

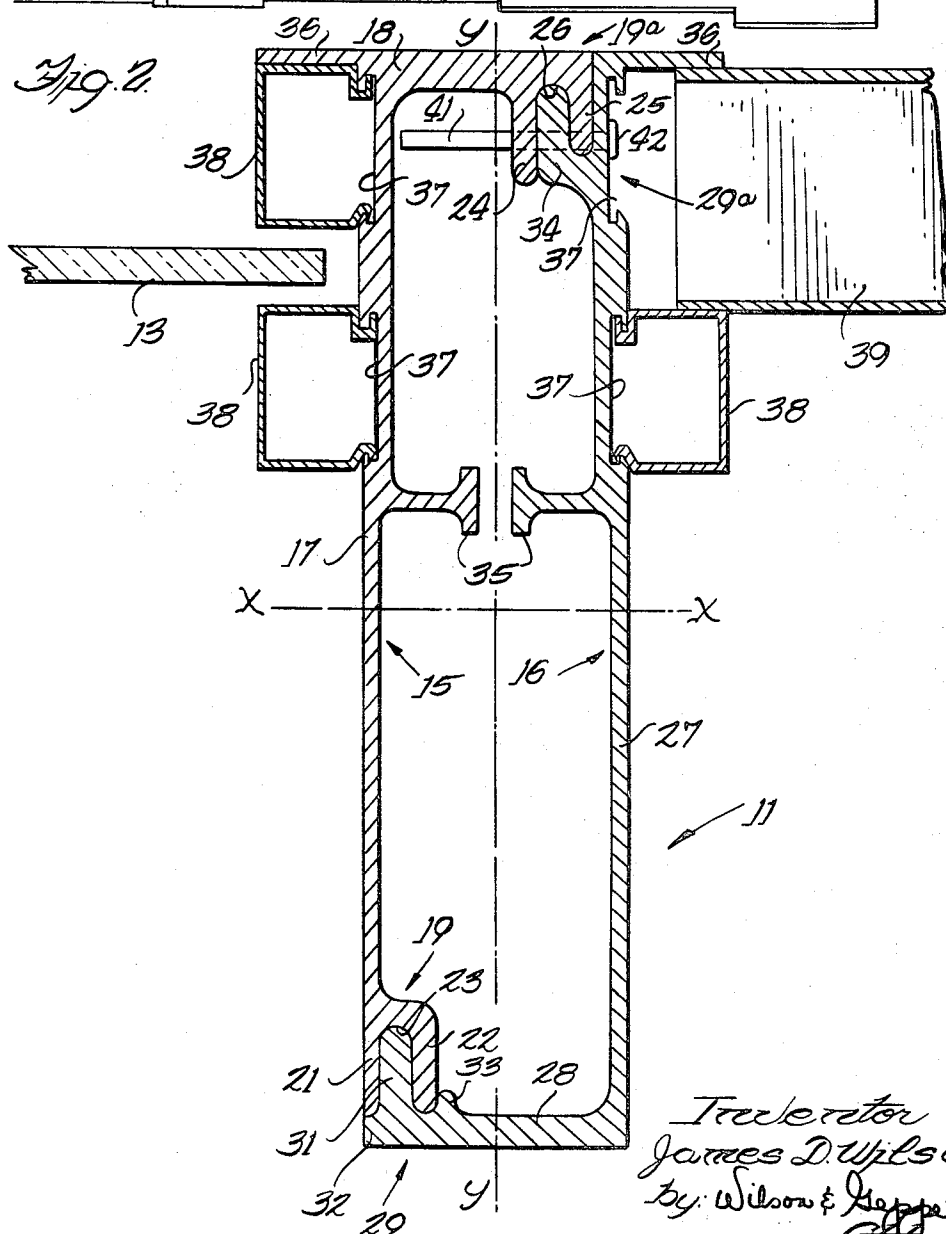
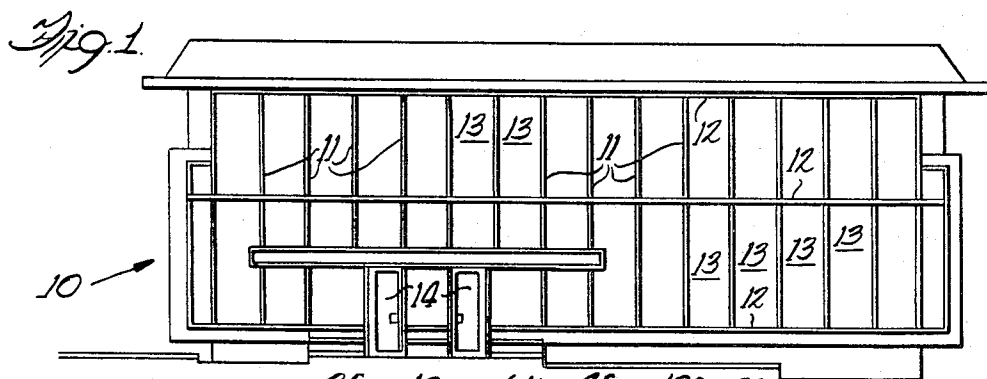
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LOAD-BEARING STRUCTURAL COLUMN

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LOAD-BEARING STRUCTURAL COLUMN

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ABSTRACT OF THE DISCLOSURE

A load-bearing structural tubular column formed of two non-identical open channel-shaped members where one member has male reentrants and the other member has cooperating female reentrants; the male and female reentrants being formed at the free edges of the members and engage in the direction of the minor axis of the tubular column to provide for shear transfer about the minor axis. A shear pin extends through the male and female reentrants adjacent one corner of the tubular column parallel to the major axis thereof to provide for shear transfer about the major axis of the column.

The present invention relates to a novel structural column and more particularly to a two-piece tubular column of a relatively lightweight extruded metal, such as aluminum, which can be utilized for primary load-bearing walls and buildings.

Among the objects of the present invention is the provision of a two-part structural column for primary load-bearing walls of buildings which, when taken together with appropriate horizontal members, provides both the primary vertical structural elements as well as the complete framing into which is installed any type of closure material, such as glass panels, masonry, cementitious materials, doors or other materials.

Another object of the present invention is the provision of a two-part metal structural column composed of two separate and generally open channel-shaped members which, when assembled into a complete column in the building wall, constitute the column within themselves, and function with physical and geometric properties nearly identical with the properties of a closed tube of the same over-all dimensions. These properties include those properties attendant the mutually normal axis and those properties deriving from the torsional properties of a closed tube. Since the sum of the properties of the separate channel members is substantially less than the properties of the resultant tube formed, this column provides a large increase in structural efficiency and a consequent reduction in cost as compared to two separate open shapes, each operating with its own set of independent geometric properties.

A further object of the present invention is the provision of a two-part structural column where the two generally open channel members can be easily extruded in the desired lengths of a lightweight metal such as aluminum. The two separate parts are non-identical in shape as shown in cross section; one section provided with male reentrants and the other section provided with female reentrants. These reentrants are generally located at opposite corners of the resultant column and are engageable in a direction parallel to the minor axis of the resultant column thus preventing separation of the column in the direction of the major axis thereof. The combined shape will assume the geometric properties about the minor axis of the equivalent closed tube, so long as the male and female reentrants remain engaged, one to the other.

The present invention also comprehends the provision of a two-part structural column having provision for shear transfer between the two separate column components in the direction of the minor axis as well as in the direction

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of the longitudinal axis of the column; this being accomplished, the two sections then operate about the major axis with the properties of the equivalent tube. This provision for shear transfer resides in a secondary connection element of a pin or dowel inserted into aligned openings drilled or provided in each channel component and parallel to the major axis. The pin or dowel has its ends concealed by subsequent nonstructural materials incident upon the use of the column in the building.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawing:

FIGURE 1 is a front elevational view of a typical building utilizing the two-part structural column of the present invention.

FIG. 2 is a horizontal cross sectional view through the two-part load-bearing column.

Referring more particularly to the disclosure in the drawing wherein is shown an illustrative embodiment of the present invention, FIG. 1 discloses a typical building 10 formed from the two-part structural columns made of a lightweight metal such as aluminum. The building includes vertical columns 11 and appropriate horizontal members 12 to provide the complete framing for the building. Appropriate closure materials such as glass panels 13 and doors 14 are installed in the framing to complete the walls of the building. As the building is not considered to be a part of the invention, no further description of the building is believed necessary.

The columns 11 are formed of two generally open channel shapes 15 and 16 which, when assembled, provide a tubular column 11, as clearly seen in FIG. 2. The general configuration of the channel members 15 and 16 can vary widely depending on the profile required for specific architectural use; however, the channel members must be provided with the male and female reentrant portions to be described. The column of FIG. 2 is an illustrative embodiment of a common shape for a structural member.

The channel member 15 has a generally long side or web 17 and a front short web 18 at right angles thereto. At the outer or free ends of the two webs are formed female reentrants 19, 19^a; the reentrant 19 on the long web 17 having an extension 21 of the web 17 and an inwardly and then parallel extending flange 22 to provide a recess 23 therebetween. The female reentrant 19^a on the short web 18 is composed of legs 24 and 25 of unequal length forming a recess 26 therebetween; the inner leg 24 being longer than the outer leg 25. These legs are formed at right angles to the web 18.

The channel member 16 also has a generally long side or web 27 and a short web 28 at right angles thereto; these webs having a pair of male reentrants 29, 29^a formed thereon. The male reentrant 29 on the short web 28 consists of a leg or flange 31 at right angles to the web and spaced from the free end 32 of the web. This leg 31 is conformably received in the recess 23 of the female reentrant 19 and a very short projection 33 is formed on the web 28 spaced from the leg 31 and located to engage the inside or inner surface of the leg 22 of the female reentrant 19. The male reentrant 29^a consists of a leg or flange 34 spaced inwardly of but parallel to the web 27 and conformably received in the recess 26 of female reentrant 19^a. The male and female reentrants 29, 29^a, 19 and 19^a, respectively, the interengage to form connections or interleavings between the channel members 15, 16 at diametrically opposite corners of the column to prevent movement about the minor y—y axis of the column.

Each channel member 15, 16 shown in FIG. 2 is provided with a strengthening rib 35 intermediate the ends of

the relatively long web 17 or 27 and an outwardly extending flange 36 at the front or outer end of the column; the flanges 36 extending from each side of the column 11. The webs 17 and 27 are provided with spaced grooves 37 to receive suitable tubular stops 38 to aid in retaining glass panels 13 or insulation panels 39 in the resulting frame, and a suitable vent sash can be utilized with the column.

Also, to provide for shear transfer between the channel members 15 and 16 about the major x—x axis of the column and also in the direction of the longitudinal axis of the column, a pin or dowel 41 having a head 42 at one end is inserted through openings drilled in the web 27, leg 25 of female reentrant 19^a, leg 34 of male reentrant 29^a and leg 24 of female reentrant 19^a and extends into the tubular column. The pin is parallel to the major x—x axis and has its head 42 concealed by subsequent non-structural materials, such as the insulating panel 39 shown. The two channel members 15 and 16 will now operate about the major x—x axis.

The pins 41 are repeated at appropriate intervals in the vertical (longitudinal) direction. So long as the male and female reentrants remain in full contact, the column will act as a closed tube. The limit design for this condition of the column then becomes that limit proper to the local buckling limits of the various flange and web elements.

While a structural column formed of a lightweight metal, such as aluminum, of a particular and effective shape has been shown and described by way of illustration, it is not my intent or desire to unnecessarily restrict the improvement by virtue of this limited showing as other shapes and profiles of tubular columns can be constructed according to the present invention. It is also contemplated that specific descriptive terms employed herein be given the broadest possible interpretation consistent with the actual disclosure.

Having thus disclosed my invention, I claim:

1. An elongated tubular structural column for primary load-bearing applications formed of a lightweight metal, such as aluminum, comprising a pair of non-identical elongated open channel-shaped members, one channel member having a male reentrant at each of the free edges thereof and the second channel member having a female reentrant at each of the free edges thereof, said male and female reentrants positioned parallel to and interengaging in the direction of the minor axis of and forming a hollow tubular column having greater structural characteristics than the sum of the separate channel members, said re-

entrants being positioned at opposite faces of the tubular column and providing shear transfer about the minor axis of the column, and shear transfer means across the major axis of the column providing shear transfer about the major axis of the column.

2. An elongated tubular structural column as set forth in claim 1, in which said shear transfer means provides for resistance to longitudinal shear forces.

3. An elongated structural tubular column as set forth in claim 1, in which said shear transfer means comprises at least one shear transfer pin extending through the male and female reentrants at a position adjacent the point of maximum shear at one face of the column.

4. An elongated tubular structural column as set forth in claim 1, in which the interengaged male and female reentrants form opposite corners of the column with the first female reentrant comprising a pair of spaced legs and the second female reentrant comprising a leg spaced inwardly and parallel to a web of the channel member, and the first male reentrant comprising a leg spaced inwardly of and parallel to a web of the channel member and the second male reentrant comprising a leg spaced inwardly from the end of and perpendicular to another web of the channel member, said male reentrants each being conformably received within the corresponding female reentrant.

5. An elongated tubular structural member as set forth in claim 4, in which the spaced legs of the first female reentrant are of unequal length.

6. An elongated tubular structural member as set forth in claim 4, in which said shear transfer means comprises at least one shear transfer pin extending parallel to the major axis through the first male and first female reentrant adjacent a position of maximum shear.

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