

TITLE

"COLUMN HOISTS"

FIELD OF THE INVENTION

THIS INVENTION relates to a column hoist particularly
5 suitable for lifting vehicles or other loads.

BACKGROUND OF THE INVENTION

Column hoists alleviate the need of inspection pits which
are dangerous, accumulate debris and severely limit the useable floor
space. They also allow greater versatility of use of floor space and are
10 usually supported by rollers or wheels thereby providing portability and
ease of hoist storage.

One known type of column hoist, described in Australian
patent specification 26678/88, comprises a lifting carriage which moves
along two vertical columns. A chain supporting the lifting carriage passes
15 around spaced pulleys one located on the lifting carriage and the other
located adjacent upper ends of the columns. A portion of the chain is
passed around a drive pulley which is driven by an electric motor. Upon
activation of the motor the drive pulley rotates and causes the lifting
carriage to be either raised or lowered by the chain.

20 Column hoists allow a person to work underneath a vehicle
raised above the ground and supported on the lifting carriage. It is
therefore highly desirable for safety reasons to ensure there is no
possibility of the lifting carriage inadvertently dropping for example if the
chain snaps or slips. Various safety assemblies have been used to
25 prevent inadvertent dropping of the lifting carriage. For instance, in
Australian Patent specification identified by application number 26678/88
there is described a safety mechanism including a spring-loaded locking
pin which is attached to a chain supporting a lifting carriage. The safety
mechanism is arranged such that upon an inadvertent snapping or
30 slipping of the chain the pin engages a slot in a column of the hoist and
thereby locks the lifting carriage to the column.

Friction brakes can also be used to clamp the lifting carriage

to the columns should the chain snap or slip. Alternatively as disclosed in Australian patent 470742 spring-loaded ratchets for engaging projections mounted on each column can be used to lock the carriage to each column if the chain should snap or slip.

5 The column hoist safety mechanisms as described above are generally unsatisfactory because they are triggered by loss of chain tension. However, should the chain snap, the lifting carriage will drop down and drag the chain down with it resulting in the chain still being tensioned to some extent due to the weight of the dropping lifting
10 carriage. This in turn may cause delays in the functioning of the safety mechanism.

 Another problem with safety mechanisms triggered by loss of chain tension is that mechanical play and wear of components can result in temporary loss of tension in the chain therefore causing pulsing
15 the safety mechanism. A particular problem with such pulsing is that the locking pin or ratchet may slide along the slots or projections causing unnecessary wear which can result in malfunctioning of the safety mechanism.

 During operation of the above column hoists not all of the
20 chain is required to support the lifting carriage which results in an exposed non-supporting chain portion hanging from the drive pulley. This non-supporting chain portion varies in length during raising and lowering of the lifting carriage. As the lifting carriage is raised, the non-supporting chain portion increases in length and forms a chain mound on the floor.
25 Further, because the supporting chain portion is looped numerous times around the pulleys a large chain mound may accumulate.

 In practice, column hoists are used in workshops which can have floor areas covered with oil, dirt, grease, water or corrosive substances which may come into contact with the chain mound resulting
30 in chain damage or slipping of the chain around the drive pulley. Further, the chain mound is a safety hazard and it may become tangled or ensnare items such as tools or rags resulting in hoist damage or

malfunction.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a column hoist which overcomes or alleviates at least one of the problems associated with prior art column hoists having a lifting carriage supported by a chain.

According to one aspect of the invention there is provided a column hoist including:

at least one hollow upright column having a drive means mounted adjacent an upper end thereof;

10 a lifting carriage moveably mounted to the column to allow the carriage to move therealong; and

a chain engagement means associated with the drive means, the chain engagement means driveably engaging a chain,

wherein a carriage supporting portion of the chain is coupled to the lifting carriage and a non-supporting portion of the chain is located inside the column.

Preferably, there is a guide means for guiding the chain means into the hollow column.

Suitably, the guide means is positioned in close proximity to the chain engagement means.

The guide means may have a chain link alignment means associated therewith for aligning links in the non-supporting portion of said chain.

The chain link alignment means may be a passage for allowing aligned portions of said chain to pass therethrough.

Preferably, there is a chain abutment member positioned in close proximity to the chain engagement means to thereby oppose the effects of centrifugal force applied to the chain due to rotation of the chain engagement means.

Suitably, the chain abutment member is positioned adjacent an upper part of the said non-supporting portion of the chain.

There may be a first safety means adapted to lock said

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lifting carriage to the support means upon downward movement of the lifting carriage past and predetermined acceleration threshold.

5 Suitably, the first safety means comprises a projection associated with the lifting carriage, the projection being operable between a free position where the lifting carriage can move along the support means and an engaging position where the projection engages the column to prevent movement of said lifting carriage.

The projection is suitably rotatably mounted between a free position and engaging position.

10 A biasing means may be provided to bias the projection to its engaging position.

Preferably, the projection may comprise a pawl mounted to a shaft.

15 Suitably, the pawl may have a nose portion to facilitate insertion into a retaining means on the column.

The retaining means may include an apertured plate attached to the column and comprise a series of spaced openings which are suitably in linear alignment along the column.

20 Suitably, the first safety means includes an inertia reel assembly coupled to the lifting carriage.

Preferably, the inertia reel assembly activates a solenoid which is operatively coupled to the projection.

Preferably, there is a second safety means adapted to stop the drive means upon sensing a decrease in chain tension.

25 The second safety means may suitably comprise an actuation arm having a guide or wheel adjacent one end which contacts the chain.

Suitably, the actuation arm is adapted to operate an isolation switch thereby removing power supplied to the drive means.

30 The lower end of the at least one column is suitably attached to a supporting base framework to allow the column hoist to be free standing.

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The supporting base framework may have associated wheels or rollers to allow the hoist to be portable.

BRIEF DESCRIPTION OF THE DRAWINGS

5 In order that the invention will be readily understood and put into practical effect reference will now be made to a preferred embodiment in which:

FIG 1 is a left side view of a hoist according to an embodiment of the invention;

FIG 2 is a front view of the hoist of FIG 1;

10 FIG 3 is a plan view through A-A of a base portion of the hoist of FIG 1;

FIG 4 is a plan view of a lifting carriage of FIG 1;

FIG 5 is a plan view of a drive pulley, output shaft and electric motor of FIG 1;

15 FIG 6 is a perspective view of a portion of a first safety means of FIG 1;

FIG 7 is a side view of FIG 1 showing a portion of the first safety means in the locked position;

20 FIG 8 is a side view of FIG 1 showing a portion of the first safety means in the unlocked position;

FIG 9 is an exploded view of a portion of the first safety means of FIG 1;

FIG 10 is a view of the projection of the first safety means engaging with an opening;

25 FIG 11 is a schematic perspective view of a chain abutment member of FIG 1; and

FIG 12 is a perspective view of a chain guide means of FIG 1.

DETAILED DESCRIPTION

30 Referring to FIGS 1 to 5 there is disclosed a column hoist 10 comprising an upright pair of spaced columns 11, 12 interconnected by a cross-member 33 adjacent their upper ends. The lower ends of columns

11, 12 are connected to a supporting base framework 13 comprising a pair of parallel extending arms 14, 15 (better shown in FIG 3) and a connecting member 16.

5 Rollers 17, 18 are pivotally mounted at the free ends of arms 14, 15 and two pneumatic wheels 19 are pivotally mounted to supporting portions 20, 21 which each extend from a respective, one of columns 11,12 rearward of base framework 13. Pneumatic wheels 19 have an associated handle 23 to assist in hoist 10 to be wheeled and guided to a desired position. Pneumatic wheels 19 are pressurised such
10 that when a load is applied to hoist 10 wheels 19 are slightly flattened (as shown in FIG 1) such that supporting base framework 13 contacts a ground surface at abutment member 24 thereby stopping movement of hoist 10.

 A lifting carriage 25 is moveably mounted to columns 11, 12
15 to allow upright movement of carriage 25 along columns 11, 12. Lifting carriage 25 comprises a pair of extending arms 26, 27 configured to cradle portions of a vehicle's wheel. Arms 26, 27 are connected to transverse arm 28 which is connected to a pair of diagonal arms 29, 30 located between columns 11, 12.

20 Roller pairs 31, 32 are pivotally mounted to lifting carriage 25 and they engage opposite faces of each of columns 11, 12 and allow carriage 25 to ride smoothly along columns 11, 12.

 A shaft 35 extends between upper ends of columns 11, 12 and rotatably to mounted to shaft 35 are at a number of guides in the form
25 of pulleys 36.

 Lifting carriage 25 also includes a shaft 37 extending between arms 29, 30 to which are rotatably mounted pulleys 38.

 A carriage supporting portion of a chain 40 is coupled adjacent one end 34 to carriage 25 and extends upwards to a guide in
30 pulleys 36, the chain then extends in a downward direction and engages a guide in pulleys 38. This looping occurs a number of times and then supporting portion of chain 40 engages a drive pulley in the form of a

Gipsy 42. The Gipsy 42 is attached to a drive means 41 mounted adjacent upper ends of columns 11,12, the drive means being in the form of an output shaft 43 coupled, via a gearbox 45, to an electric motor 44.

5 A non-supporting chain portion 40A of chain 40 is located inside hollow column 11. A guide 110 assists in feeding non-supporting chain portion 40A abutment member 111, shown best in FIG 11, opposes the effects of centrifugal force on chain portion 40A as it revolves around Gipsy 42.

10 Gipsy 42 is adapted to engage the links of chain 40 thereby allowing a non-slip engaging relationship. Upon rotation of drive pulley 42 by motor 44, chain 40 raises or lowers lifting carriage 25 and the length of chain portion 40A varies in accordance with this raising or lowering.

15 Referring to FIG 6 a first safety means 59 is illustrated in which a front face of each of columns 11, 12 is provided with a respective apertured plate 50, 51 formed with a series of aligned spaced apertures 52.

20 A shaft 55 is pivotally mounted to arms 29, 30 of lifting carriage 25. A pawl arrangement which is formed by a pair of spaced projections 53, 54 which are rigidly mounted to a shaft 55 such that they project normal to the pivotal axis of shaft 55. Springs 56 (each of which may be a coil or leaf spring) are mounted to each of arms 29, 30 and abut against a rear portion of projections 53, 54 to provide biasing of projections 53, 54 (thereby causing rotation of shaft 55) towards an
25 engaging position in respective apertures 52.

30 One end of shaft 55 is provided with an abutment member in the form of a wheel 57 mounted to shaft 55 by arm 58 to restrict rotation of projections 53, 54 from a free position and the engaging position. This rotation is restricted by a rod 60 which is in constant abutment with wheel 57 wherein rod 60 is moveable between an energised position as shown in FIG 8 and a retracted position as shown in FIG 7. Rod 60 is pivotally connected to a side face of column 12 through pivot links 61, 62 and 63

as shown in FIGS 7 and 8. It can be seen from FIGS 7 and 8 that when rod 60 is in its energised position wheel 57 is caused to move backwards thereby rotating shaft 55 and which in turn forces projections 53 and 54 to adopt their free positions against the bias of springs 56. However, when
5 rod 60 adopts its de-energised position as shown in FIG 7, springs 56 force projections 53 and 54 into the engaging position in a respective one of apertures 52.

FIGS 9 and 10 show detail of this portion of the first safety means 59 in greater detail. FIG 9 illustrates the various parts of the shaft
10 and projection assembly and comprises shaft 55, projections 53, 54, pins 65, 66, half-nut 67, arm 58 to be welded to shaft 55, washer 68, wheel 57, washers 69, 70, and bolt 71 for engagement with half-nut 67.

FIG 10 shows projection 53 comprising a nose portion 72 to facilitate its insertion into a respective aperture 52 due to the biasing of
15 springs 56. It can be seen from FIG 10 that the particular nose configuration of the projection facilitates its insertion into respective opening thereby minimising the possibility of the projection riding across openings rather than locking into a respective aperture 52.

Further, protrusion of projections 53, 54 into respective
20 apertures 52 is limited by the columns to which plates 50, 51 are attached. This therefore has the advantage of alleviating the need for lifting the carriage to allow removal of projections 53, 54 from respective apertures 52, for example after safety means 59 has been activated:

In FIGS 7 and 8 it can be seen that rod 60 is operated
25 between the energised and de-energised positions by a solenoid 75. A piston 76 of solenoid 75 is coupled to rod 60 by a link mechanism 77 such that when solenoid 75 is de-energised, projections 53, 54 engage respective apertures 52 and when solenoid 75 is energised projections 53, 54 disengage apertures 52.

30 As best illustrated in FIG 2, power supply to solenoid 75 is controlled by a switch 101 which is operatively coupled to an inertia reel assembly 100. Inertia reel assembly 100 comprises a housing 102

mounted adjacent the upper end of column 12 and a flexible belt 103 attached to carriage 25 and is biased to move into housing 102. Switch 101 is electrically connected to solenoid 75 and thereby controls the energisation and de-energisation of solenoid 75.

5 Inertia reel assembly 100 can be pre-set to lock the belt should there be a sudden acceleration of carriage 25 (such as would occur should chain 40 snap). Locking of the belt activates switch 101 which in turn de-energised solenoid 75 to retract rod 60 which in turn immediately results in projections 53, 54 engaging the next available
10 respective apertures 52.

 It can be seen that in this arrangement, the locking of lifting carriage 25 is entirely independent of chain 40 as triggering of the safety mechanism is dependent only on sudden movement of the lifting carriage 25 and not any loss of tension in chain 40. In order to sense the amount
15 of slackness in chain 40, there is a second safety means comprising an isolation switch 106 having an actuation arm 107, the free end of which has pivotally attached roller 108 in abutment with chain 40. If tension is lost in chain 40 switch 106 will be activated which in turn cuts power to electric motor 44. This in turn will halt the movement of lifting carriage 25
20 thereby preventing undue tension loss of chain 40 which can result in the chain 40 jumping out of a respective pulley 36 or 38.

 Referring to FIGS 11 and 12, guide means 110 is attached to column 11 by screws 112 which pass through mounting apertures 113 in flanges 114 and engage with threaded holes in column 11. Guide
25 means 110 guides chain portion 40A into column 11, therefore chain portion 40A is covered and does not form a mound upon a floor surface. Attached at a lower end of guide means 110 is a chain link alignment means in the form of a block 116 having a groove which forms a passage 115 between the block and guide means 110.

30 An aperture (not shown in the FIGS) is cut in column 11 to allow block 116 and a lower portion of guide means to be located inside column 11. Passage 115 is only slightly wider than chain 40 therefore, in

use, chain portion 40A passes through passage 115 and when carriage 25 is lowered, chain links that are misaligned (as a result of low tension of chain portion 40A) are forced into alignment as they pass through passage 115.

5 Chain abutment member 111 is mounted near the upper end of column 11 by a bracket (not shown) and is positioned adjacent an upper part of chain portion 40A. Chain abutment member 111 opposes the effect of centrifugal force on chain portion 40A as it revolves around Gipsy 42 during raising of carriage 25. This therefore has the advantage
10 of reducing the possibility of the chain portion 40A from being thrown off Gipsy 42.

 It should be appreciated that various other changes and modifications may be made to the embodiment described herein without departing from the spirit and scope of the invention.

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CLAIMS:

1. A column hoist including:
at least one hollow upright column having a drive means mounted adjacent an upper end thereof;
5 a lifting carriage moveably mounted to the column to allow the carriage to move therealong; and
a chain engagement means associated with the drive means, the chain engagement means driveably engaging a chain,
wherein a carriage supporting portion of the chain is coupled to the
10 lifting carriage and a non-supporting portion of the chain is located inside the column.
2. A column hoist as claimed in claim 1, further including a guide means for guiding the chain means into the hollow column.
3. A column hoist as claimed in claim 2, wherein the guide means is
15 positioned in close proximity to the chain engagement means.
4. A column hoist as claimed in any one of claims 2 or 3, wherein the guide means has a chain link alignment means associated therewith for aligning links in the non-supporting portion of said chain.
5. A column hoist as claimed in claim 4, wherein the chain link
20 alignment means is a passage for allowing aligned portions of said chain to pass therethrough.
6. A column hoist as claimed in any preceding claim, wherein there is a chain abutment member positioned in close proximity to the chain engagement means to thereby oppose the effects of centrifugal force
25 applied to the chain due to rotation of the chain engagement means.
7. A column hoist as claimed in claim 6, wherein the chain abutment member is positioned adjacent an upper part of the said non-supporting portion of the chain.
8. A column hoist as claimed in any preceding claim, further including
30 a first safety means adapted to lock said lifting carriage to the support means upon downward movement of the lifting carriage past and predetermined acceleration threshold.

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9. A column hoist as claimed in claim 8, wherein the first safety means comprises a projection associated with the lifting carriage, the projection being operable between a free position where the lifting carriage can move along the support means and an engaging position where the projection engages the column to prevent movement of said lifting carriage.
10. A column hoist as claimed in claim 9, wherein the projection is rotatably mounted between a free position and engaging position.
11. A column hoist as claimed in claim 10, wherein there is a biasing means for biasing the projection to its engaging position.
12. A column hoist as claimed in claim 11, wherein the projection may comprise a pawl mounted to a shaft.
13. A column hoist as claimed in claim 12, wherein the pawl has a nose portion to facilitate insertion into a retaining means on the column.
14. A column hoist as claimed in claim 13, wherein the retaining means includes an apertured plate attached to the column and comprise a series of spaced openings which are suitably in linear alignment along the column.
15. A column hoist as claimed in any one of claims 8 to 14, wherein the first safety means also includes an inertia reel assembly coupled to the lifting carriage.
16. A column hoist as claimed in claim 15, wherein the inertia reel assembly is arranged to activate a solenoid which is operatively coupled to the projection.
17. A column hoist as claimed in any preceding claim, further including a second safety means adapted to stop the drive means upon sensing a decrease in chain tension.
18. A column hoist as claimed in claim 17, wherein the second safety means comprises an actuation arm having a guide or wheel adjacent one end which contacts the chain.
19. A column hoist as claimed in claim 18, wherein the actuation arm is adapted to operate an isolation switch thereby removing power supplied





to the drive means.

20. A column hoist as claimed in any preceding claim, wherein the lower end of the at least one column is suitably attached to a supporting base framework to allow the column hoist to be free standing.

5 21. A column hoist as claimed in claim 20, wherein the supporting base framework has associated wheels or rollers to allow the hoist to be portable.

22. A column hoist substantially as described herein with reference to and as illustrated by the accompanying drawings.

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