

Nov. 9, 1971

R. G. LANGSTON
BUILDING STRUCTURE

3,618,280

Filed July 22, 1969

2 Sheets-Sheet 1

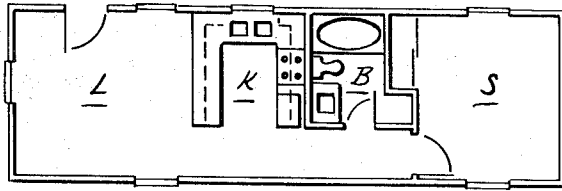


Fig. 1

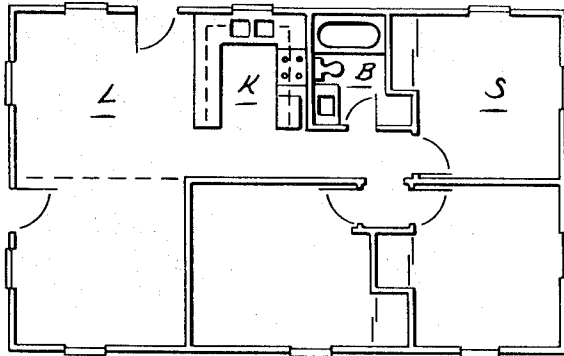


Fig. 2

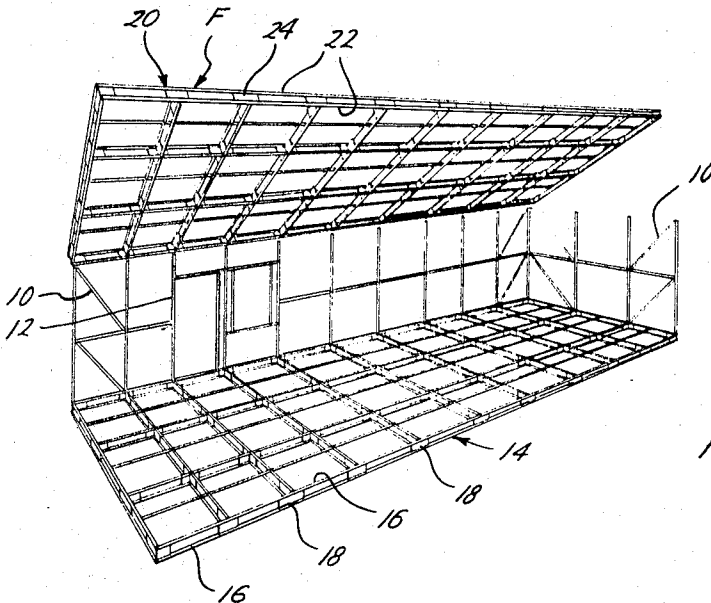


Fig. 3

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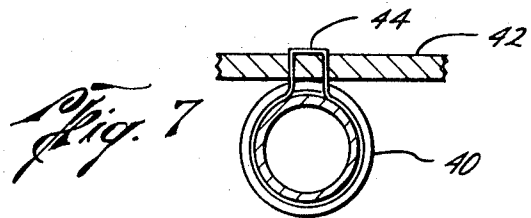
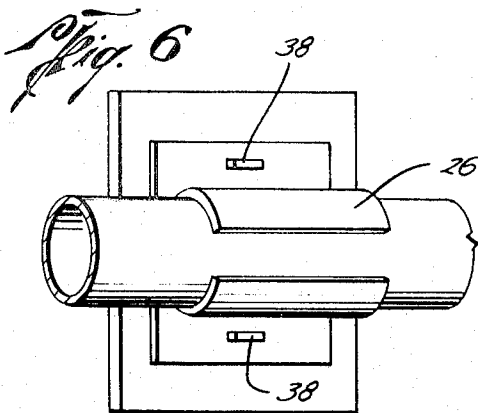
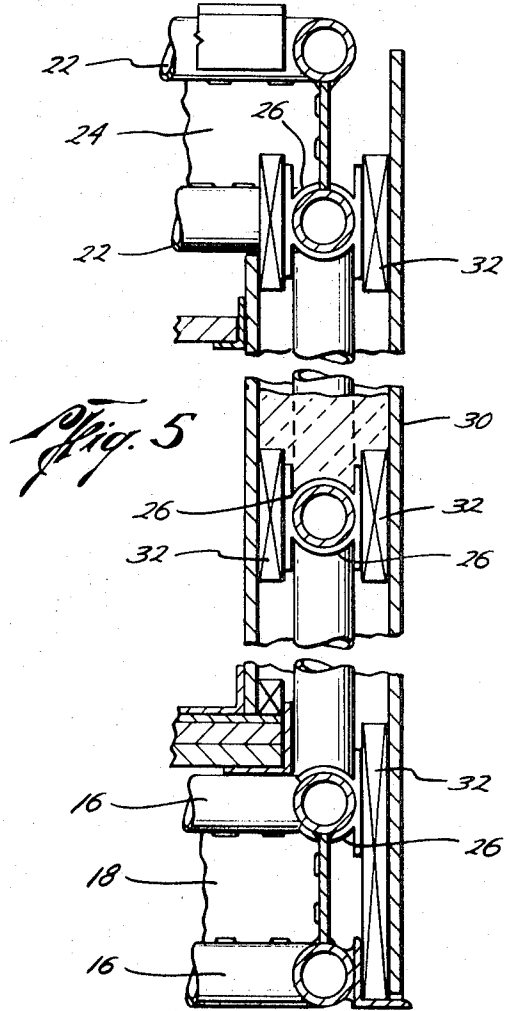
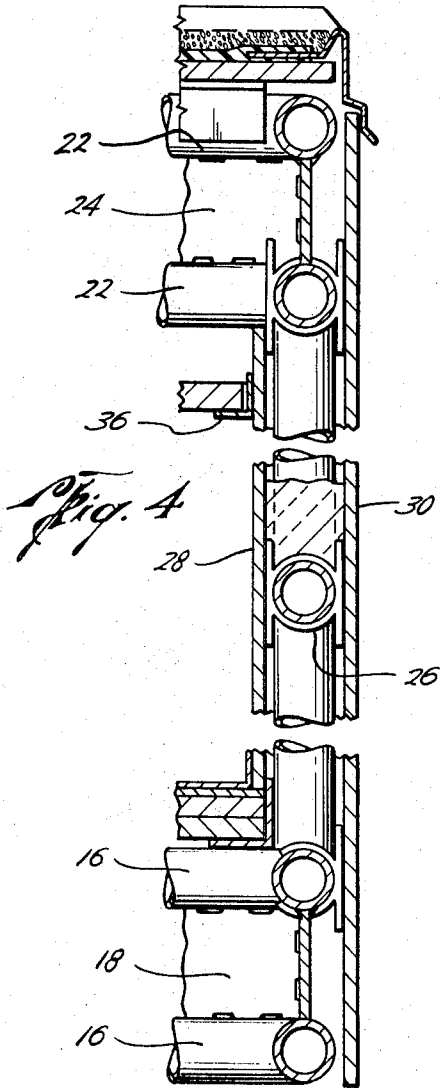
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2 Sheets-Sheet 2



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BUILDING STRUCTURE

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9 Claims

ABSTRACT OF THE DISCLOSURE

A building structure which can be made in modular units with each unit having a welded pipe frame and both interior and exterior surfacing materials secured to the frame by acrylonitrile butadiene styrene clips having a C-shaped portion to engage the pipe frame and a flat surface to be bonded directly to the surfacing materials or to nailing boards to which the surfacing materials may be secured.

SUMMARY

The present invention relates to an improved building structure with a metal frame which is modular in design. Additionally the present invention relates to an improved subcombination of an extruded plastic device which secures surfacing materials to the metal frame.

An object of the present invention is to provide an improved building structure which is modular in design and is relatively inexpensive to produce.

Another object is to provide an improved building structure which may be substantially completely fabricated in a factory and shipped as a unit to the installation site.

A further object is to provide an improved device to secure the usual surfacing materials to a pipe frame structure.

Still another object is to provide an improved bonding of a plastic clip to a flat surface material which is effective to be a self-supporting bond within a short period of time.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the present invention are hereinafter set forth and explained in detail with reference to the drawings wherein:

FIG. 1 is a plan view of a single unit or basic unit of modular building construction of the present invention.

FIG. 2 is a plan view of a double unit in which a second unit has been combined with the basic unit shown in FIG. 1.

FIG. 3 is a partial view of the improved frame structure of the basic unit shown in perspective with two sides removed and with the roof tilted upward so that its structure is more clearly shown.

FIG. 4 is a partial sectional view of a wall to illustrate the use of the improved means for securing the surfacing materials to the frame structure.

FIG. 5 is a partial sectional view similar to FIG. 4 but illustrates a modified form of means securing the surfacing materials to the frame structure.

FIG. 6 is a perspective view of the attachment of the plastic clip to a flat member.

FIG. 7 is a sectional view illustrating a modified form of structure for securing a flat member to the pipe frame structure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The basic unit plan illustrated in FIG. 1 includes a simple house design of the present invention. This design includes the bathroom B and the kitchen area K together with a bedroom S and a living room L. This basic unit when constructed in accordance with the present invention

can be fabricated on an assembly line. The basic unit functions as the smallest building structure and also may be combined with other building structures fabricated in the same manner to provide larger living area.

A larger combined unit is illustrated in FIG. 2 and includes the four rooms of the basic unit shown in FIG. 1 and adds thereto a second module or unit having three rooms which may be used as two additional bedrooms and a dining room. By utilizing the welded pipe frame structure of the present invention as hereinafter described, the individual units may be fabricated on an assembly line to minimize their cost and further may be made of modular design so that the desired amount of floor space is provided.

The welded pipe frame structure F is best seen in FIG. 3. The frame F includes a plurality of pipes of preselected lengths and a plurality of flat plate brackets which are welded between pipes to provide the desired structural spacing on the floor joists and rafters. This structure is welded together by tack welding which provides more than adequate structural strength.

The pipe is preferred to be one and one-quarter inch diameter black iron pipe. The housing units shown in the drawings are designed so that all of the pipes may be precut to lengths and is therefore readily available at the assembly line. Referring to the frame structure F shown in FIG. 3, there are only six different lengths of pipe shown in the structure. The basic unit structure of the frame F is designed to be four feet by four feet. Thus, except for the diagonal bracing 10 and the door frame 12 all of the pipe may be cut to lengths of four feet or a multiple thereof. The floor joists 14 may include two twenty foot pipes 16 which are vertically spaced apart by the brackets 18 every four feet. The rafters 20 are of the same construction and include two twenty foot pipes 22 spaced vertically apart by the brackets 24 positioned every four feet along the length of pipes 22. It should be noted that all of the floor and ceiling structure includes this double pipe construction with the pipes being spaced vertically from each other by the brackets.

In order to have a modular construction the lengths of the pipes have been preselected to provide such modular design. As stated, the longest pipes in the illustrated structure such as the pipes 16 and 22 in the floor joists and the rafters may be selected to have a length of twenty feet. Thus in the frame F shown in FIG. 3, the length of the unit would be forty feet. It would have a width of twelve feet and a height of eight feet. In such structure each individual pipe element is four feet long or a multiple of four feet except the diagonal braces 10 and the door frame braces 12. The portion of the pipes in the floor and ceiling which are not of double construction extend lengthwise of the frame and may be in four foot lengths to extend between the other rafter and joist pipes.

While such frame structure F includes pipes of preselected length and bracket plates all spot welded together, such welding being particularly suited to a fabrication in an assembly line, a suitable provision must be made for the securing of the usual interior and exterior surfacing materials to such frame structure. The improved securing means of the present invention includes the clip 26 which is shown in FIGS. 4, 5 and 6. Also, the modified securing means shown in FIG. 7 may be used for this purpose.

As shown in FIG. 4, the interior surfacing material 28 and the exterior surfacing material 30 are secured to the frame F directly by the clip 26. In this form of securing with the clip 26, the C-shaped portion of the clip 26 is adapted to engage the pipe and the flat portion of the clip is to be bonded to either the interior surfacing material 28 and the exterior surfacing material 30. In the

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modified form of the securing means shown in FIG. 5, the same clip 26 is used except that it is bonded to a nailing board 32 to which the exterior surfacing material 30 and the interior surfacing material 28 are secured as by nailing.

The roof structure may be of any suitable form and is supported on the upper pipe 22 of the rafters 20. The floor is supporting from the upper of the pipes 16 in the floor joints 14. The ceiling 34 is supported in any suitable manner such as by the angle 36 secured to the interior of the interior surfacing material 28 immediately below the lower of the rafter pipes 22.

Considerable difficulty may be encountered in the bonding of the clip 26 either to one of the surfacing materials or to the nailing board 32. For this reason, the material of the clip is important. By selecting the clip to be an extrusion of acrylonitrile butadiene styrene, it was discovered that the clip itself could be utilized to form the desired bonding. By first placing the flat surface of the clip against the surface to which it is to be bonded and applying acetone around the juncture between the clip and the surfacing material or nailing board, the acetone flows between the clip and the board to dissolve a small portion of the material of the clip which is in contact with such surface and by holding the clip tightly against such surface as the acetone is evaporating the clip is effectively bonded to the surface by its material which was dissolved by the acetone. As shown in FIG. 6, it is normally preferred that the clip be secured at least temporarily to such surface by a pair of staples 38 and then the acetone is applied as above directed. In this way, the clip may be used before the bonding is complete and the bond when completed is sufficiently strong so that the surfacing material in most instances fails before the bond fails. The use of the staples to hold the clip in the desired place while the bonding step is being performed greatly simplifies the fabrication steps.

A modified form of structure for securing the surfacing materials to the frame F is shown in FIG. 7. The securing device 40 is a sleeve which may be secured on the pipes before they are welded together. The nailing board 42 is secured to the sleeve 40 by the staple 44. The staple 44 is preferably designed to have its ends shaped so that they move in opposite directions after they have passed throughout the nailing board 42 and the sleeve 40 and engage the pipe.

From the foregoing description it can be seen that the present invention provides a modular building structure which is readily fabricated on an assembly line to minimize the cost thereof and further provides an improved securing means for securing the surfacing materials to the pipe frame which allows the use of such simplified and inexpensive frame structure.

What is claimed is:

1. A building structure, comprising a frame of welded pipe, interior surfacing materials, exterior surfacing materials, a plurality of acrylonitrile butadiene styrene clips for supporting said surfacing materials from said frame, each of said clips having a pipe engaging portion and a surface engaging portion, said surface engaging portion of said clip being bonded to the surfacing material by partially dissolving with a solvent at least a portion of the surface engaging portion of said clip in contact with said surfacing material and allowing the dissolved portion to solidify to form an integral bond between the clip and the surfacing material.
2. A building structure according to claim 1, wherein the solvent used to dissolve such portion of the surface engaging portion of said clip is acetone.
3. A building structure according to claim 1, wherein the pipe engaging portion of said clip is C-shaped and the surface engaging portion is flat.

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4. A building structure, comprising a welded pipe frame including a plurality of pipe sections and flat plate brackets tack welded together, interior surfacing materials supported on said pipe frame, exterior surfacing materials supported on said pipe frame, means for securing said exterior and interior surfacing materials to said pipe frame, and said pipe frame including pipe in not more than six different pre-cut lengths,

said securing means including, a plurality of acrylonitrile butadiene styrene clips, each clip having a pipe engaging portion and a surface engaging portion, said surface engaging portion of said clip being bonded to the surfacing material by partially dissolving with a solvent at least a portion of the surface engaging portion of said clip in contact with said surfacing material and allowing the dissolved portion to solidify to form an integral bond between the clip and the surfacing material.

5. A building structure according to claim 4, wherein the solvent used to dissolve such portion of said clip is acetone.
6. A building structure according to claim 1, including a plurality of nailing boards bonded to the surface engaging portion of said clips by dissolving that portion of the surface of said clip in contact with said nailing board and allowing such dissolved portion to solidify to form an integral bond between the clip and said nailing board, said surfacing materials being attached to said nailing boards to support said surfacing materials from said frame.
7. A building structure according to claim 6, wherein the solvent used to dissolve such portion of said clip is acetone.
8. A subcombination with a building structure having a welded pipe frame, interior surfacing materials and exterior surfacing materials, of a supporting connection comprising an acrylonitrile butadiene styrene clip having a pipe engaging portion and a surface engaging portion, said surface engaging portion of said clip being bonded to the surfacing material by partially dissolving with a solvent at least a portion of the surface engaging portion of said clip in contact with the surfacing material and allowing such dissolved portion to solidify to form an integral bond between the clip and the surfacing material.
9. A subcombination according to claim 8, wherein said clip includes a C-shaped portion for engagement on a pipe and a flat portion for attachment to said surfacing materials.

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