Dec. 12, 1961 W. E. BLAIN 3,012,635

CHAIN COLUMN HOIST

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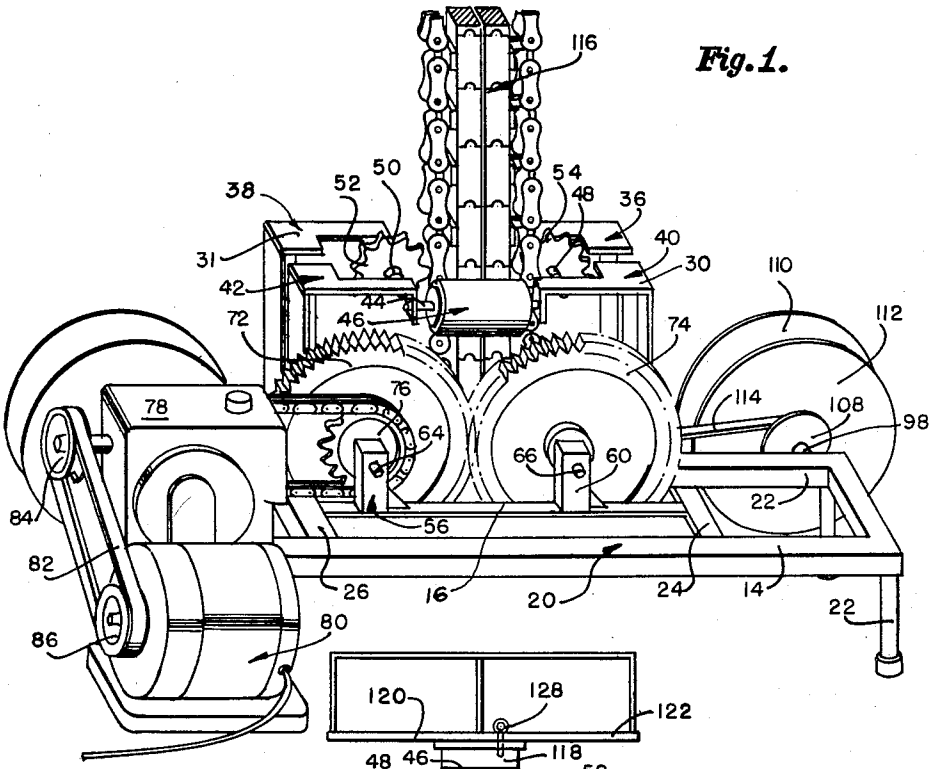


Fig. 1.

Fig. 2.

INVENTOR

Willard E. Blain

BY Kenon Palmer Stewart & Estabrook

ATTORNEYS

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Fig. 3.

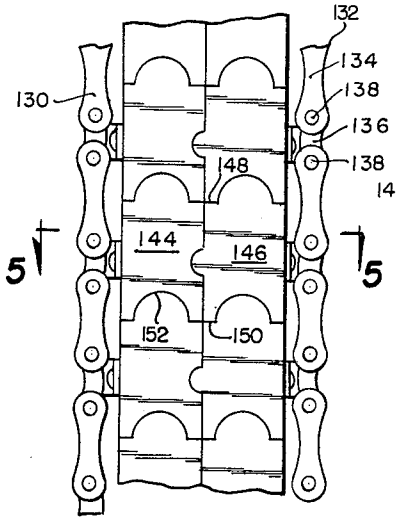


Fig. 4.

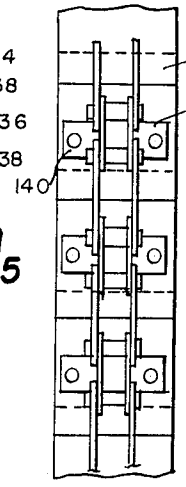
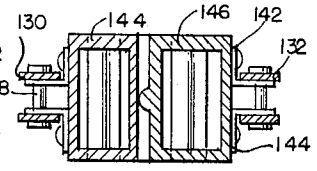


Fig. 5.



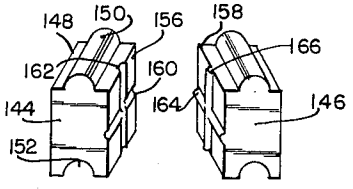


Fig. 6. *Fig. 7.*

Fig. 8.

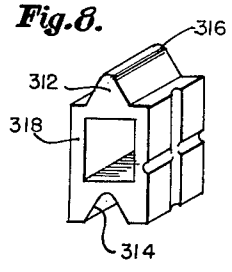


Fig. 10.

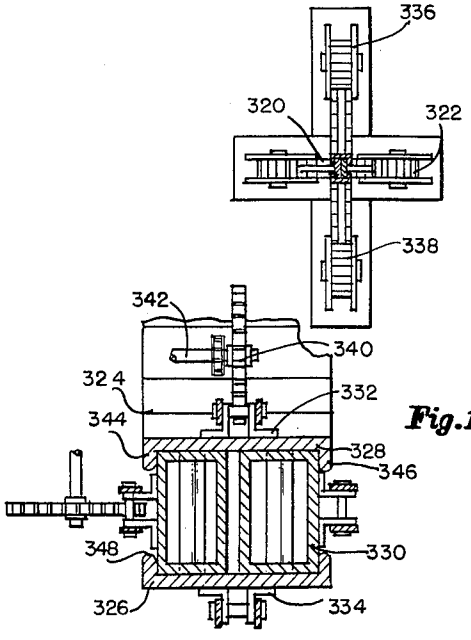


Fig. 11.

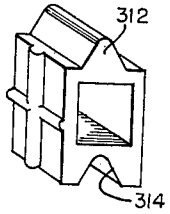


Fig. 9.

INVENTOR

Willard E. Blain

BY Kirmon Palmer Stewart and Estabrook ATTORNEYS

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CHAIN COLUMN HOIST

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Fig.15.

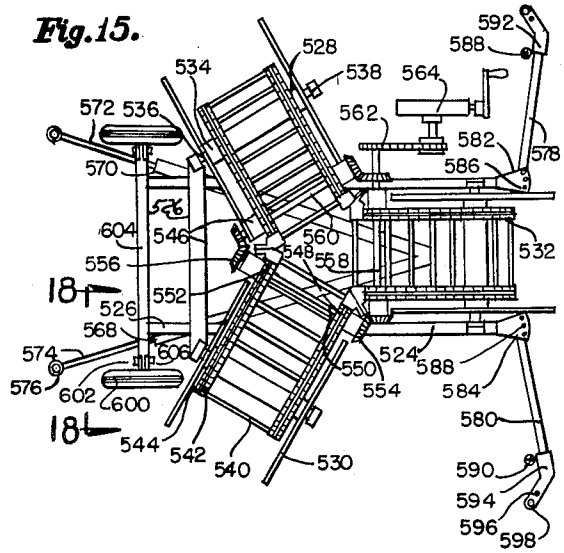


Fig.14.

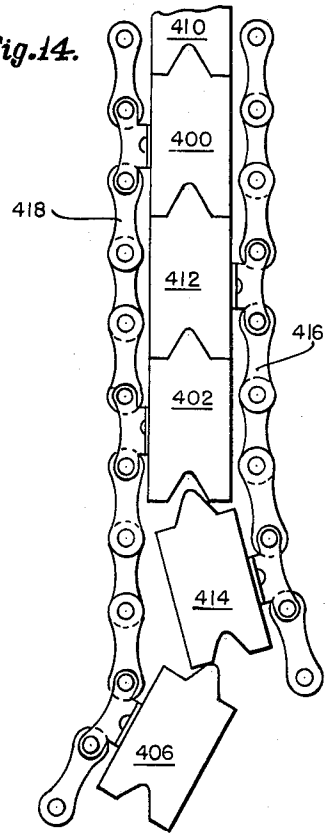


Fig.16.

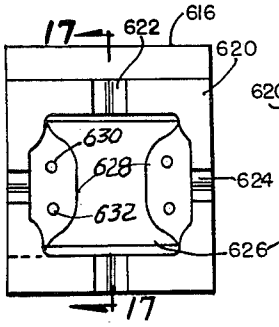


Fig.17.

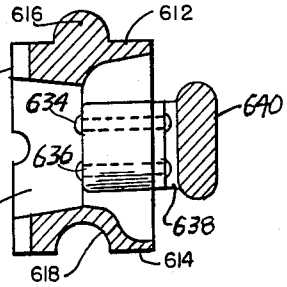


Fig.12.

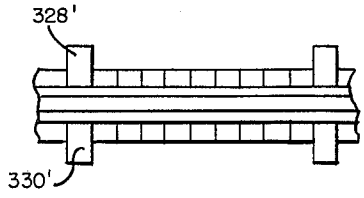
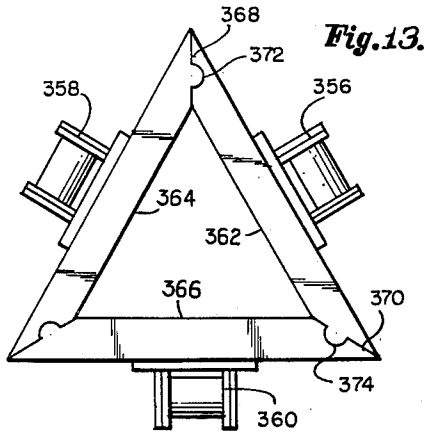


Fig.13.



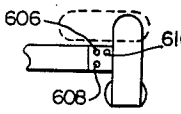


Fig.18.

INVENTOR

Willard E. Blain

BY Kenyon, Palmer, Stewart and Estabrook

ATTORNEYS

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3,012,635
CHAIN COLUMN HOIST

Willard E. Blain, % Blain Mfg. Co., P.O. Box 175, 121 B SW., Miami, Okla.

Filed June 6, 1958, Ser. No. 740,402
10 Claims. (Cl. 187—19)

This invention pertains to hoists and in particular to chain column hoists and a column forming means embodying the principles of a chain column hoist.

This application is a continuation in part of application Serial No. 660,544, filed May 21, 1957, now abandoned.

As set forth in the above previously filed application, column type hoists have been proposed for use in all manner of ways in which known hoists and jacks can be used and in fact some column type hoists have been developed. However, these are limited in the heights which can be reached due to the construction thereof. Further, some of the known hoists are of considerable weight and size as compared to those constructed according to the principles of my invention. The weight and size of the prior hoists limit their usefulness in so far as the problem of transportation and storage is concerned, and also results in high cost.

The objects of my invention include, as set forth in the prior application set out above, the provision of relatively portable hoists which are capable of being raised to great heights as compared to prior known hoists of a similar type. Further the objects include provision of a hoist which can be raised through trees and branches, etc., without interference and may be used for a radio antenna, for example.

Some of the objects include providing a hoist mounted work platform. Other objects include providing a simple means for storing a collapsible and expandable column having simple means for raising and lowering the column and in which the column forming means are readily storable in collapsed form at the base of the column.

Additional objects include providing relatively inexpensively constructed hoists, the use of known type of chains and chain drive means, together with the use of a pad structure which is collapsible yet which when expanded assumes a rigid relationship.

Further objects include the use of interengaging pad elements on opposed column forming means to provide rigid columns and including stressing the columns to insure rigidity.

The objects of the instant invention thus include those generally set forth in said prior application, and in addition the objects include:

Extending the usefulness of the hoist structure to special column uses and as support means.

To provide an interlocking single type column formed of cooperative column elements useful for certain installations such as where extreme light weight is desired.

The provision of drive means for raising and lowering column elements wherein the drive means is compact.

Providing a pad structure in chain column hoists for use in certain desired installations wherein there are means for locking the pads on adjacent runs of the hoist structure to each other.

To provide improved interlocking means on pads that are used in accordance with the invention.

Providing a collapsible and expandable servicing hoist structure of extreme flexibility.

And the provision of means adaptable to support of platforms, etc., at spaced points in marsh lands or in water, for example, or wherever else it is desired to obtain a rigid support.

These and other objects and advantages will become

apparent from the following description and the accompanying drawings wherein:

FIGURE 1 is a perspective view of a hoist constructed in accordance with the invention.

FIGURE 2 is a front elevational view.

FIGURE 3 is an enlarged fragmentary elevational view showing a hoist column formed of elements constructed in accordance with the invention.

FIGURE 4 is a side elevational view of the structure shown in FIGURE 3.

FIGURE 5 is a sectional plan view taken along line 5—5 of FIGURE 3.

FIGURE 6 is a perspective view of a pad forming part of the invention.

FIGURE 7 is a perspective view of a pad forming part of the invention.

FIGURE 8 is a fragmentary perspective view illustrating another form of pad which may be used instead of that illustrated in FIGURE 6.

FIGURE 9 is a perspective view illustrating a form of pad which may be used in place of that illustrated in FIGURE 7.

FIGURE 10 is a fragmentary sectional plan view illustrating another form of hoist.

FIGURE 11 is a fragmentary sectional plan view on an enlarged scale and illustrating a portion of the hoist of FIGURE 10.

FIGURE 12 is a fragmentary side elevational view illustrating one arrangement of locking blocks usable with the column.

FIGURE 13 is a fragmentary sectional plan view of another form of column.

FIGURE 14 is a fragmentary elevational view of an interlocking column.

FIGURE 15 is a top plan view of a hoist constructed in accordance with the invention.

FIGURE 16 is a side elevation of a pad.

FIGURE 17 is a sectional view taken along line 17—17 of FIGURE 16.

FIGURE 18 is a sectional view taken along line 18—18 of FIGURE 15.

Referring now in particular to the drawings: A preferred form of hoist constructed in accordance with the instant invention comprises a frame **10**, the frame includes longitudinal members **12** and **14**, as well as intermediate longitudinal members **16** and **18**. These longitudinal members are interconnected by lateral members such as **22**, **24** and **26**. Any number of such members may be provided as required for strength and to support elements hereafter described. In the preferred form illustrated in FIGURES 1 and 2 four such lateral members are used. The frame also includes legs **29**. The frame members are preferably united by welding to provide a rigid base.

A pair of upstanding guide frame elements **30** and **31** are provided at the front of the frame. These each comprise paired vertically extending legs **32** and **34** which support horizontally extending plates **36** and **38**, **40** and **42**. The latter are provided in spaced pairs with each one being supported by one of the vertically extending legs **32** and **34** of the elements **30** and **31**. The paired plates **36**, **38** and **40**, **42** extend inwardly of the legs **32** and **34** and the inner ends of each spaced pair are connected by a shaft **44**. A horizontally disposed roller **46** is rotatably supported on each of the shafts **44**. In the form of the invention shown, the shaft **44** is connected to the plates by welding. Obviously journal or other bearing means may be provided and the shaft may be removably connected.

The horizontally extending plates **36**, **38**, **40** and **42** extend substantially parallel inwardly of their connections to the vertically extending legs **32** and **34** and the inner

ends, in addition to being connected by shafts 44, are connected by laterally extending shafts 48 and 50. Shaft 48 is connected to the horizontally extending plates 36, 40 at their inner ends adjacent the point of connection of the shafts 44 to the latter plates, so as to extend laterally of the latter shafts. Shaft 48 is also connected to the laterally extending plates 36, 38 by welding. Shaft 50 is connected to the opposite pairs of plates 38 and 42 in the same manner and also by welding. Here again it is understood that the shafts may be connected by means permitting ready removal and replacement.

Four journal blocks 56, 58, 60 and 62 are supported in spaced pairs on the horizontal rails 12 and 16. These opposed blocks support shafts 64 and 66 respectively, and a pair of opposed sprockets 68 and 70 are fixed to the shafts 64 and 66, respectively. The two shafts are drivingly interconnected by a pair of meshed spur gears 72 and 74 which are fixed to their respective shafts. The shaft 64 also has a second sprocket 76 fastened thereto.

A reduction gear mechanism 78 is supported on the frame 10. A motor 80 is likewise supported on the frame 10 by virtue of its connection to one of the side rails 14. The motor is connected to the reduction gear mechanism by means of a belt 82 and pulleys 84 and 86, and the reduction gear mechanism is connected to the sprocket 76 by an additional sprocket 88 and chain 90. The sprocket 88 is connected to the output shaft of the reduction gear. It is apparent that when the motor is operated the shafts 64 and 66 will be rotated and sprockets 68 and 70 will likewise rotate. The motor is a reversible motor and thus the sprockets can be rotated in both forward and reverse directions.

The two sprockets 68 and 70 and the vertically spaced sprockets 52 and 54 are positioned so as to provide a vertically extending shaft-way or column-way between the sprockets. The facing peripheries of the two upper sprockets 52 and 54 and the two lower sprockets 70 and 68, respectively, are the same distance apart and the upper and lower sprockets are vertically aligned.

A pair of spaced horizontal shafts 92, 94 are supported in journals 96 provided at the opposite ends of the frame and the corresponding ends of the members 16 and 18. A pair of reels 100 and 102 are connected to the shafts 92, 94, respectively. The reels have cores 104. A second core 106 is also attached to each of the shafts. A plate 108 is connected to one end of core 106 and the opposite end of each core is attached to the adjacent reel. The reels are formed by pairs of spaced plates 110 and 112, and thus the cores 106 are supported by the plates 110 and 112. Each of the reels 100, 102 has a spiral spring 114 associated therewith with the spring having one end connected to a core 106 and its opposite end connected to the hoist frame. Rivets are used to so connect the spring ends. The springs are formed so as to urge the reels to rotate in opposite directions, and to wind the forming elements on to the reels.

The above described mechanism is adapted to function in cooperation with beam forming means to provide an extensible and retractable hoist. This means will now be described:

As seen in FIGURES 1 and 2 a column 116 is adapted to be positioned between the sprockets 52, 54 and 68, 70. The column comprises an upper pedestal 118 on which platform 120 is supported. The platform has a flat bottom member 122 and the pedestal has a flat upper surface 124 adapted to be rotatably supported on the bottom member 122. A pivot pin 126 rotatably connects the platform to the pedestal and a removable pin 128 is adapted to cooperate with a hole in the platform base 122 and spaced holes in the pedestal for the purpose of adjustably securing the platform in desired positions of relative rotation with respect to the pedestal.

The pedestal 118 has connected to it, at opposite sides thereof, a pair of chains 130 and 132. These are common link chains and comprise the outer links 134 and inner links 136 connected by pins 138. Each pair of facing inner links 136 is provided with oppositely disposed flanges 140 and 142. Each of the pairs of flanges 140 and 142 on chain 130 is connected to a pad 144 and each of the corresponding flanges on the chain 132 is connected to a pad 146. The pads are generally cubical in shape and have upper and lower surfaces 148 and 150 which are each adapted to cooperate with corresponding surfaces on the pads above or below. Each of the pads is preferably provided with an upper guide 151 and a complementarily formed lower guide receiving channel 152. The pedestal has a flat lower base 154 against which are adapted to abut two of the pads 144 and 146. The latter two pads and pedestal can each be provided with the mating guide means 151 and 152.

The lower end or opposite end of each of the chain and pad lines, considering the end connected to the pedestal as the upper end, are connected to one of the cores 104 in the reels 100 and 102, respectively. The connection is such that these lines of chain links and blocks can be rolled up on to the cores through rotation of the reels in one direction or rolled off of the cores by rotation of the reels in an opposite direction. These combinations of chains and pads are preferably referred to as column halves. The chains 130 and 132 are meshed with the pairs of upper and lower sprockets 52 and 70 and 54 and 68, respectively. The distance between the periphery of the sprockets is selected to be such that the pads 144 and 146 are held together along mating vertical faces 156 and 158.

The mating faces can be plane vertically extending faces or can be provided with mating indentations and projections to assist in maintaining the pads in a relatively fixed relationship. These indentations may take the form of horizontal and vertical channels 160 and 162 on pad 144 cooperable with their mating projecting horizontal and vertical elements 164 and 166 provided on the opposite block 146. This construction will prevent shifting between the horizontally disposed blocks along their vertical faces. The upper and lower projections and indentations 151 and 152 will prevent sliding separation between the vertically disposed blocks in a horizontal plane. With these three types of projecting members and mating indentations the blocks will be rigidly affixed relative to each other when they are brought into association with each other, as long as the blocks 146 and 148 are prevented from separating horizontally laterally of their vertical faces 156 and 158.

The hoist is provided with guide means 168 and 170, respectively, cooperable with the chain column halves. Each of the column halves comprising the chain links and associated pads are adapted to be guided by the guiding means 168 or 170 as the case may be, to assist in proper winding or unwinding on their associated reels.

The pads 144 and 146 are made of a size with respect to the links 134 and 136 of the associated chains such that the chains will be stretched when the links and pads are brought into vertically aligned position in the column; that is, when the columns are formed. This is accomplished by having the vertical distance between the upper surface 148 and the lower surface 150 greater than twice the length of the links.

It is apparent that by operation of the motor 80 the sprockets can be rotated to move the chains upwardly and formulate a column or to withdraw the column and disconnect the parallel pads for winding on to their associated reels. Further as the column is formed the links are placed in tension and the pads in compression with the pads in intimate association with their vertically arranged cooperating pads as well as with their laterally associated pads. As a result a rigid column is achieved.

The rollers 46 on opposite sides of the column provide lateral support in one plane and the upper sprockets 52, 54 provide lateral support in the opposite plane.

The resulting hoist can be used to project columns to a relatively great height as compared to those possible with hoists heretofore known.

FIGURES 8 and 9 show another form of pads which may be provided. In this form of the invention the pads have V-shaped upper and lower projections and complementarily formed indentations **312** and **314**. The crowns of the projections and indentations are curved as indicated at **316**. Further the blocks are cored at **318**. The core extends completely through the block and results in a reduced weight.

FIGURES 10 and 11 illustrate another form of hoist beam. In this form of the invention the column halves **320** and **322** are formed identically with those previously discussed. In addition to comprising these elements however the beam comprises lock columns **324** and **326**. These latter are formed by lock blocks **328** and **330**. The latter are each connected to spaced links on the chains **332** and **334**. The lock blocks and chains can be stored on the reels **336** and **338** in the same manner that the column halves **320** and **322** are stored on their associated reels. The upper ends of these spaced columns **324** and **326** are connected to the platform adjacent the point of connection of the upper ends of the column halves and accordingly the lock columns rise with the column halves of the beam. Further drive means comprising the sprocket **340** and shafts **342** can be utilized to drive the lock columns upwardly and maintain their vertical position. These sprockets are positioned so as to force the lock blocks against the sides of the pads. Further the lock blocks are provided with spaced flanges **344** and **346** which are spaced at a distance equal to the overall distance between the outer faces of the blocks. Further with the lock block height being greater than two link lengths, the link lengths being equal, and a lock block being attached to every other link, the lock columns tend to bow inwardly toward the beam column pads. Further, with the sprockets **340** forcing the lock blocks against the sides of the pads and with the flanges **344** and **346** abutting against the outer faces of the pads and with the upper ends of the lock columns being attached to the platform so as to maintain the columns in position the lock blocks will more securely prevent disassociation of the beam halve pads and provide additional rigidity to the beams. The inner ends of the lock block flanges are curved as indicated at **348** to facilitate association of the lock blocks with the pads.

FIGURE 12 illustrates that the locking blocks **328'** and **330'** may be spaced along the columns instead of their being locking blocks for every pair of pads.

FIGURE 13 illustrates another form of column wherein the chains **356**, **358**, **360** have associated therewith pads **362**, **364** and **366**. Each of these pads have laterally flared vertical surfaces **368** and **370**. These surfaces are respectively provided with recesses **372** and projections **374**. The chains and pads are arranged in triangular relationship as illustrated in FIGURE 13 and are driven so that when they are raised to form a column the projections on each pad will fit into the depression on the adjacent pad with the lateral faces **368** and **370** being in abutting relationship. This will form a rigid triangularly shaped column.

In FIGURE 14 there is illustrated another form of the invention wherein the pads **400**, **402** and **406** are connected to the chains **418** and the pads **410**, **412** and **414** are connected to the chains **416**. As is apparent alternate pads are connected to opposite chains and as contrasted with the apparatus of FIGURE 1, for example, a single column of pads is formed in the formation of the combined pad and chain columns. In FIGURE 1 it is apparent that the pads form two pad columns. The pads **410**, and **400** etc. are constructed as the previously disclosed and described pads shown in FIGS. 8 and 9 in that they have the same V-shaped upper projections **312** and lower recesses or indentations **314**.

The drive means for the chains **418** and **416** can be that of any of the types of drives disclosed herein. The difference between the structure of FIGURE 1 and that of

FIGURE 14 resides in the formation of a single column of intercalated pads of the opposed chains in the latter figure. The pads **400** and **402** are connected four links apart on their chains and are each of an overall height slightly greater than two links. Thus the links are placed in tension by the assembled pads. The form of the invention illustrated in FIGURE 14 is very desirable for a light aerial construction, for example.

FIGURES 15, 16, 17 and 18 illustrate an aircraft servicing hoist. In this embodiment of the invention a trailer frame **524** having suitable cross bracing structure has platform means consisting of spaced longitudinally extending angle irons **526**. These irons support reels having internal or external spring means for urging the reels to rotate and wind up their associated chain column structure. These reels are identified as **528**, **530** and **532**. As shown they are not enclosed reels but are left open and comprise central cores **534** mounted by means of shafts **536** and bearings **538**. Each of these reels is adapted to receive and wind thereon the paired chain column structure interconnected at spaced intervals by the rods **540**. The chain column structure connected to the rods **540** consists of the chains **542** and pads **521** and **522**. Each side column forming element thus consists of paired columns and connecting rods **540**. The column sides pass under paired sprockets **546** and **548** mounted on a shaft **550**. Shaft **550** is supported in bearings **552**, and the shaft supports bevel gears **554** and **556**. The reels **532** and **534** are provided with identical structure and as a result the three shafts **550**, **558** and **560** are interconnected. One of these shafts is provided with a drive sprocket **562** adapted to be driven by the manually operated speed reducer **564**. The column is raised and lowered through rotation of the crank. The pads of each side of the column will abut the pads of the other columns and they can be bolted together as the column is raised, if desired.

The aircraft hoist includes tubular track forming means **568** and **570**. These receive mating extensions **572** and **574** which are adapted to be slid in and out of the tracks **570** and **568** to form outriggers. The extensions are provided at their ends with screw jacks **576**. The members **570** and **568** are cylindrical pipe like members and the extendable outriggers are also cylindrical in shape in order to slide in and out. At its forward end the vehicle includes pivotally connected outriggers **578** and **580**. The latter are pivotally connected to plates **582** and **584**, respectively, by pins **586** and **588**. The outriggers have screw jack means **588** and **590** adjacent their ends as well as plate means **592** and **594**. The outriggers are adapted to pivot on the pins **586** to a position extending forwardly and toward the longitudinal center and thereupon the plates **592** and **594** can be interconnected by a bolt **596**. One of the plates carries hitch means **598** and can be utilized to attach the hoist to a prime mover. The trailer has a pair of wheels **600** and stub axles having projecting bifurcated flanges **602**. The latter are pivotally connected to cross frame member **604** by pins **606** and are each provided with additional bolt holes **608** and **610**. The cross frame **604** is likewise provided with bolt holes alignable with the pivotally mounted bifurcated flanges **602** and bolts can be passed through these holes for affixing the wheels in a normal position in which they will be used in the towing of the hoist. However, the bolts used in the openings **608**, **610** can be removed and the wheels then swung upwardly, thus slightly decreasing the overall height of the hoist. This would be advantageous in use in cramped quarters and in transporting, for example.

FIGURES 16 and 17 show a pad structure which is preferable in certain types of hoist constructed in accordance with the invention. In this embodiment the pad is substantially hollow. The pad has upper and lower surfaces **612** and **614** as well as the upper guide **616** and lower guide receiving channel **618** which correspond to the like parts of the pad of FIGURE 6. The mating

vertical face 620 has channels 622 and 624 as does the pad of FIGURE 6. Channels 622 and 624 are adapted to receive the corresponding, mating, projections on the opposed block. The pad is hollowed to reduce weight, and has a bore 626 extending from face 620 to the opposite side of the pad.

A pair of bosses 628 are formed integrally with the pad and extend from approximately midway of the pad to the exterior rear surface. These bosses are pierced by a pair of openings 630 and 632. These openings receive rivets 634 and 636 which fasten the link flanges 638 on the chain link 640 to the bosses.

I claim:

1. A hoist comprising a frame means, a pair of link chains, means for moving said chains along an extended vertical path in facing relationship to define a column, said chains being connected adjacent one end to a supporting member, pad means connected to each of said chains with the pads adjacent said one end of said chains being in abutting engagement with said supporting member, said pad means on one of said chains being intercalated with the pad means of the other of said chains and each of said pad means being in vertical load supporting contact with its adjacent pad means, the total normal free lengths of said pad means being greater than the total normal free length of said chain with said pad means placing said chains in tension in said column.

2. A chain column hoist comprising a pair of linked chains, means interconnecting said chains adjacent one end thereof, pad means connected to said chains at spaced intervals therealong and adapted to form a continuous column, the total overall length of said pad means being greater than the lengths of said chains along the portion of said chains to which said pad means is connected.

3. A chain hoist column structure having side forming elements consisting of spaced links and pads interconnected to form one side element of a column wherein said links include pads and associated chain structure connected at opposite ends of said links with the pads of each of said side forming elements being connected to pads of adjacent side forming elements of said column, and said pads having a greater overall length along the portion of the chain to which they are connected than the normal overall length of said chain therealong.

4. In a chain column hoist pads for use therewith, each of said pads comprising an upper and lower bearing surface for transmitting vertical load and a side surface adapted to face adjacent pads, each of said side surfaces including a portion extending at an acute angle with a second portion thereof, one of said portions including projecting elements projecting outwardly therefrom and adapted to cooperate with mating recess structure on adjacent pads to prevent relative movement in the planes of the faces of said pads.

5. The apparatus of claim 4 including bolt receiving means for locking adjacent pads to each other.

6. The hoist as set forth in claim 2 wherein the pad means connected to one of said chains has means for contacting the pad means of the other of said chains along facing surfaces thereof.

7. The hoist of claim 6 wherein the pad means have mating elements on their said facing surfaces, the latter elements having shoulders preventing relative parallel movement of one pad with respect to an opposite facing and abutting pad.

8. The hoist of claim 2 wherein pad means on one of said chains is spaced to one side of the pad means on the other of said chains.

9. The hoist of claim 2 wherein each pad means of one of said chains is spaced longitudinally along said chain with respect to a corresponding pad means of the other of said chains.

10. A hoist comprising a frame means, a pair of link chains comprising outer links and inner links of uniform length pivotally connected to each other adjacent their ends, means for moving said chains along an extended vertical path in facing relationship to define a column, said chains being connected at one end to a supporting member, pad means connecting at least certain of said inner links of said chains with at least one pad adjacent said one end of said chains being in abutting engagement with said supporting member, said pad means on one of said chains being intercalated with the pad means of the other of said chains and each of said pad means being in vertical load-supporting contact with an adjacent pad means, the total normal free length of each pad being greater than the combined length of the inner link to which said pad is connected and the next adjacent outer link of said chains with said chains being placed in tension in said column by said pad means.

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