Aug. 2, 1966 R. D. MUTCH 3,263,965

DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

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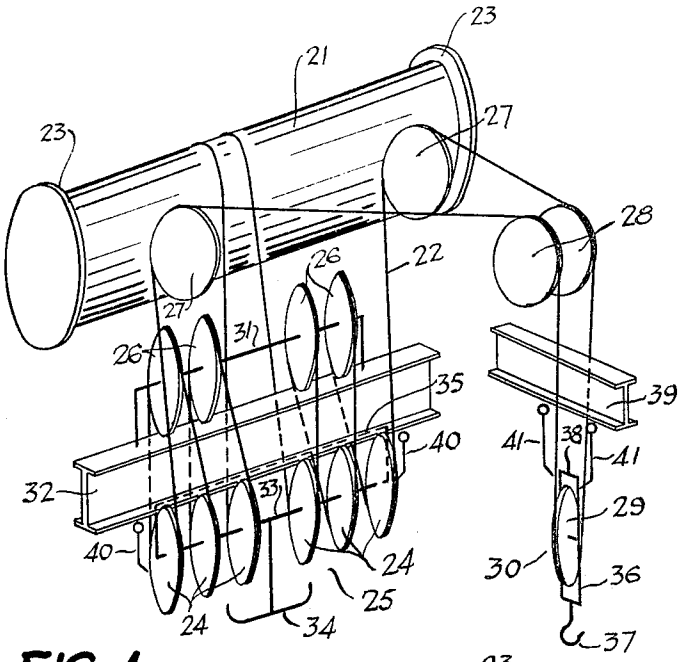


FIG. 1

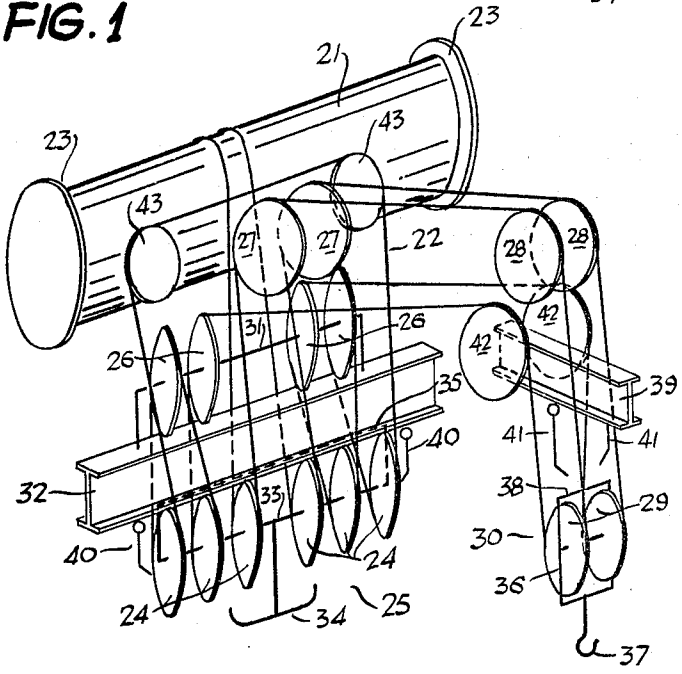


FIG. 2

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DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

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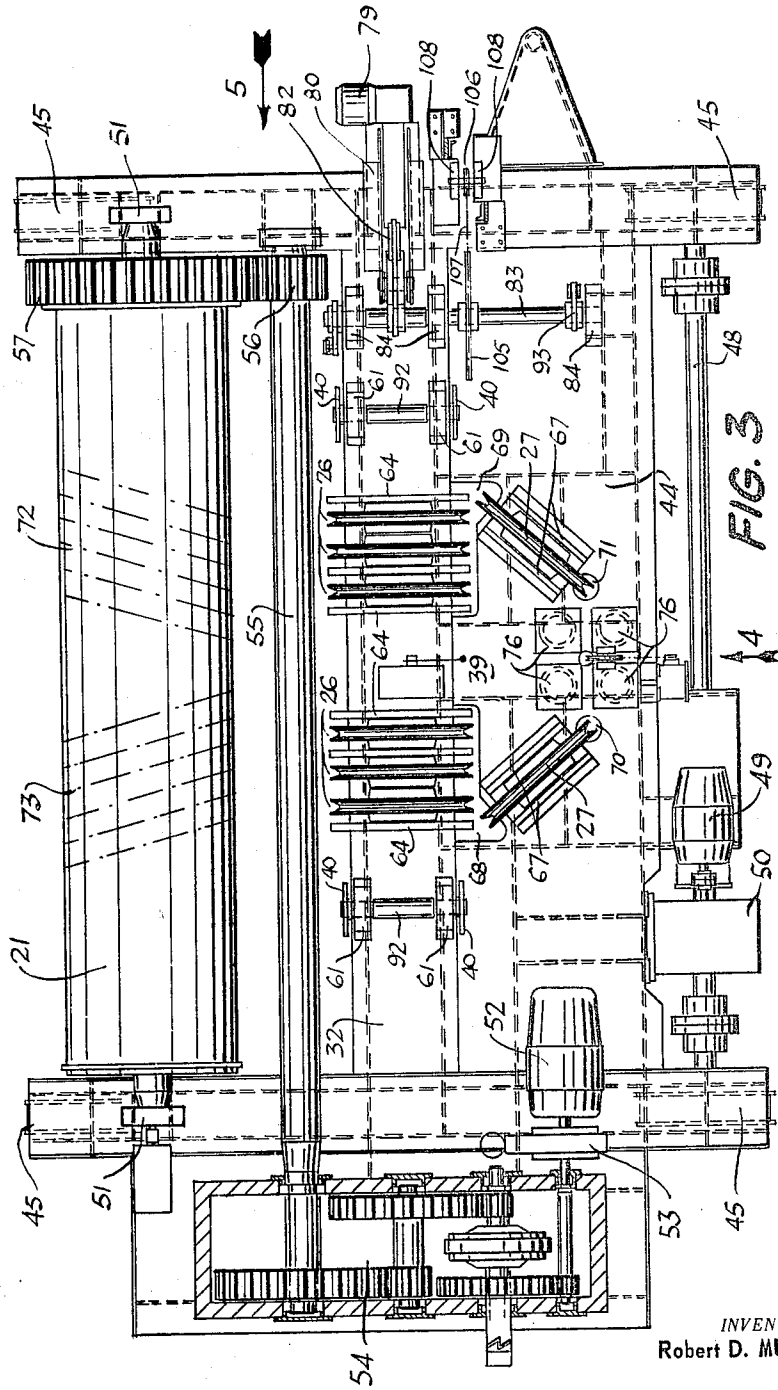


FIG. 3

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DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

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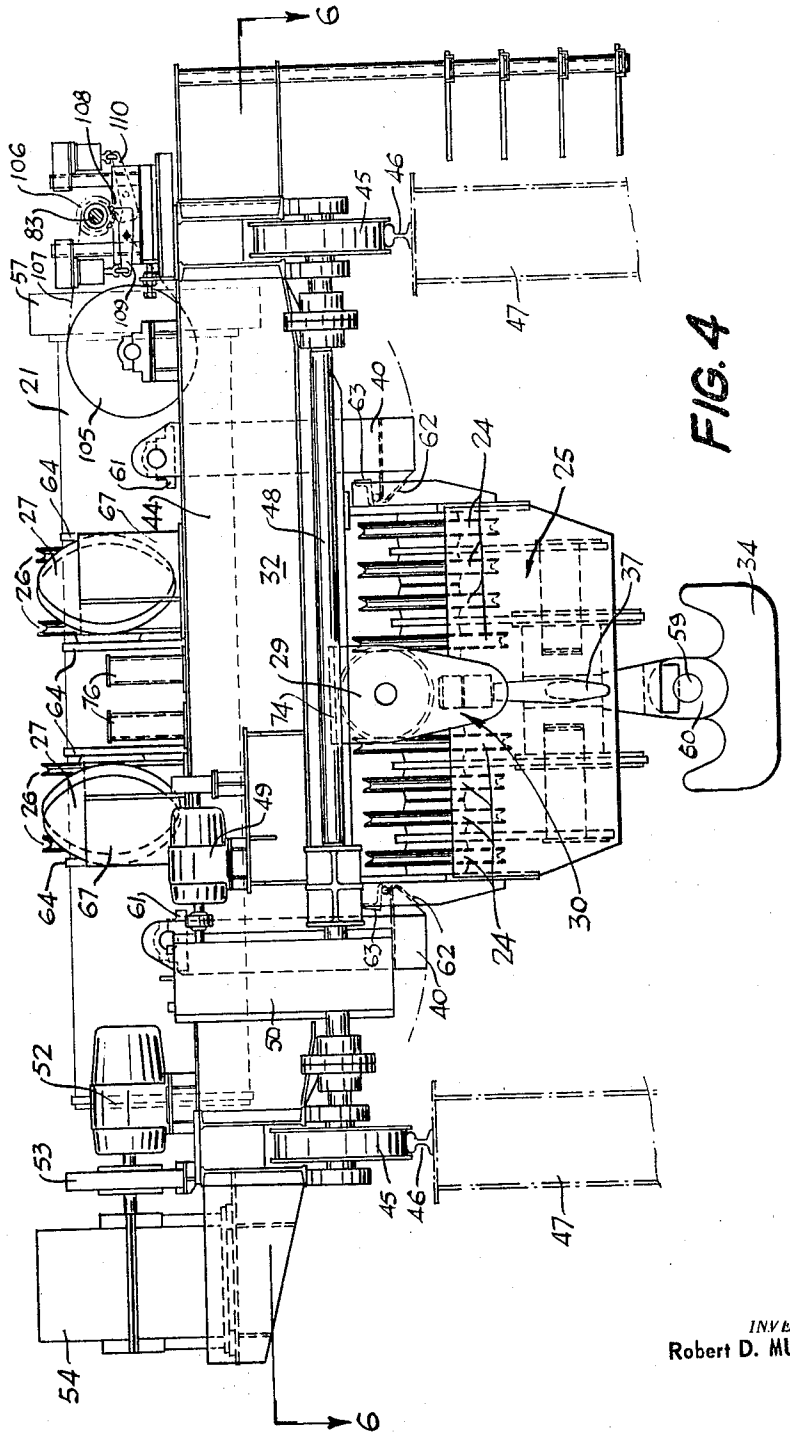


FIG. 4

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DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

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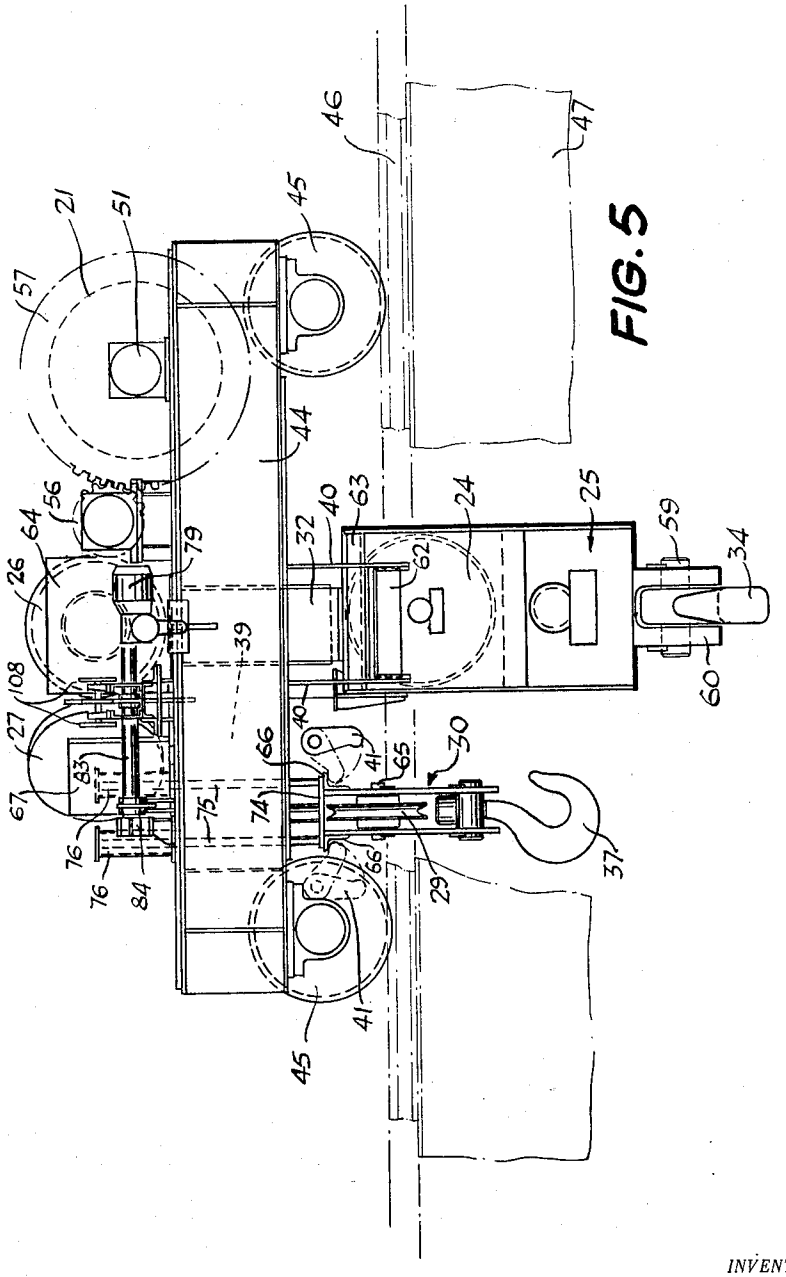


FIG. 5

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DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

Filed Aug. 31, 1964 6 Sheets-Sheet 5

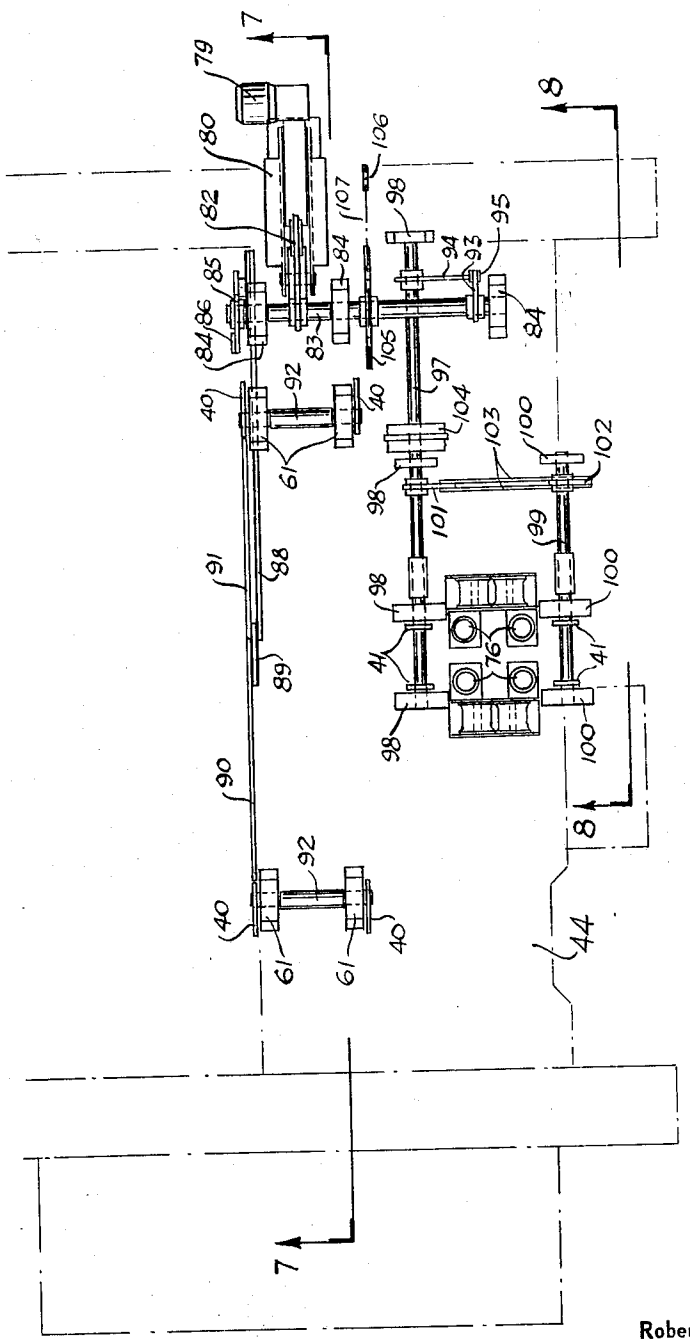


FIG. 6

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Aug. 2, 1966 R. D. MUTCH 3,263,965

DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

Filed Aug. 31, 1964 6 Sheets-Sheet 6

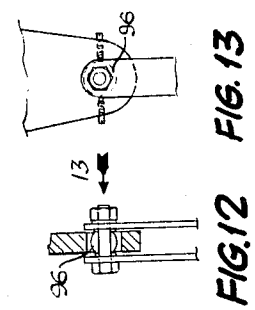


FIG. 13

FIG. 12

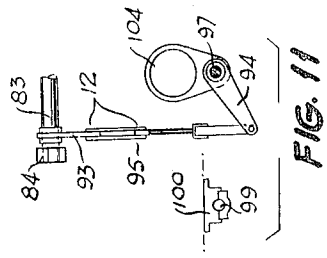


FIG. 11

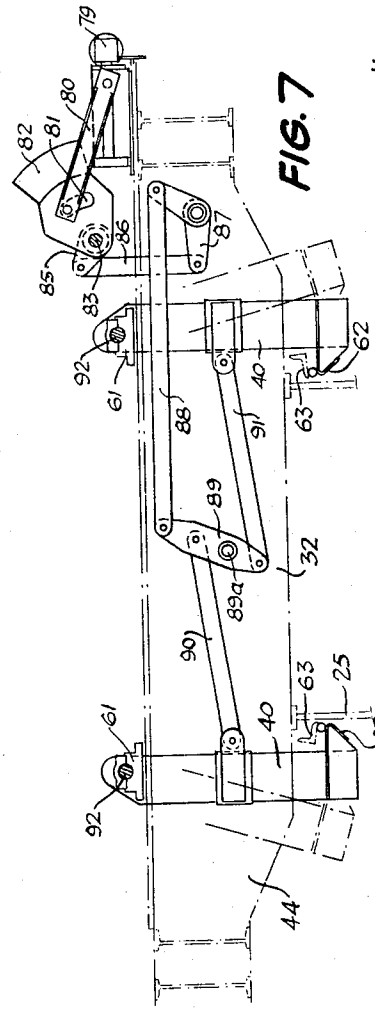


FIG. 7

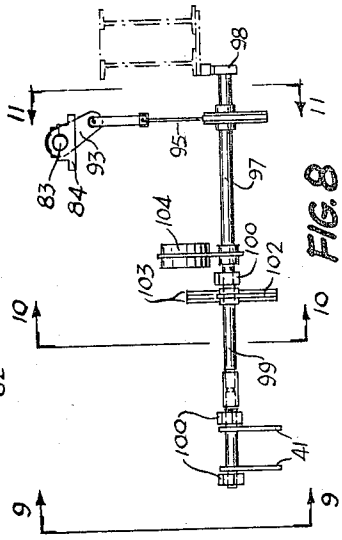


FIG. 8

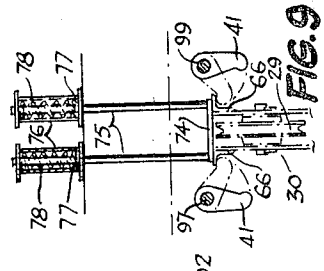


FIG. 9

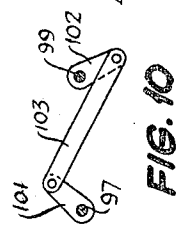


FIG. 10

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United States Patent Office 3,263,965 Patented August 2, 1966

3,263,965

DUAL-SPEED, DUAL-LOAD HOIST ARRANGEMENT

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Filed Aug. 31, 1964, Ser. No. 393,116
13 Claims. (Cl. 254—144)

This invention relates to hoist arrangements for cranes, and particularly to an improved hoist arrangement for overhead cranes in which dual-speed and dual-load characteristics are obtained by using two hook blocks reeved into one hoist rope system and operated by a single hoist drum with one motor and one set of hoist gearing.

In a well known dual-speed, dual-hoist for overhead cranes, a single hook block is separated into two parts, an upper part and a lower part which contains the hook, with both parts having a common rope reeving therebetween. An arrangement of locks allows the block to be used as a main hoist in one unit, with both upper and lower parts locked together, giving a ratio of high load capacity and slow speed, and also to be used as an auxiliary hoist with the upper part automatically locked to the overhead trolley frame and the lower part free to be used as the auxiliary hoist. In the latter auxiliary hoist arrangement the rope reeving in the fixed upper part of the block becomes part of the static system and thus the block is effectively re-reeved and the mechanical advantage altered to provide the lower part of the block only with a ratio of low load capacity and high speed.

A disadvantage with this arrangement is that although the upper part of the block is automatically locked to the overhead trolley frame for auxiliary hoist operation, the locks connecting the upper and lower parts together for main hoist operation require manual operation. For example, to separate the upper and lower parts of the block it is necessary to lower the block to the floor as a unit, for an operator to manually disengage the connecting locks, and then to raise both parts once again, whereupon the upper part is automatically locked to the overhead trolley frame and the lower part is free to be lowered and used separately as an auxiliary hoist. This operation not only requires additional manual labour, but also takes more time due to the extra operating sequence of lowering the block for manual disengagement of the upper and lower block parts.

The important factors in determining the heights of buildings, where overhead cranes of the well known type are installed, are the maximum required distance from floor to crane hook, plus the distance from crane hook to the uppermost portion of the crane mechanism, plus the required clearance between the crane mechanism and the building roof. Thus, another disadvantage in the well known arrangement lies in the fact that the upper and lower parts of the block are nested together, one on top of the other, therefore adding to the distance from the crane hook to the uppermost portion of the crane mechanism and consequently adding to the overall building costs.

The present invention overcomes the disadvantages outlined for the well known arrangement by providing two separate hook blocks positioned substantially on the same horizontal plane and reeved into one hoist rope system, one block serving as the main hoist and the other block serving as the auxiliary hoist. A single hoist drum operates the common hoist rope system and is driven by a single motor and a single set of hoist gearing. The separate hook blocks are each supported by beams built into the overhead trolley frame and each block, in its

uppermost position, nests against the underside of its respective beam, thus reducing the distance from crane hook to the uppermost portion of the crane mechanism by the height of one hook block, as compared with the well known arrangement.

A system of locks automatically clamps one of the hook blocks to the underside of its respective support beam and frees the other hook block for operation when the crane operator selects the appropriate control lever, an automatic safety feature of the lock system ensuring that neither hook block will be released for operation until the other hook block is securely clamped to the underside of its support beam.

As the rope system is common to both main and auxiliary hoist blocks, the rope reeving in the block clamped to the underside of its beam will effectively become part of the static portion of the rope system and so, by providing each hook block with a different rope reeving arrangement, two hoists, each having a different mechanical advantage, may be operated as main and auxiliary hoists from a single hoist drum and driving apparatus.

The ratio of the number of rope sheaves in each block determines the relative load capacities of the blocks, the hoisting speeds being inversely proportional to the load capacities, assuming the load on the hoist rope to remain substantially constant.

Thus a 100 ton main hook block with 10 sheaves (20 parts of rope) could be combined with a 10 ton single sheave (2 parts of rope), a 20 ton two sheave (4 parts of rope), or a 40 ton four sheave (8 parts of rope) auxiliary hook block. Therefore, if the speed of the main hook block is 5 feet per minute, the corresponding speeds of the auxiliary hook blocks in the above examples will be 50 feet per minute, 25 feet per minute, or 12½ feet per minute respectively, that is the product of load × speed is constant for all combinations.

In the following description, three executions of block sheave combinations are shown, the preferred example being an 8:1 combination and the alternative executions being 6:1 and 3:1 combinations.

These executions cover two conditions of operation, the 8:1 and 6:1 combinations catering for the situation where the auxiliary hoist has a greater distance to travel than the main hoist, or where higher hoisting speeds are required, such as where the auxiliary hoist is required to travel down to a basement level or down a sunken shaft, and the 3:1 combination catering for general situations where main and auxiliary hoists travel similar distances and where higher auxiliary hoist load capacity is more essential than higher auxiliary hoisting speeds.

It is, therefore, the main object of this invention to provide an improved hoist arrangemet for cranes wherein the characteristics of high load capacity, slow speed and low load capacity, high speed are both combined in a single hoist arrangement.

Another object of this invention is to provide an improved hoist arrangement for overhead cranes in which dual-load, dual-speed characteristics are obtained by providing two hook blocks of different mechanical advantage ratios, which are reeved into one hoist rope system and operated by a single hoist drum with one motor and one set of hoist gearing.

Another object of this invention is to provide an improved hoist arrangement which may be converted to either high load capacity, slow speed or low load capacity, high speed operation without the need for any manual operations.

Another object of this invention is to provide an improved hoist arrangement for overhead cranes in which dual-load, dual-speed characteristics are obtained by providing two hook blocks of different mechanical ad-

vantage ratios and incorporating a system of clamps to secure one hook block in its upper most and inoperative position when the other hook block is in operation, thus ensuring that only one hook block is in operation at any one time.

A further object of this invention is to provide an improved hoist arrangement wherein the characteristics of dual-load and dual-speed are obtained without increasing the overall height of the apparatus.

These and other objects and advantages of this invention will be apparent by reference to the following detailed specification and drawings in which:

FIG. 1 is a schematic representation of the 6:1 execution of this invention;

FIG. 2 is a schematic representation of the 3:1 execution of this invention;

FIG. 3 is a plan view of the preferred 8:1 execution of this invention, with the hoist ropes omitted for clarity;

FIG. 4 is a side elevation looking in the direction of arrow **4** in FIG. 3;

FIG. 5 is an end elevation looking in the direction of arrow **5** in FIG. 3;

FIG. 6 is a plan view of the operating linkage mechanism for the main and auxiliary hoist clamps, taken approximately at **6—6** in FIG. 4 and omitting all other details for clarity;

FIG. 7 is a section taken on **7—7** in FIG. 6 and shows further details of the operating linkage mechanism for the hoist clamps;

FIG. 8 is a section taken on **8—8** in FIG. 6, showing further details of the linkage mechanism and again omitting all other details for clarity;

FIG. 9 is a section taken on **9—9** in FIG. 8;

FIG. 10 is a section taken on **10—10** in FIG. 8;

FIG. 11 is a section taken on **11—11** in FIG. 8;

FIG. 12 is an enlarged detail taken at **12** in FIG. **11**; and

FIG. 13 is an enlarged detail taken in the direction of arrow **13** in FIG. 12.

Refer now to the figures, wherein like numerals represent like parts throughout.

All executions of this invention are assembled on a crane trolley frame. In the usual application of this invention the crane trolley frame will be mounted on rollers to travel transversely across the building width on transverse bridge girders, the bridge girders being mounted at each end on common end trucks which are mounted on rollers to travel lengthwise along the building on girders positioned lengthwise along each side of the building and close to the roof. Thus the trolley may be positioned over any area of the building.

FIG. 1 shows a schematic representation of the 6:1 ratio execution of this invention, the main hook block having twelve parts of rope and the auxiliary hook block having two parts of rope, providing relatively low load capacity and high speed auxiliary hoist characteristics.

In this execution hoist drum **21**, which has left and right-hand rope grooving (not shown), is rotatably mounted on the crane trolley frame (not shown) and suitably driven. Hoist rope **22** is anchored at each end near flanges **23** on hoist drum **21** and travels around hoist drum **21** in the left and right-hand grooves to the two inner sheaves of the main hook block sheaves **24** in main hook block **25**. Hoist rope **22** is then reeved around the six main hook block sheaves **24** and the four fixed centre head sheaves **26**, then travels upwards and around the fixed centre guide sheaves **27** and **28** and then the rope loop passes down and around the auxiliary hook block sheave **29** in auxiliary hook block **30**. Auxiliary hook block sheave **29** acts as an equalizer when the main hook block **25** is in use and as its own equalizer when the auxiliary hook block **30** is in use. An equalizer bar may be substituted for sheave **29**.

Head sheaves **26** are journalled on common fixed shaft **31** and are supported on main hook block beam **32** which is built into the trolley frame. Main hook block sheaves **24** are journalled on common shaft **33** to which double main hook **34** is attached.

Therefore, main hook block sheaves **24** travel up and down with main hook **34**, the upward travel being limited by main stop frame **35** which comes to rest contacting the underside of main hook block beam **32**.

Guide sheaves **27** and **28** are journalled on fixed centres and supported by the trolley frame.

Auxiliary sheave **29** is journalled in auxiliary hook block frame **36**, to which auxiliary hook **37** is attached.

Therefore, auxiliary sheave **29** travels up and down with auxiliary hook **37**, the upward travel being limited by auxiliary stop frame **38** which comes to rest contacting the underside of auxiliary beam **39**, which is also built into the trolley frame.

Stop frames **35** and **38** are integral with the hook block frames and act as stiffeners to withstand the rope loads when the hook blocks are in contact with the undersides of their respective support beams.

Clamping devices **40** and **41** are attached to the lower surfaces of main beam **32** and auxiliary beam **39** respectively. The clamps are provided with tapered faces arranged to grip corresponding tapered surfaces on the hook blocks so that the clamps, when engaged, will force the hook blocks upwards against stop surfaces on the undersides of the support beams. Clamping force is provided by a lever system with an over-centre counterweight, the position of which is controlled by a reversible electric motor with limit switches to de-energize the motor as the counterweight approaches either end of its travel. The clamps are interlocked so that when one set is engaged, the other set is open. A further interlock ensures that neither set of clamps can be operated until both hook blocks are in their highest positions. This further interlock is operated in conjunction with the overhoisting limit switch.

Overhoisting protection is provided by a single limit switch which cuts out the main motor in the hoist direction whenever either hook block reaches its uppermost position. The clamp motor circuit is then completed, allowing the clamps to be operated.

In operation, one hook block is always clamped in its uppermost position. This is carried out before the crane is put into service and, thereafter, only one hook block can be operated at any time. During the crane assembly both main hook block **25** and auxiliary hook block **30** will be on the ground. The hoist drum **21** is then rotated and the auxiliary hook block **30** will rise first and travel upwards to stop and be automatically clamped in its uppermost position. The crane control lever is then moved to "main" position and with continued hoist drum rotation the main hook block **25** will rise to its uppermost position. Thereafter, movement of the crane control lever to either "main" or "auxiliary" positions will release the respective set of clamps and free the hook block for operation as follows:

With main hook block **25** free and on the ground, the control lever in "main" position and the auxiliary block **30** clamped in its uppermost position, rotation of hoist drum **21** in the hoist direction will cause the rope **22** to exert an upward load on the auxiliary block **30** against the underside of its support beam **39** and start to raise the main hook block **25**, with or without a load. The rope system, now being taut but free to equalize around the sheave **29** of the auxiliary hook block, will now raise the main hook block **25** as required. Reversal of hoist drum **21** will slacken the rope system, thus removing the upward rope load on the auxiliary block **30**, causing the weight of the auxiliary block to be supported by its clamps **41** and allowing the main hook block **25** to be lowered.

With the main hook block **25** in its uppermost position, movement of the control lever to "auxiliary" position

will engage the main hook block clamps **40** and release the auxiliary hook block clamps **41**. The auxiliary hook block **30** is then free to be lowered and raised with or without a load, the main hook block **25** being pulled up against its support beam **32**, by clamps **40**, while the rope **22** runs freely through the main block sheaves **24** and head sheaves **26**.

FIG. 2 shows a schematic representation of the 3:1 ratio execution of this invention, the main hook block **25** having twelve parts of rope and the auxiliary hook block **30** having four parts of rope, providing relatively high load capacity and slow speed auxiliary hoist characteristics.

This execution is basically the same as the execution shown in FIG. 1 except that there are two additional guide sheaves **42**, two equalizer sheaves **43**, the auxiliary hook block **30** has two auxiliary sheaves **29** and the hoist rope **22** is reeved around the sheaves as follows:

Hoist rope **22** is anchored at each end near flanges **23** on hoist drum **21** and travels around hoist drum **21** in the left and right-hand grooves to the two inner sheaves of the main hook block sheaves **24** and then up and around the two guide sheaves **27**, over the two guide sheaves **28** and down and around the two auxiliary sheaves **29**. Hoist rope **22** then travels up and around the two guide sheaves **42** to the two inner head sheaves **26** and then is reeved around head sheaves **26** and the remaining main hook block sheaves **24**, leaving the outer sheaves **24** to travel up and loop around equalizer sheaves **43** to complete the reeving. Equalizer sheaves **43** act as equalizers for both the main hook block **25** and the auxiliary hook block **30**. By using a modified reeving a single equalizer sheave can be used in place of the two sheaves **43** shown in FIG. 2. The operation of this execution is the same as for the 6:1 ratio execution shown in FIG. 1.

Refer now to FIGS. 3, 4 and 5 which show the preferred execution of this invention and in which hoist rope **22** is omitted for clarity.

Crane trolley frame **44** is mounted for movement transversely across the building on rollers **45**, which roll on tracks **46** mounted on transverse bridge girders **47**. Bridge girders **47** are mounted at each end on common end trucks (not shown) which are also mounted on rollers to traverse the building lengthwise on girders positioned lengthwise along each side of the building and close to the roof.

Rollers **45** are coupled together by shafts **48** which are reversably rotated by driving motor **49** through gearbox **50**. Hoist drum **21** is rotatably mounted in bearings **51** mounted on crane trolley frame **44**, and is reversably rotated by driving motor **52** through brake **53**, main gearbox **54** (shown in section in FIG. 3), driving shaft **55**, pinion gear **56** and main gear **57**.

Main hook block **25** is positioned under main hook block supoprt beam **32** which is built integral with crane trolley frame **44**. Eight main hook block rope sheaves **24** are rotatably mounted on concentric fixed shafts which are fixed in the frame of main hook block **25**. Main hook **34** is mounted on main hook block **25** by a pin **59** fixed in a clevis **60**, which is rotatably mounted in main hook block **25**.

Main clamp arms **40** are pivotally mounted in bearings **61** mounted on crane trolley frame **44**, and are positioned such that when in the vertical position, as shown in FIG. 4, clamp jaws **62** engage main clamp ledges **63**, fixed to main hook block **25**, to clamp main hook block **25** to the underside of its support beam **32**. Main clamp ledges **63** are positioned to present a sloping surface to enable clamp jaws **62** to pull main hook block **25** upwards against the underside of its support beam **32**.

Six head rope sheaves **26** are rotatably mounted on shafts which are fixed between brackets **64** and mounted on the upper surface of crane trolley frame **44**. Sheaves **26** are positioned directly above main hook block sheaves **24**, the six sheaves **26** being positioned above the six outer spaces between main hook block sheaves **24**.

Auxiliary hook block **30** is positioned under auxiliary hook block support beam **39**, which is built integral with crane trolley frame **44**.

Auxiliary rope sheave **29** is rotatably mounted on shaft **65**, which is fixed in auxiliary hook block **30**. Auxiliary clamps **41** are pivotally mounted to clamp auxiliary hook block **30** in its uppermost position by rotating from the open position shown in FIG. 5, to the engaged position, as shown in broken line, where auxiliary clamps **41** contact the auxiliary clamp ledges **66**.

Two guide rope sheaves **27** are rotatably journalled between support brackets **67** and mounted separately on the upper surface of crane trolley frame **44** and on the same horizontal plane as the six head rope sheaves **26**.

Cut-outs **68** and **69** are provided through the upper surface of crane trolley frame **44** for the passage of hoist rope **22** between head sheaves **26**, main hook block sheaves **24** and guide sheaves **27**, and cut-outs **70** and **71** are provided for the passage of hoist rope **22** between guide sheaves **27** and auxiliary hook block sheave **29**.

The reeving of hoist rope **22** around the preferred execution of this invention is similar to the reeving shown in FIG. 1, but simplified as follows:

Hoist rope **22** is anchored at each end to hoist drum **21** and travels around left-hand and right-hand grooves **72** and **73** respectively (shown in broken line in FIG. 3), leaving hoist drum **21** and passing down to the two inner sheaves of the eight main hook block sheaves **24**. Hoist rope **22** is then reeved around the eight sheaves **24** and the sheaves **26**, then travels upwards and around the two guide sheaves **27**. The loop of hoist rope **22** then passes down and around sheave **29**, which acts as an equalizer sheave.

When one hook block is clamped to the underside of its support beam and the other hook block is raised and trips the overhoisting limit switch to cut out the hoist drum motor there may, in rare instances, be a slight time lag before the hoist motor actually stops. This is because the hoist motor is braked frictionally and there is the possibility that moisture on the brake drum may slightly retard the braking effect. To prevent any excessive strain on hoist rope **22**, if this circumstance should occur, cushioning springs have been incorporated into the auxiliary hook stop-plate **74** located close to the underside of support beam **39**. Reference to FIGS. 3, 5, 6 and 9 show stop-plate **74** with shafts **75** extending upwardly from each corner and projecting into individual spring chambers **76**. Collars **77** are fixed to each shaft **75** and positioned within each spring chamber **76** to compress springs **78** when stop-plate **74** is forced upwardly.

Thus, any overload on hoist rope **22** will be relieved by the cushioning springs **78**, which are designed to be compressed when a predetermined overload is imposed upon them.

Refer now to FIGS. 6 to 13 which show details of the operating linkage mechanism for the main and auxiliary hoist clamps and in which all details not pertaining to the linkage mechanism have been omitted for clarity.

Reversible worm-drive motor reducer **79** is started when the crane control lever is moved to either "main" or "auxiliary" hoist position by the crane operator, the direction of rotation of motor **79** depending upon whether main or auxiliary hoist is selected.

The worm-drive of motor **79** is operably connected to move one end of arm **80** horizontally, the other end of arm **80** being positioned in slot **81** in counterweight **82**. Counterweight **82** is non-rotatably mounted on cross-shaft **83**, such that operation of motor **79** will result in rotation of cross-shaft **83**, which is journalled in bearings **84** mounted on crane trolley frame **44**. Lever **85** is non-rotatably mounted on one end of cross-shaft **83** and is pivotally connected to one end of link **86**, the other end of link **86** being pivotally connected to one arm of bell-

crank 87. The other arm of bell-crank 87 is pivotally connected to one end of link 88, the other end of link 88 being pivotally connected to the outer end of lever 89 which is pivotally mounted at 89*a* on crane trolley frame 44. The inner ends of links 90 and 91 are pivotally connected to lever 89 at positions equi-distant from the pivot point 89*a*, the other ends of links 90 and 91 being pivotally attached to the outer main hook block clamp arms 40.

Inner and outer clamp arms 40 are non-rotatably mounted in pairs on cross-shafts 92 and connected in pairs, at the lower ends thereof, by clamp jaws 62. Cross-shafts 92 are journalled in bearings 61, mounted on the upper surface of crane trolley frame 44.

Also, non-rotatably mounted on the other end of cross-shaft 83 is lever 93, which is connected to lever 94 through link mechanism 95. Reference to FIGS. 11 to 13 show details of link mechanism 95 and specifically spherical joints 96, which permit rotation of cross-shaft 83 to produce rotation of cross-shaft 97, through levers 93 and 94 and link mechanism 95. Cross-shaft 97 is journalled in bearings 98, mounted on crane trolley frame 44. A first pair of auxiliary clamps 41 are non-rotatably mounted on the end of cross-shaft 97 opposite to the end on which lever 94 is connected, and a second pair of opposed auxiliary clamps 41 are non-rotatably mounted on cross-shaft 99, which is journalled in bearings 100 also mounted on crane trolley frame 44. Particular reference to FIG. 10 will show lever 101 non-rotatably mounted on cross-shaft 97 and lever 102 non-rotatably mounted on cross-shaft 99, with links 103 interconnecting the ends thereof. Thus rotation of cross-shaft 97 will cause the first pair of auxiliary clamps 41 to rotate in the same direction of rotation and the second pair of auxiliary clamps 41, through levers 101 and 102 and links 103, to rotate in the opposite direction of rotation. The first and second pairs of auxiliary clamps 41 are positioned to grip auxiliary clamp ledges 66 of auxiliary hook block 30 when rotated to the engaged position (as shown in broken line in FIGS. 5 and 9), and to be disengaged from auxiliary clamp ledges 66 when in the open position (as shown in FIGS. 5 and 9).

A counterweight 104 is non-rotatably mounted on cross-shaft 97 and positioned to be in a balanced state when both pairs of auxiliary clamps 41 are in the open position, and to rotate with cross-shaft 97 to exert a bias force, to assist the clamping force, when auxiliary clamps 41 are in the engaged position.

Also mounted on cross-shaft 83 is a chain sprocket 105 which drives a smaller chain sprocket 106 by means of chain 107. Chain sprocket 106 drives a 2-way ratchet assembly 108 which, in combination with solenoid operated pawls 109 and 110, provides one-way directional movement for the operating linkage mechanism, see FIG. 4. Pawls 109 and 110 are alternatively operated when the crane control lever is moved to either "main" or "auxiliary" hoist positions, to permit rotation of cross-shaft 83 in the required direction only and to lock the clamps in the engaged positions.

The operating sequence of the preferred execution of this invention is as follows:

Assume that main hook block 25 is latched and auxiliary hook block 30 is in the latching zone. To put main hook block 25 into operation the crane control lever is placed in "main" hoist position. Reversible worm-drive motor reducer 79 automatically starts and its worm-drive rotates to move arm 80 which lifts counterweight 82 and rotates cross-shaft 83 in an anti-clockwise direction. Anti-clockwise rotation of cross-shaft 83 produces anti-clockwise rotation of bell-crank 87 and, through link 88, a corresponding anti-clockwise rotation of lever 89. Anti-clockwise rotation of lever 89, through links 90 and 91, causes main hook block clamp arms 40 to be rotated outwardly, thus releasing clamp jaws 62 from main clamp ledges 63 and freeing the main hook block 25 for operation. In this position counterweight 82 has passed over the vertical position and is now exerting a downward bias force to assist in maintaining clamp arms 40 in the open position.

Anti-clockwise rotation of cross-shaft 83 also simultaneously rotates lever 93 in an anti-clockwise direction, thus lifting link mechanism 95 and rotating cross-shaft 97 in a clockwise direction, as shown in FIG. 11. Clockwise rotation of cross-shaft 97 causes counterweight 104 to be moved away from its vertical balanced position to exert a bias force urging cross-shaft 97 to further clockwise rotation. In FIGS. 9 and 10 it is seen that the lifting of link mechanism 95 produces an anti-clockwise rotation of cross-shaft 97 and, through links 103, a clockwise rotation of cross-shaft 99. Specific reference to FIG. 9 shows that this causes auxiliary clamps 41 to be securely clamped to auxiliary clamp ledges 66, with counterweight 104 acting to retain auxiliary clamps 41 in the engaged position.

Thus, releasing main hook block 25 for operation automatically clamps auxiliary hook block 30 in the non-operative position, and rotation of hoist drum 21 in the required direction of rotation will now permit main hook block 25 to be lowered for operation.

In the same manner, movement of the crane control lever to "auxiliary" hoist position will reverse the above procedure, releasing auxiliary hook block 30 and securely clamping main hook block 25. In this case counterweight 82 will act to exert a bias force to assist the clamping force holding clamping arms 40 in their engaged positions.

A further execution of this invention, not illustrated, caters for a situation requiring an auxiliary hoist with a relatively high load capacity and where hoist speed is not of major importance. This further execution is similar to the execution shown in FIG. 2, except that auxiliary hook block 30 has four auxiliary sheaves 29 and two additional head sheaves are mounted on the crane trolley frame above auxiliary sheaves 29 and the hoist rope 22, after reeving around auxiliary sheaves 29 and the two additional head sheaves, passes to the main head sheaves 26. Guide sheaves 27 and 28 may be used or omitted, as determined by the physical requirements of the hoist installation.

What I claim is:

1. A hoist arrangement including a support frame structure, a main hook block having a plurality of rope sheaves rotatably mounted therein, an auxiliary hook block having a rope equalizing means mounted therein, a plurality of fixed rope sheaves rotatably mounted on said support frame structure, a hoist drum rotatably mounted on said support frame structure, a hoist rope operatively engaging said rope equalizing means and reeved around said rope sheaves and anchored to said hoist drum, and means for selectively clamping said main or auxiliary hook blocks against said support frame structure for independent operation of the unclamped hook block.

2. A hoist arrangement as set forth in claim 1 in which said rope equalizing means comprises a rotatably mounted rope sheave.

3. A hoist arrangement as set forth in claim 1 in which said rope equalizing means comprises an equalizer bar.

4. A hoist arrangement as set forth in claim 1 in which said hoist rope is anchored at each end to said hoist drum.

5. A hoist arrangement as set forth in claim 1 in which said support frame structure includes main support structure for said main hook block and auxiliary support structure for said auxiliary hook block.

6. A hoist arrangement as set forth in claim 1 in which a line through the axes of said fixed rope sheaves is substantially above and parallel with a line through the axes of said main hook block rope sheaves.

7. A hoist arrangement as set forth in claim 1 including stop frame means attached to each of said main and auxiliary hook blocks to provide support therefor when said hook blocks are clamped against their respective support structures.

8. A hoist arrangement as set forth in claim 1 in which said clamping means includes a lever system for operating clamps to selectively clamp said main or auxiliary hook blocks against their respective support structures.

9. A hoist arrangement as set forth in claim 8 in which said lever system includes counterweights adapted to be moved through over-centre positions for adding additional and non-reversing clamping force to said clamps.

10. A hoist arrangement including a support frame trolley, a main hook block having a plurality of rope sheaves rotatably mounted therein, an auxiliary hook block having a rope equalizing means mounted therein, main support structure for said main hook block, auxiliary support structure for said auxiliary hook block, said main and auxiliary support structures being integral with said support frame trolley, a plurality of fixed rope sheaves rotatably mounted on fixed centres on said support frame trolley and having a line through their axes substantially above and parallel with a line through the axes of said main hook block rope sheaves, a plurality of guide rope sheaves rotatably mounted on said support frame trolley, a hoist drum rotatably mounted on said support frame trolley, reversible drive means for rotating said hoist drum, a hoist rope operatively engaging said rope equalizing means and reeved around said rope sheaves and anchored to said hoist drum, and means for selectively clamping said main or auxiliary hook blocks against their respective support structures for independent operation of the unclamped hook block.

11. A hoist arrangement as set forth in claim 10 including spring means mounted on said auxiliary hook block support structure, said spring means positioned to provide cushioning effect when said auxiliary hook block is rapidly pulled up against its support structure.

12. A hoist arrangement as set forth in claim 10 in which said main hook block has six rope sheaves, said rope equalizing means comprises a rope sheave, said plurality of fixed rope sheaves comprises four sheaves, and said plurality of guide rope sheaves comprises four sheaves.

13. A hoist arrangement as set forth in claim 10 in which said rope equalizing means comprises an equalizing bar, said main hook block has six rope sheaves, said plurality of fixed rope sheaves comprises four sheaves, and said plurality of guide rope sheaves comprises four sheaves.

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