in the nature of eyepits or granmets having an opening therein through which a tie-rod, rope or the like may be passed to further strengthen the structure as will become clearer later on.

In Figure 1, I have shown a preferred mode of packing my structure for shipment. It comprises a container having body walls comprising panels 7, 8, 9 and 10 articulated by suitable
be made to lie tangent to the uppermost side wall members.

In Figure 9, I have illustrated the manner in which the gable forming elements 12 and 13 are joined edge to edge by means of forked pegs 18 which engage the edge portions of the opposite element. Thus, the forked peg 18 in gable element 12 engages the edge of element 13 while at the same time the peg attached to element 13 engages the edge element 12. Apertures 20 (Figure 9) are provided near the apex of the gable members for registry with the ridge pole as will be explained in detail hereinafter. Figure 10 is a cross-sectional view showing the construction of pegs 18.

In Figure 13 I have illustrated how the outer edge of the gable elements are fitted into arcuate slot 21 cut in the uppermost side wall tube with peg 17 shown positioned to be inserted in the hole 22 provided in uppermost front wall tube 1a.

One form of ridge pole is illustrated in Figure 14 comprising a rod 23 configured to conform to the pitch of the roof and having end plates 24 fastened at each end by means of screws or the like 25. Each end plate has a spaced pair of holes 26, which, when the ridge pole is properly positioned between the gable members, registers with corresponding holes 28 in the gable members. Bolts and wing nuts 27 are inserted through the aligned pairs of holes to maintain the ridge pole in position. If desired, the bolts may be permanently fastened to plates 24 so that there will be no danger of losing them or having to provide a bag or the like in which they may be kept.

The completed structure is shown in Figure 11 with the roof positioned over the ridge pole and resting on the sloping edges of the gable members. The weight of the roof is generally sufficient to retain it in place; however, if desired, it may be secured by means of ropes, tie-rods, or the like.

In Figure 12, I have shown a partial plan view of the roof with portions broken away to show the manner in which the ridge pole is attached to the gables. Ridge pole 23 is positioned so that end plates 24 contact the uppermost portions of the gables in face-to-face relation with bolt holes 26 aligned with bolt holes 28 in the gable members. Bolts and wing nuts 27 are inserted to complete the assembly.

It will be understood that many types and varieties of structures may be assembled with many alternative constructions possible from the same kit. For example, a lean-to, block house, fences, and even bridges may be constructed, the number of designs being limited only by the ingenuity of the builder.

For outdoor use, it is preferable to use proofed board or to treat all members with some kind of water repellent substance. The nature of the proofing agent is not a limitation on my invention, and any of the known proofing agents may be used. The tubular members may be proofed by dipping after being cut to size and notched or they may be treated during the forming operation as the paper stock is formed about a tubing mandrel. In the latter case, the proofing agent chosen should be compatible with the adhesive agent. It is also desirable to select an agent which is flame resistant or to apply a separate flame resistant agent. The proofing matter may also be mixed with the proofing agent, if desired.

In Figure 15, I have shown a cross-sectional
view taken through a pair of interlocking notches with the members slightly separated to illustrate the coaction between the cut portions 5 of one tube and the arcuate portions 1c lying between opposed notches of the other. It will be clear that as the upper tube is pressed into the notch of the lower tube with its cut edges 5, the arcuate portions 1c of the upper tube contact the cut portions 5 along the entire periphery of the cuts. The two members, being hollow tubes, have a certain degree of resiliency and will “give” slightly when wedged together. The indented portion 4 acts as a brace or rib between opposed portions 1c exerting force outwardly should the wall portions 1c be pressed inwardly.

In Figure 16, I have illustrated a method of anchoring the structure to a foundation and at the same time securing the roof firmly in place. A foundation of concrete, stone, wood or the like may be provided, as at 32, to which is fastened tie-rod 29 having threads 30 and nut 31 at one end. When a tie-rod is used, the tubes must be provided with eyelets in the notched portions through which the rods may pass, as illustrated in Figure 9. Apertures 32 are provided in the roof panels through which the end rod may also pass. A spaced 33 may also be provided.

In Figure 17, I have shown an alternative construction in which the container walls and roof are of a sheet of flexible material such as canvas or the like. End wall members are the same as in the rigid container excepting that the pegs 17 and 18 are replaced by metal fasteners 34. A sheet of canvas 35 is provided of dimensions similar to roof panels 1, 5, 9, 15 with the exception that there may be a slight overlapping portion at one end of the canvas to lap an edge of the container and hook over fasteners 34. Pockets 36 are spaced lengthwise through the flexible sheet into which are inserted rods 37 spaced to form the longitudinal corners of the container and to provide rigid longitudinal support at those points. Grommets or eyelets 38 are spaced near the outer edges of the sheet and correspond in position to the metal fasteners 34 affixed to end wall elements 12 and 15.

To assemble the flexible container, canvas 35 is stretched out flat and the ends forming elements 12 and 13 are set up between the projecting pair of spaced rods 37 whereupon the flexible sheet is folded about the end pieces with grommets 38 engaging over fasteners 34. To assure that the canvas will not slip from the fasteners additional rods 39 are provided which pass through the loop portion of longitudinal pairs of fasteners after the grommets have been snapped on thus preventing the canvas from being removed without first removing the rods 39. In addition to this, the rods 39 may be used as roof ribs or they may be tapered at one end and have a head at the other for use as tie-rods, the tapered end being stuck in the ground to retain the structure in much the same manner as shown in Figure 16.

In Figure 19, I have shown a novel way in which my structure may be weatherstriped. Z-shaped angular bars 48 are placed lengthwise of each tubular member with the foot or leg to the outside of the structure facing downward, as at 41, and biting into the periphery of the tube; leg 42 at the opposite or inner end being turned upward. It is important that the bars are placed in this manner, for if the positioning were reversed the outer leg would turn upward and rain would catch therein and run into the building. As an alternative, felt strips, calking or the like may be employed, the latter being of practical value only if the structure is to remain standing for a considerable length of time. It may also be found desirable to insulate the structure by blowing or otherwise packing insulating material in the tubes. Other modifications may be made in my invention without departing from the spirit of it. Having thus described my invention in an exemplary embodiment, what I claim as new and desire to secure by Letters Patent is:

1. A wall member for a toy house comprising a cylindrical paperboard tube, said tube having longitudinally spaced pairs of cuts therein, said pairs of cuts extending at right angles to the longitudinal axis of said tube and being coextensive within the same arcuate segments thereof, with the portions of said tube lying between each of said pairs of cuts displaced inwardly to form recesses for the reception of similarly constructed additional tubes extending normal to the longitudinal axis of said first mentioned tube.

2. A wall member for a toy house comprising a cylindrical paperboard tube, said tube having longitudinally spaced pairs of cuts therein, said pairs of cuts extending at right angles to the longitudinal axis of said tube and being coextensive within the same arcuate segments thereof, with the portions of said tube lying between each of said pairs of cuts displaced inwardly to form recesses for the reception of similarly constructed additional tubes extending normal to the longitudinal axis of said first mentioned tube, pairs of said cuts being diametrically opposed, with the displaced areas lying between the pairs of cuts fastened together.

3. The structure claimed in claim 2 wherein said inwardly displaced areas are secured together by means of grommets.

4. In a building structure for the purposes described, a plurality of paperboard tubes comprising the walls of said structure, each of said tubes having longitudinally spaced substantially parallel pairs of cuts therein extending across the axis of the tube and being coextensive within the same arcuate segment thereof with the portions lying between each of said pairs of cuts displaced inwardly to provide openings in said tubes for the reception of additional tubes extending parallel to the said spaced pairs of cuts, the distance between each of said pairs of cuts being slightly less than the diameter of said tube.

5. The structure claimed in claim 4 in which the cuts in each spaced pair of cuts are inclined inwardly at an angle of substantially 15°.

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