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Thomas

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[54] **SYSTEM FOR LIFTING AND HANDLING PANELS**

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[52] **U.S. Cl.** ..... **214/1 H,** 52/173, 52/750, 294/74

[51] **Int. Cl.** **E04g 21/02**

[58] **Field of Search** ..... 214/1 SW, 1 H; 224/50, 51, 49; 294/74; 52/173, 750; 248/354 R, 354 P

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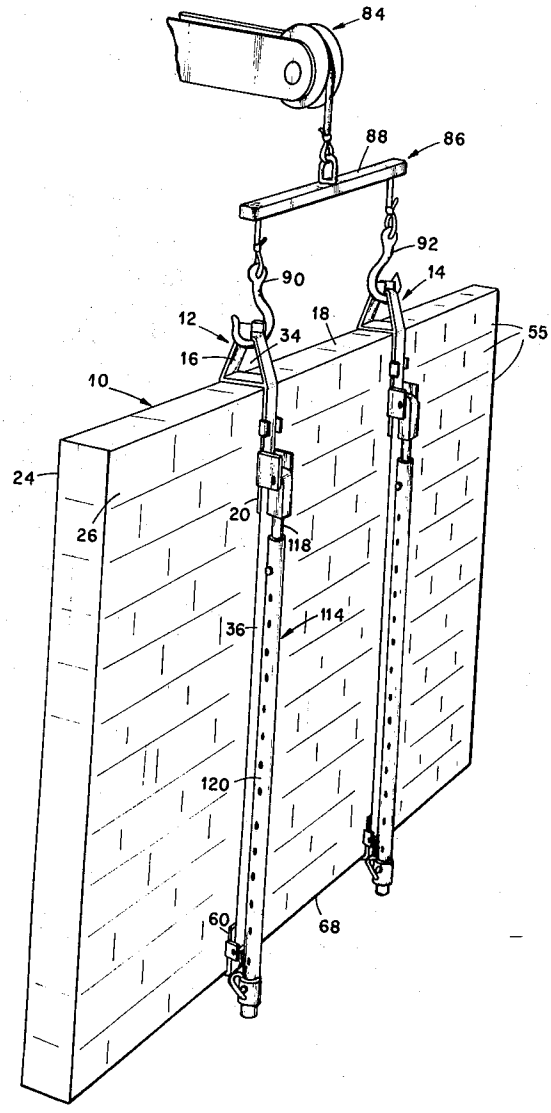
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Assistant Examiner—Frank E. Werner
Attorney—Edwin M. Luedeka et al.

[57] **ABSTRACT**

A system for handling a panel including means releasably securing a panel for lifting and handling and means attachable to the first means for aligning the panel in a upright position during installation of the panel.

6 Claims, 6 Drawing Figures



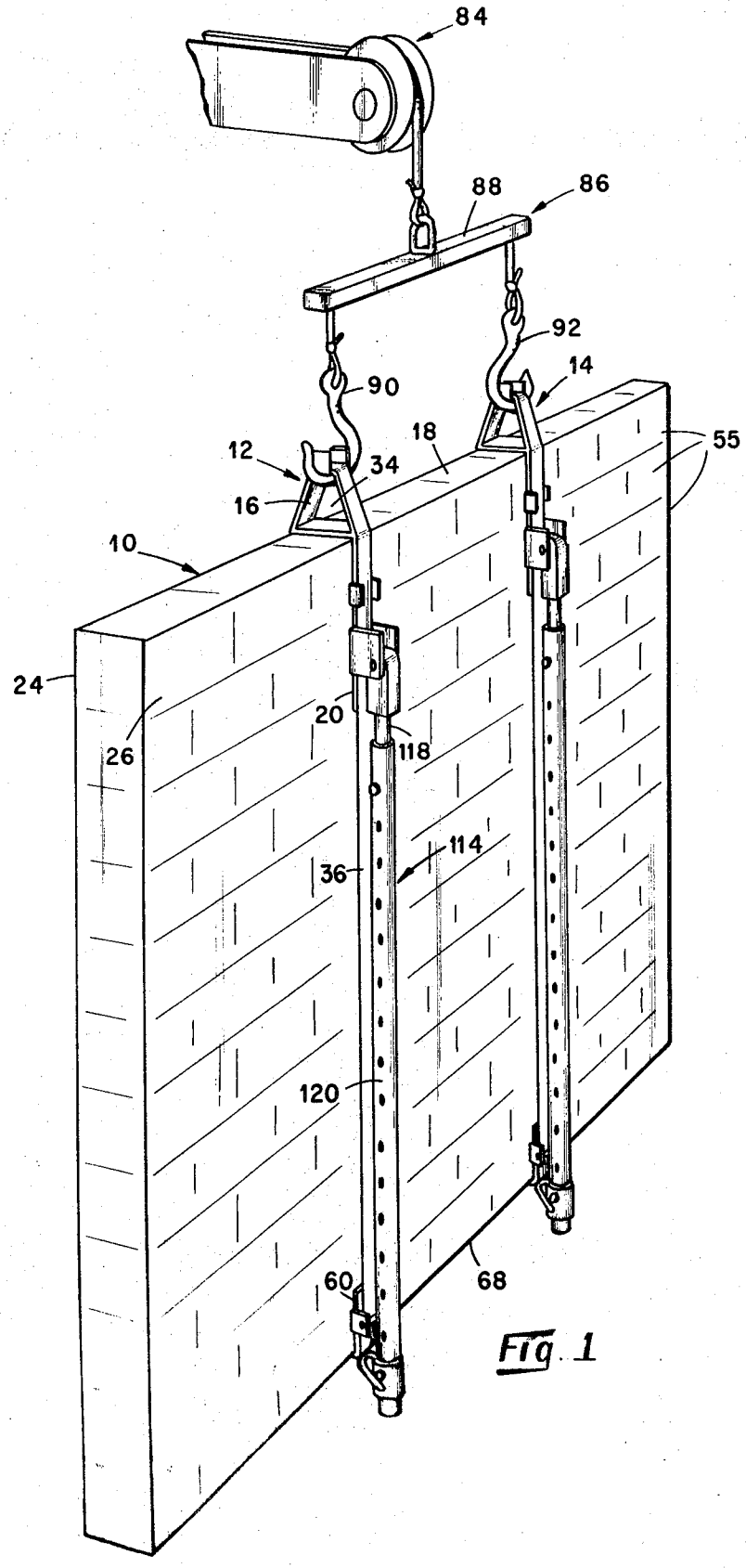


Fig. 1

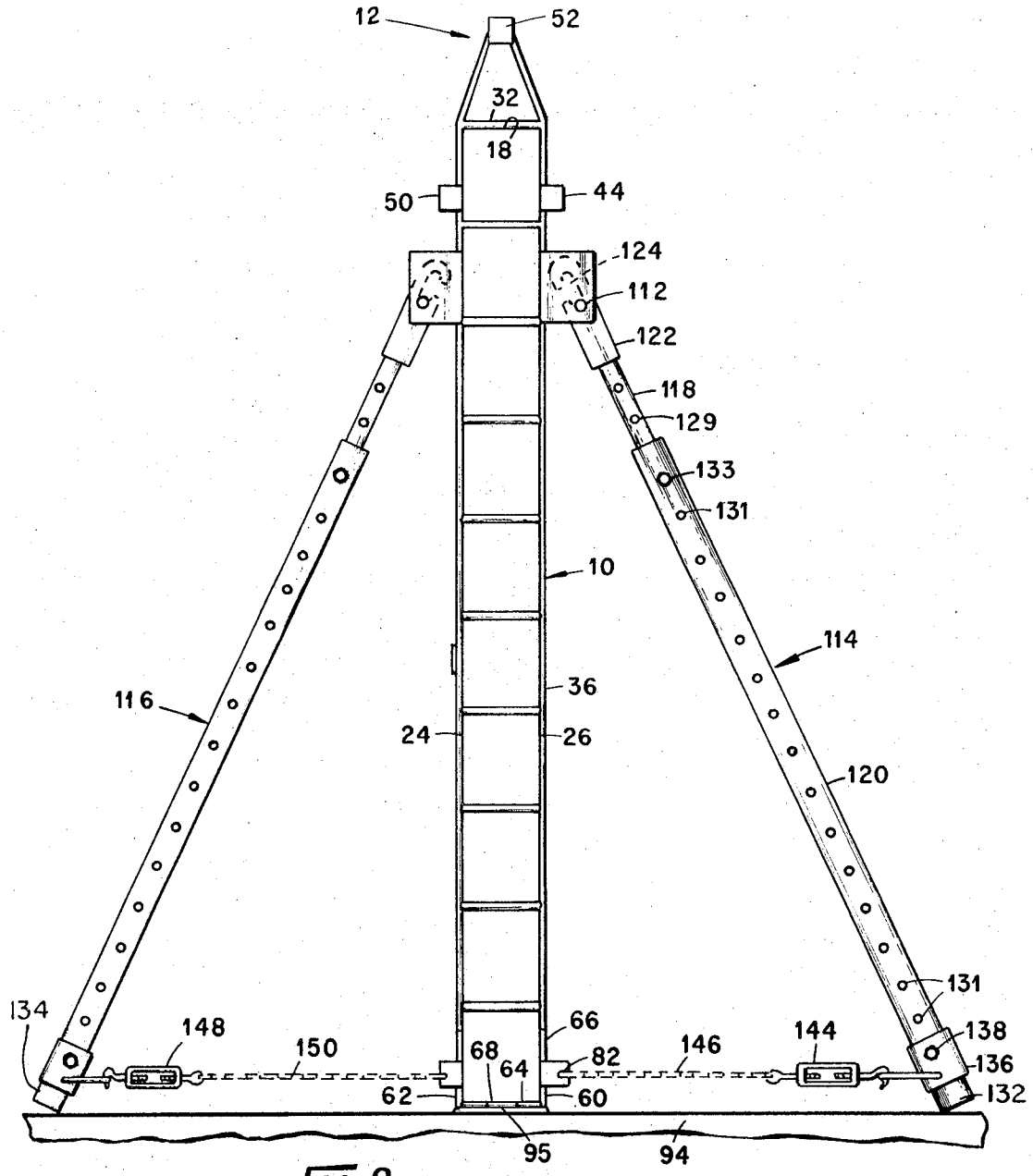

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Fig. 2

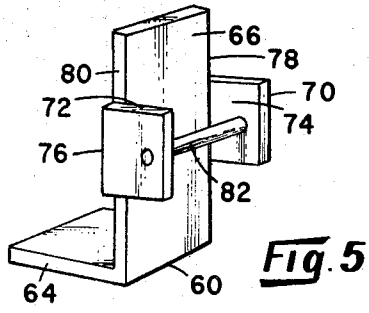

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Fig. 5

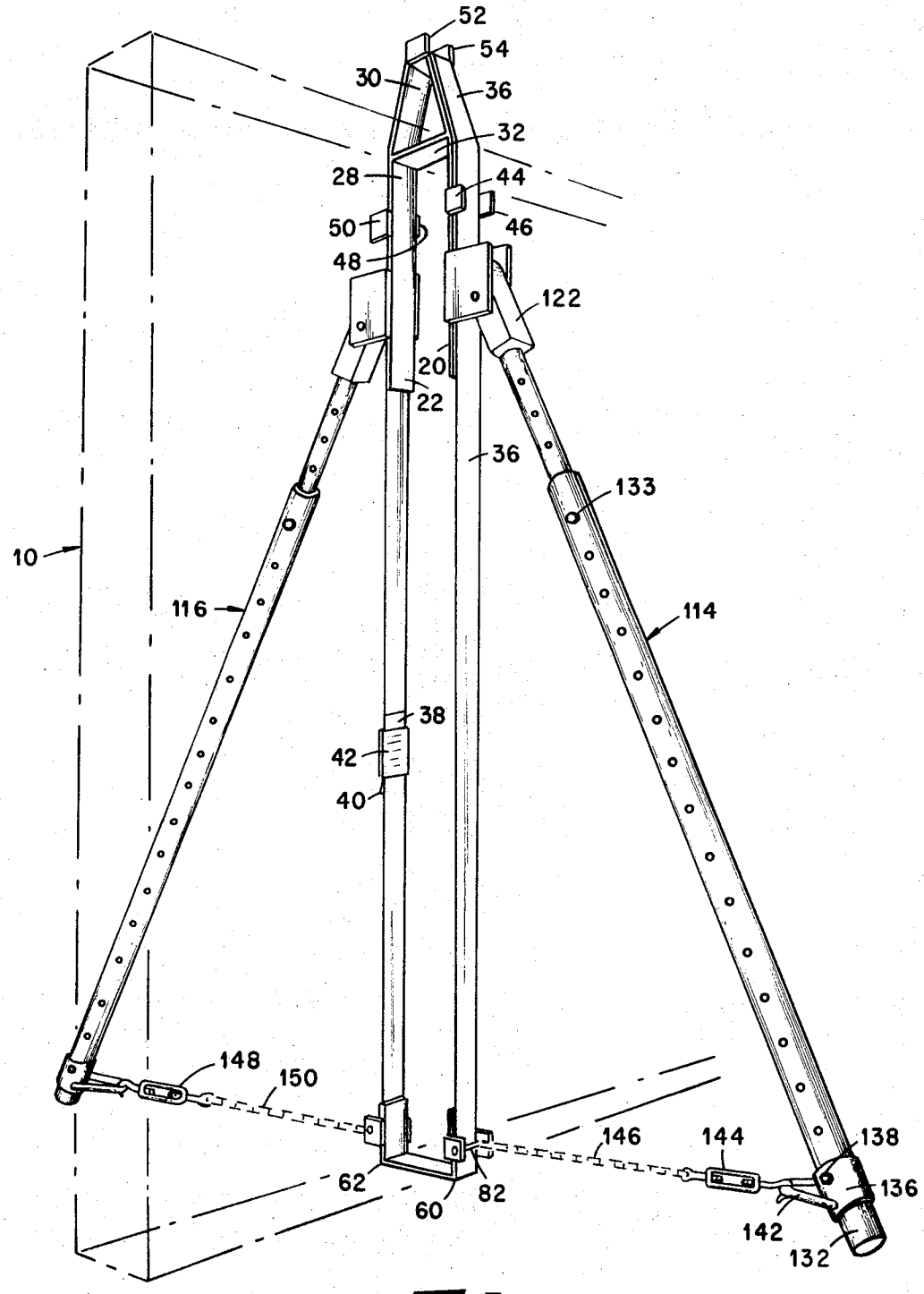

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Fig. 3

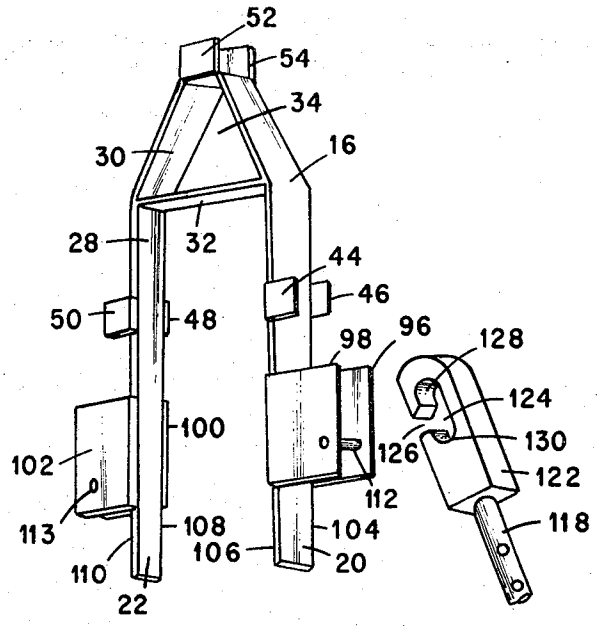

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Fig. 4

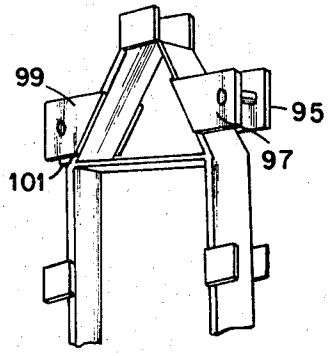

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Fig. 4A

SYSTEM FOR LIFTING AND HANDLING PANELS

This invention relates to systems for lifting and handling slabs or panels, particularly prefabricated masonry slabs or panels.

It is becoming increasingly common in the construction industry to prefabricate a wall or floor section of a building at a location distant from the construction site and thereafter transport the prefabricated panel to the construction site where it is installed in the building. Certain of these prefabricated panels, particularly masonry panels, are of great weight so that they must be lifted and transferred with the assistance of a crane or other lifting device. Due to their great weight, special care is required to avoid damage to the panel during handling. Moreover, the relatively large expense represented by using a crane or the like for holding the panel while it is being installed can negate a substantial part of the savings available through prefabrication methods.

Masonry panels prefabricated by laying up bricks or masonry blocks in courses are particularly susceptible to damage during transfer from the prefabrication site to the construction site by handling means known heretofore.

It is an object of the present invention to provide a system for lifting heavy slabs or panels particularly masonry panels comprising laid up bricks or masonry block. It is also an object to provide apparatus adapted to releasably engage a panel and secure it for lifting and handling and adapted to adjustably secure the panel during its installation. It is a further object to provide a system for securing a panel for installation in an upright position, wherein the upright position of the panel is adjustable.

Other objects and advantages of the invention will become known by references to the following description and accompanying drawings, in which:

FIG. 1 is a perspective view of the disclosed system and showing various features of the invention;

FIG. 2 is an end view of a prefabricated masonry wall secured in an upright position by means of the present system;

FIG. 3 is a perspective view of apparatus for use in the disclosed system;

FIG. 4 is a fragmentary view of a portion of the apparatus shown in FIG. 3;

FIG. 4A is an alternative embodiment of that portion of the apparatus shown in FIG. 4; and,

FIG. 5 is an enlarged perspective view of a further portion of the apparatus shown in FIG. 3.

Stated briefly, the present system comprises means for releasably securing a panel at one or more locations thereon for lifting and handling and means attachable to the first means for aligning the panel in a desired upright position during installation of the panel. More particularly, the present system includes apparatus adapted to encircle a panel and be engaged by lifting means and to be further engaged by means suitable for accomplishing upright alignment of the panel during installation thereof.

For purposes of disclosure, the present system is described in connection with the lifting and handling, including vertical alignment, of an upright masonry panel. The disclosed system is particularly useful in handling prefabricated panels of bricks or masonry blocks laid up in courses and bonded with mortar. It

will be evident that the present system and apparatus are useful in handling various panels in a variety of positions. With reference to the Figures, in the depicted system, a masonry panel **10** is encircled by two removable collars **12** and **14**, one of the collars being located inwardly from each of the opposite ends of the panel by about one-third of the length of the panel. Each of the collars includes a bifurcated yoke **16** adapted to fit over the top edge **18** of the panel with the opposite legs **20** and **22** of the yoke lying along each of the opposite sides **24** and **26** of the panel. Preferably, the legs of each yoke are in contact with and bear against the sides of the panel so that the yoke is relatively tightly fitted over the panel and does not wobble about when positioned on the panel. It will be recognized that if the spacing between the legs **20** and **22** of a particular yoke may be greater than the thickness of the panel disposed therebetween, the yoke may be rigidified with respect to the panel by the use of shims between the legs and the sides of the panel. As best seen in FIG. **3**, this yoke comprises a unitary elongated member **28** bent into a generally "U" shape to define oppositely disposed legs **20** and **22** and a base **30**. A cross member **32** is interposed between the legs **20** and **22** at the points where the legs commence curving to form the base of the yoke. As shown in the Figures, this cross member serves to limit the extent to which the yoke fits over the top edge of the panel due to the cross member **32** contacting the top edge **18** of the panel as the legs of the yoke are fitted over the panel and along the opposite sides of the panel. In this manner, the base **30** of the yoke upstands from the top edge of the panel to define a loop **34** through which a lifting device can be fitted.

The yoke **16** is held in position on the panel by means of a band **36**, preferably metal, which encircles the panel and yoke and is joined at its opposite ends **38** and **40** by a crimped sleeve **42** or the like. To maintain the band on the yoke **16**, each of the side legs of the yoke is provided with a pair of guide members **48** and **50**, and **44** and **46**, which serve to receive the band **36** therebetween and maintain it in overlying alignment with the legs. The base **30** of the yoke **16** is also provided with a similar pair of guide members **44** and **46** which position and maintain the band in overlying alignment with the base of the yoke. When tightened snugly about the panel, the band **36** holds the yoke fixedly secured to the panel. Each of the legs **20** and **22** of the yoke depend downwardly from the top edge of the panel by a distance sufficient to cause the legs to bear against more than one, and preferably at least three, courses **55** of masonry blocks so that a lift force applied to the collar assembly results in a substantially vertical pull upon the panel thereby reducing the likelihood of damage to the panel due to an uneven or non-vertical pull thereagainst.

At the locations where the band passes around the bottom corner edges and of the panel, there are provided corner brackets **60** and **62** (see FIGS. **2** and **3**) disposed between the band and the bottom corner edges **56** and **58** of the panel to aid in preventing breakage of the panel in these locations by reason of pressure applied thereagainst by the band during lifting operations. With reference to FIG. **5**, each of the corner brackets **60**, for example, comprises an elongated member formed into a generally "L" shape to define a first leg **64** adapted to engage the bottom surface **68** of the panel (FIG. **2**) and a second leg **66** adapted to en-

gage and lie along the side **26** of the panel as best seen in FIG. **2.** This second leg **66** of the corner bracket **60** is provided with a pair of lugs **70** and **72** attached at one of their respective ends **74** and **76** to the opposite side edges **78** and **80** of the leg **66** of the corner bracket and project perpendicularly from the bracket, hence perpendicularly from the side of the panel. A cross member **82** is provided between the projecting lugs **70** and **72** to define a point of attachment for an adjustable connection between the panel and other elements as will be referred to hereinafter.

In accordance with the present system, the panel is prefabricated at a location distant from the construction site and after completion, it is fitted with one or more collar assemblies as referred to above. The panel may be thereafter lifted as by a crane **84** or the like and placed on a vehicle (not shown) for transport to the construction site. One suitable lifting apparatus comprises a sling **86** including a rigid bar **88** having hooks **90** and **92** connected to its opposite ends, the hooks being adapted to engage the loop **34** of each yoke **16.** Once the panel arrives at the construction site, it is lifted by the crane from the transport vehicle and placed in position in the building. Employing the crane, the bottom edge **68** of the wall is lowered into the desired location on a floor **94** of the building or on another foundation which may carry a bed of mortar **95** as depicted in FIG. **2.** By reason of the weight of the panel, the bottom end remains in the selected location.

As shown in FIGS. **2, 3** and **4,** the yoke **16** of the apparatus employed in the present system includes two sets of plates **96** and **98,** and **100** and **102** secured to and extending outwardly from the side edges **104** and **106,** and **108** and **110,** of the respective legs **20** and **22** of the yoke. Bolt means **112** and **113** extend between the respective plates **96** and **98** and **100** and **102** to define a cross member between each set of plates.

The depicted apparatus further includes a pair of extensible legs **114** and **116,** one leg being disposed on each side of the panel, each leg comprising two telescoping sections **118** and **120.** The upper section **118** of the leg **114** is provided with a generally C-shaped hook **122** defining an opening **124** suitable for receiving the cross member **112** when the hook is positioned between the two plates **96** and **98.** In the disclosed hook, the opening **124** therein includes an entrance **126** disposed intermediate the ends **128** and **130** of the opening so that the hook may be releasably attached between the plates **96** and **98** by passing the cross member **112** through the entrance **126** to the opening **124** and thereafter moving the leg **114** up or down to secure the hook against inadvertent withdrawal from its position of engagement with the cross member. By this means, each of the legs **114** and **116** is pivotally connected to its respective side of the yoke **16.** In the depicted apparatus, the legs **114** and **116** are shown in their upper positions so that the respective cross members **112** and **113** are disposed in the lower portions of the respective openings in each hook. In an alternative embodiment depicted in FIG. **4A,** the two sets of plates **95** and **97** and **99** and **101** which receive the legs **114** and **116** therebetween are secured to and extend outwardly from the base **30** rather than from the leg portions of the yoke. In this embodiment, the plates do not extend outwardly from the panel as far as do the plates **96, 98, 100** and **102** of FIG. **4** so that the panel may be positioned closer to another panel as where positioning several panels on a truck for transporting them to a construction site.

As depicted in FIGS. **2** and **3,** once the bottom edge of the panel is in position on the floor **94** with the hook of each leg engaging the yoke, the lower ends **132** and **134** of the telescoping legs are moved outwardly from the panel sufficiently to cause the lower end of each leg to engage the floor **94** at a location spaced laterally from the panel by a short distance, such as about six feet. The top and bottom sections **118** and **120,** respectively of the leg **114** are each provided with openings **129** and **131,** respectively, which when aligned define passageways through the leg **114.** Bolt means **133** is inserted into such aligned openings to maintain the leg in the desired extended or withdrawn position. In this manner, each leg depends from the yoke **16** at an acute angle with respect to the upright panel. The lower end of each leg is provided with a sleeve **136** slidably disposed on the outer surface of the bottom section **120** of the leg and including a set of aligned openings therein through which bolt means **138** is inserted to lock the sleeve in position on the leg. The openings **131** extending through the bottom section **120** of the leg **114** permit the sleeve to be locked in a selected position along the length of the leg. This sleeve is further provided with a ring **142** to which there is secured one end of a turnbuckle **144.** The opposite end of the turnbuckle **144** is connected, as by means of a chain **146,** to the cross member **82** which extends between the two lugs **70** and **72** of the corner bracket **60.** A similar turnbuckle **148** and chain **150** assembly is provided to connect the lower end of the opposite leg **116** to the corner bracket **62** that is held on the bottom edge of the panel by the band **36** as referred to above. With a chain and turnbuckle assembly connected between a leg and its corner bracket, the outward movement of the leg is limited by the length of the chain and turnbuckle assembly. When the panel is disposed on the floor in an approximately upright position and the lower ends of the legs are in contact with the floor and held against outward movement by their respective chain and turnbuckle assemblies and the hooks of the legs are engaged with their respective cross member on the yoke, the respective cross members reside in the bottom ends of the opening defined by the respective hooks on the top ends of the legs. Further, the legs exert opposing forces against the top end of the panel so that it is retained firmly in its upright position. Thereafter, the crane is disengaged and thereby freed to be utilized with other panels or in another profitable manner. It will be recognized that when the panel is so positioned with the legs extended on opposite sides of the panel, any upward movement of the leg **114,** for example, will exert a push against the top end of the panel, the direction of such push being such as will tend to move the top edge of the panel away from the leg that is exerting the push. In accordance with the disclosed system, tightening of the turnbuckle **144** reduces the length of the turnbuckle and chain assembly and causes the lower end **132** of the leg **114** to be drawn toward the bottom edge **68** of the panel, simultaneously reducing the angle at which the leg depends from the top edge of the panel. Because the lengths of the panel and leg are fixed, the resultant action on the panel due to tightening of the turnbuckle is to cause the top edge of the panel to move laterally with respect to the bottom edge of the panel. With reference to FIG. **2,** tightening of the

turnbuckle **144** will cause the top edge of the panel to move to the left. It is noted that in order for the desired movement of the top edge of the panel to take place, there must be a corresponding loosening of the turnbuckle **148** of the leg **116** on the opposite side of the panel so that the angular relationship between the panel and the leg **116** on this opposite side of the panel is increased to accommodate the desired panel movement. Accordingly, in aligning the top edge of a panel, any tightening of a turnbuckle is accompanied by corresponding loosening of the turnbuckle on the opposite side of the panel, and vice versa. Through repeated manipulation of the turnbuckles, the top edge of the panel is incrementally adjusted to the extent required to vertically align the top edge of the panel with respect to the bottom edge. Once the panel is adjusted to the desired vertical position, it is maintained stationery by the depicted apparatus for permanent installation.

Upon completion of the installation of the panel, the respective chain and turnbuckle assemblies are disconnected from each of the legs and the hook of each leg is disengaged from its respective cross member on the yoke **16.** Thereupon, the metal band **36** is severed and withdrawn from its encircling position about the panel.

For handling masonry panels, the band **36** is of a thickness less than the thickness of the usual masonry mortar joint employed (between about ⅜ and ½ inch) so that when the panel has been installed using a mortar joint between the bottom of the panel and a supporting surface, the severed band may be readily withdrawn from between the bottom of the panel and its supporting surface, i.e. a floor. A preferred band comprises a flat metal strap about two inches wide and about 1/16 inch thick. Such bands are sufficiently strong to bear great weights and when withdrawn they leave a relatively small opening in a mortar joint that can easily be filled with additional mortar. Such bands are relatively inexpensive hence may be discarded after a single use. Other suitable means, such as one or more cables, will be recognized by one skilled in the art as suitable substitutes for the depicted band. If desired, metal shims may be provided between the panel and floor to hold the panel spaced above the floor (or a subjacent panel) until the mortar has solidified sufficiently to support the panel. These shims may be removed or left in position to become a permanent part of the structure.

With the band removed, the yoke **16** and the corner brackets **60** and **62** are readily removed from their position against the panel. The several elements of the apparatus are collected and returned to the point where the panels are prefabricated by reuse with subsequent panels.

While a preferred embodiment has been shown and described, it will be understood that there is no intent to limit the invention by such disclosure, but rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for handling a panel in an upright position and aligning said panel vertically when said panel is resting on a supporting surface including

collar means encircling said panel at a location between opposite ends thereof, said collar means including bifurcated yoke means disposed on the top edge of said panel and having leg portions thereof lying along opposite sides of said panel, bracket means disposed on the bottom edge of said panel, and band means encircling said panel and releasably securing said yoke and bracket means to said panel, whereby said yoke and bracket means are rigidified with respect to said panel, and

a pair of leg means pivotally connected to said yoke on opposite side surfaces of said panel and extending downwardly therefrom at an angle with respect to said panel to bear against said supporting surface at respective locations spaced from said panel,

adjustable means connecting said bottom edge of said panel to each of said pair of leg means whereby the angular position of each of said leg means with respect to said panel is adjustable to change the angular relationship between the panel and each leg and cause the top edge of said panel to move relative to said bottom edge of said panel for vertically aligning said panel.

2. The apparatus of claim **1** wherein said band comprises a flat metal strap having a thickness less than about ⅜ inch.

3. The apparatus of claim **1** wherein said yoke includes a cross member disposed between the legs thereof, said cross member contacting the top edge of said panel when said yoke is disposed on said panel to maintain a portion of said yoke above said top edge of said panel.

4. The apparatus of claim **1** wherein each of said pair of leg means is extensible.

5. The apparatus of claim **1** wherein said adjustable means comprises a turnbuckle and chain assembly.

6. In a system for handling a masonry panel in an upright position wherein said masonry panel comprises a plurality of courses of laid up masonry units, the combination comprising

lifting means,

a supporting surface for said panel,

collar means encircling said panel at a location between its opposite ends, said collar means comprising bifurcated means disposed on the top edge of said panel and having leg portions thereof lying along opposite sides of said panel, bracket means disposed on the bottom edge of said panel, and band means encircling said panel and releasably securing said yoke and bracket means to said panel, whereby said yoke and bracket means are rigidified with said panel, and

means releasably connecting said lifting means and said collar means whereby a lifting force exerted by said lifting means is transferred through said collar means to said panel to lift said panel,

a pair of leg means pivotably connected to said collar means at locations on said collar means adjacent the top edge of said panel and on opposite sides of said panel, said pair of leg means depending from said collar means at an acute angle with respect to said panel, the lower ends of said legs bearing against said supporting surface at respective locations on opposite sides of said panel and spaced from said panel whereby said panel is stabilized in an upright position, and

adjustable means connecting the bottom edge of the panel to each of the leg means whereby the distance between each leg and the bottom of the panel is adjustable to change the angular relationship between the panel and each leg and thereby exert a moving force against the top edge of the panel and align such top edge with the bottom edge of the panel.

* * * * *