United States Patent

Brown

[15] **3,651,905**

[45] **Mar. 28, 1972**

[54] CLUTCH AND BRAKE CONTROLS FOR CLAMSHELL HOIST

[72] Inventor: **Archer W. Brown**, St. Paul, Minn.

[73] Assignee: **American Hoist & Derrick Company**, St. Paul, Minn.

[22] Filed: **Jan. 13, 1970**

[21] Appl. No.: **2,567**

[52] **U.S. Cl.** ..... **192/17 A**, 192/4 R, 254/185, 192/87.13

[51] **Int. Cl.** **F16d 67/04**

[58] **Field of Search** ..... 192/4 R, 12 C, 17 A, 18; 254/185, 187

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Primary Examiner—Benjamin W. Wyche

Attorney—Burd, Braddock & Bartz

[57] **ABSTRACT**

A material handling machine having a clamshell bucket and a hoist assembly having a closing drum, a holding drum, and a boom drum all connected through a gear train to a power source. The holding drum and boom drum are rotatably mounted on a common shaft. Separate clutch and brake units associated with each of the drums have coordinated controls so that the holding line and closing line have substantially the same amount of movement during the lowering and the raising of the bucket.

18 Claims, 5 Drawing Figures

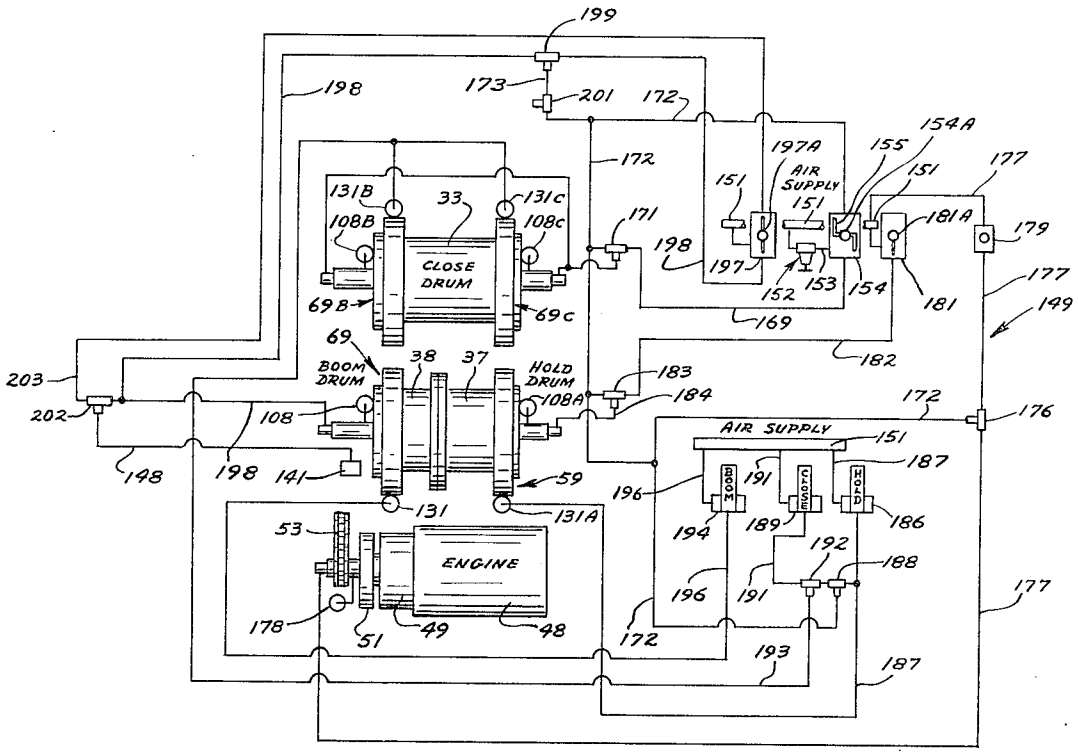


FIG. 1

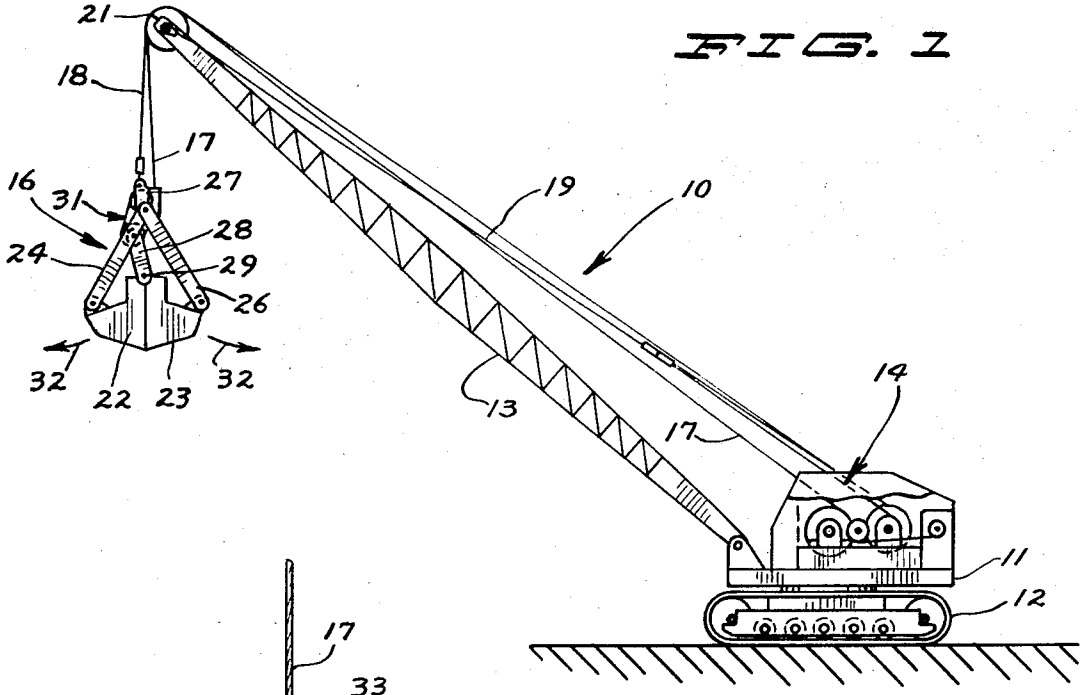
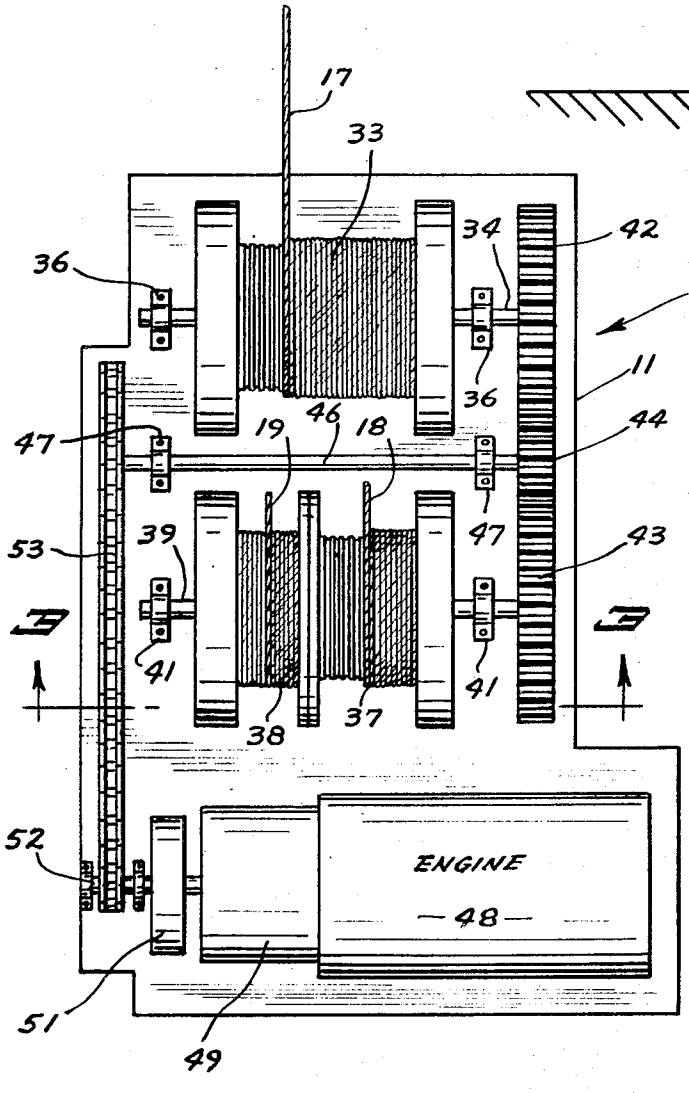


FIG. 2



INVENTOR.
ARCHER W. BROWN
BY
Burd Braddock & Bartz
ATTORNEYS

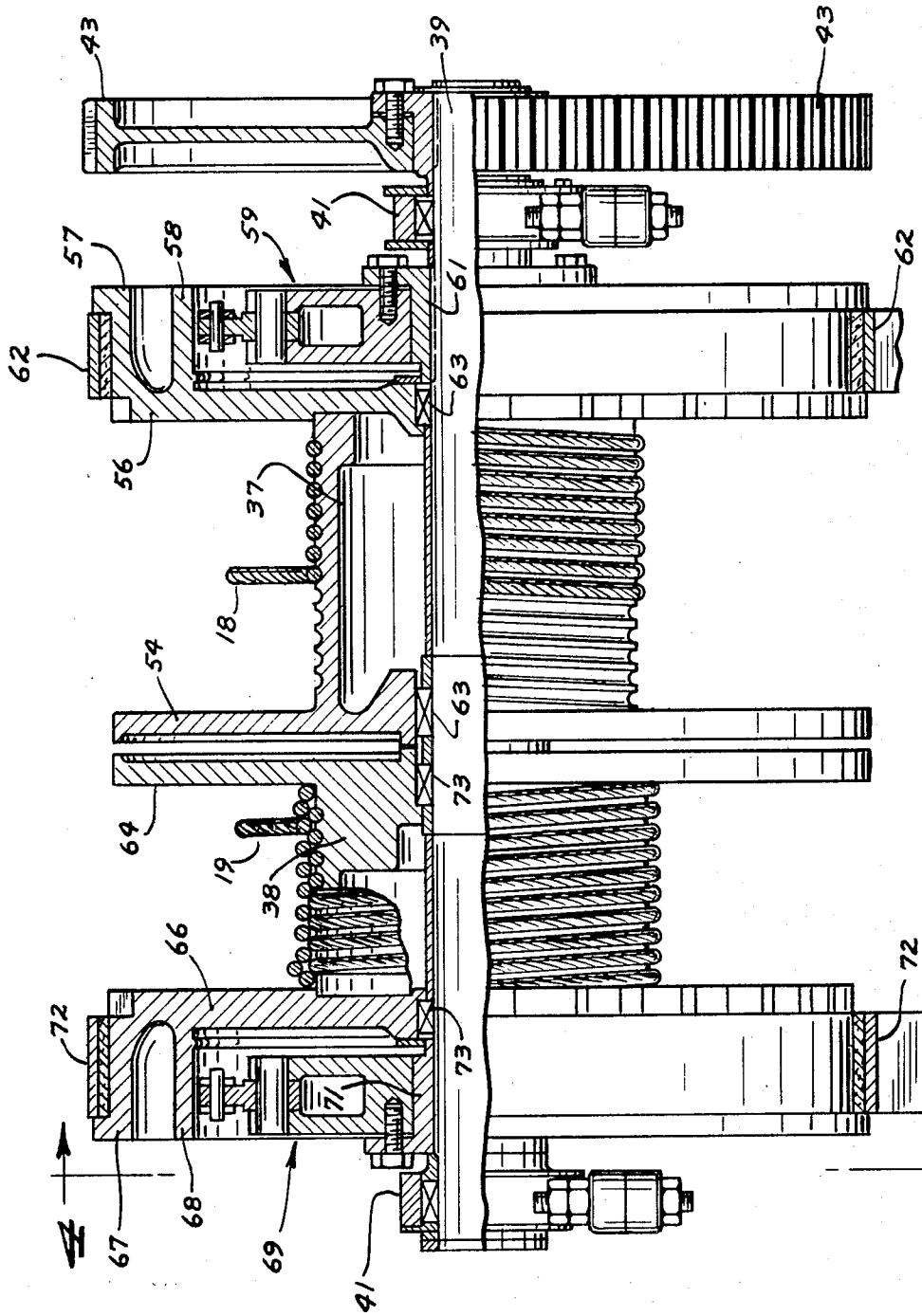


FIG. 3

INVENTOR.
ARCHER W. BROWN

BY
Burd Bradlack & Bartz
ATTORNEYS

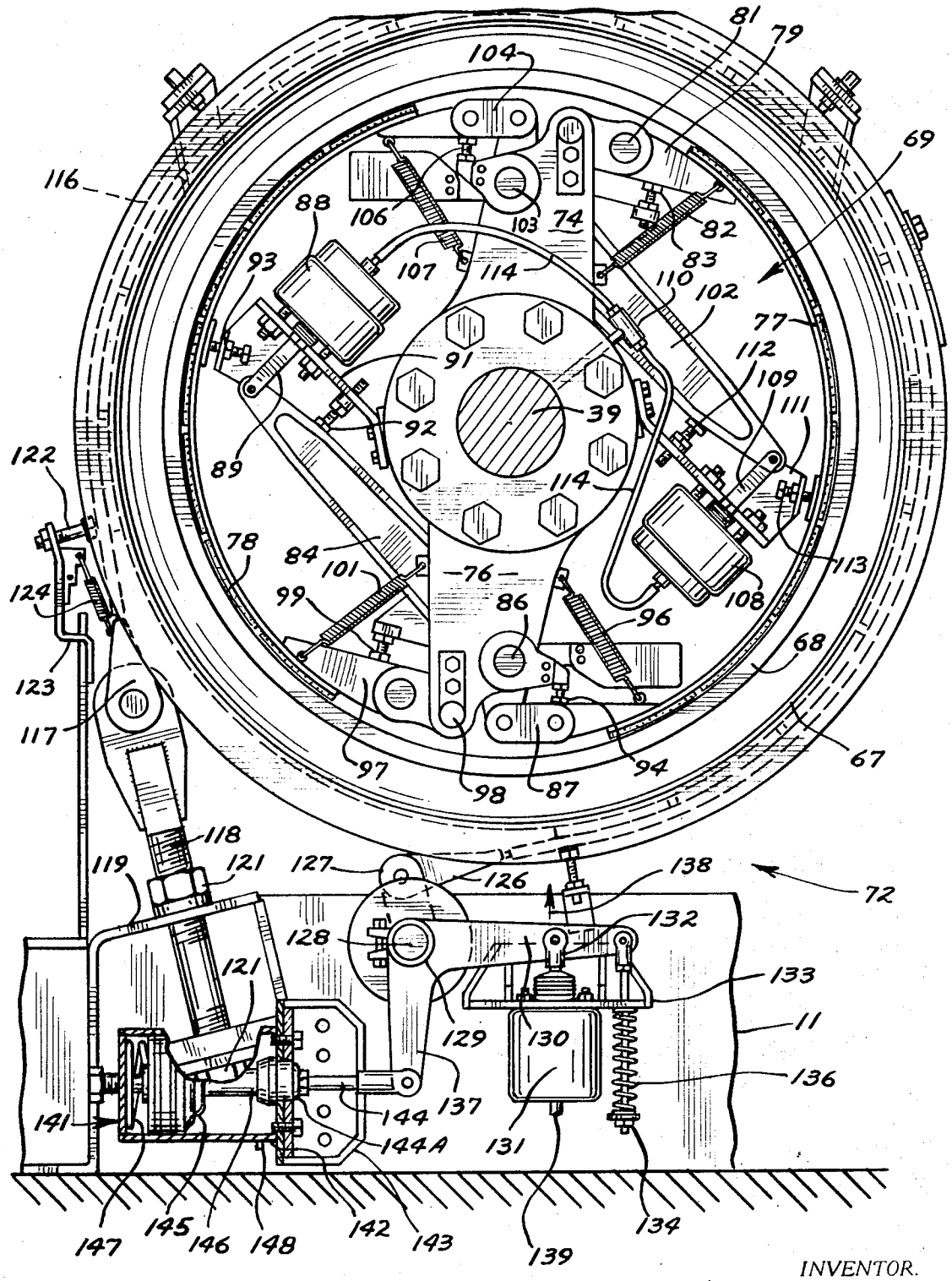


FIG. 4

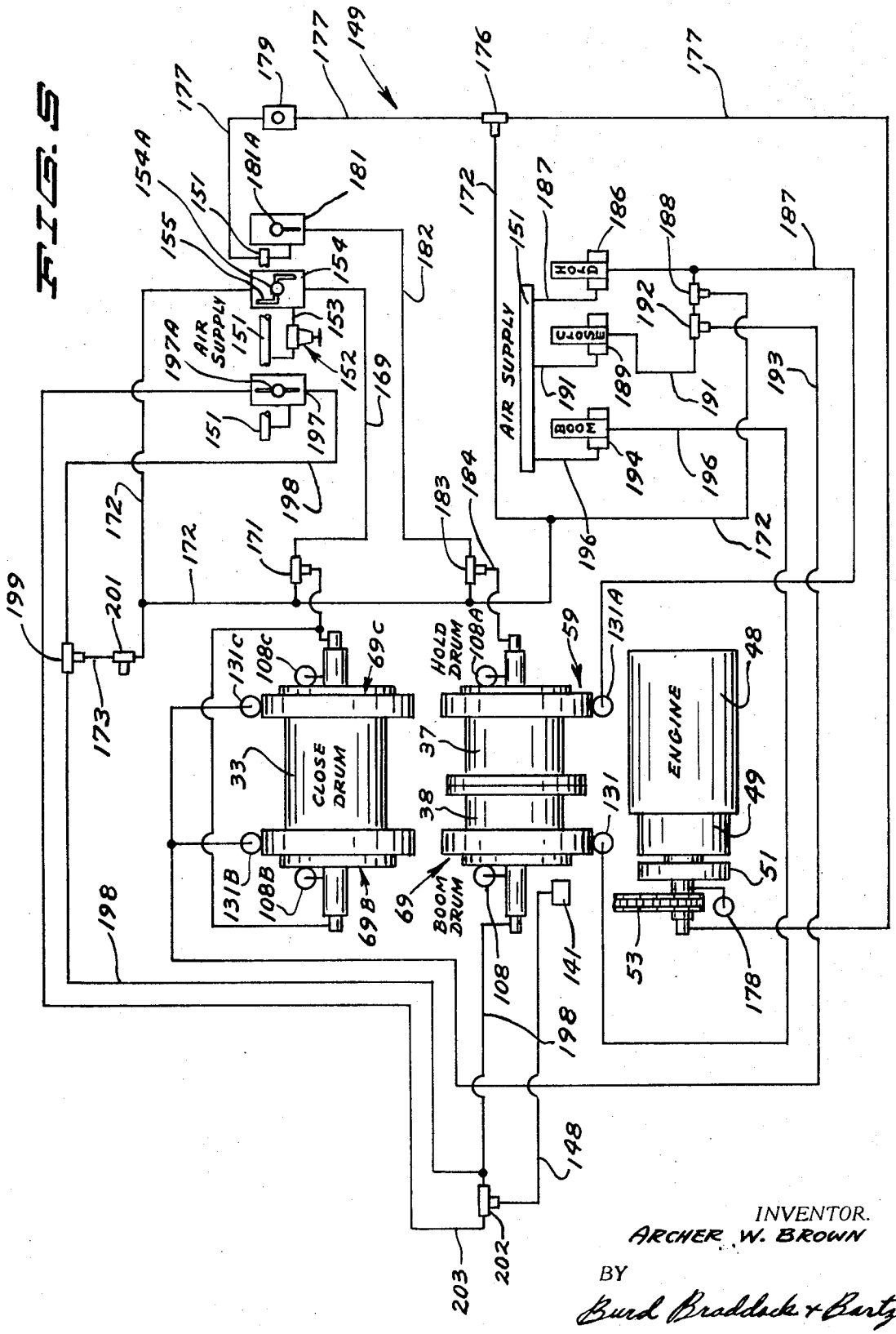
INVENTOR.
ARCHER W. BROWN

BY

Burd Braddock & Barty

ATTORNEYS

FIG. 5



INVENTOR.
ARCHER W. BROWN

BY
Burd Braddock & Bartz
ATTORNEYS

CLUTCH AND BRAKE CONTROLS FOR CLAMSHELL HOIST

BACKGROUND OF THE INVENTION

The standard hoist on a clamshell machine has three parallel arranged drums driven with an internal combustion engine. A power transmission, including clutches, is connected between the engine and each of the drums. Each drum is provided with a selectively operable brake. A closing line is connected to the first drum, a holding line is connected to the second drum, and a boom line is connected to the third drum. The closing drum is normally equipped with two clutches and one brake. The holding drum is equipped with one clutch and two brakes. The heavy pull on raising a clamshell bucket is primarily carried on the closing drum. The heavy heat dissipation for lowering the bucket is taken primarily on the holding drum. The free fall of the bucket is only under the control of two brakes. In the lowering of the bucket, there are no coordinated controls which function to keep both the closing and holding lines tight to eliminate the twisting and the fouling of the lines. Unequal tensions on the closing and holding lines may result in the relative movement of the two shells of the bucket so that it may prematurely open if the closing drum line becomes slack. In U.S. Pat. No. 2,947,397, a fluid interlock is interposed between the closing drum control circuit and the holding drum control circuit. The interlock partially actuates the holding clutch causing a drag on the holding drum to take the slack out of the holding line without the holding line taking over the load on the closing line.

SUMMARY OF THE INVENTION

The invention is related to a control system for a clamshell hoist which provides for the free fall lowering of the empty bucket under the control of three or more brakes. The brakes are controlled at a common control pressure to substantially equalize the braking loads on the brakes. The hoist assembly has a first closing drum drivably connected through a power transmitting means to a second holding drum and a third boom drum. The second and third drums can be rotatably mounted on a single shaft to conserve space on the machinery platform. The clutching and braking systems associated with the closing drum and the holding drum are coordinated so that both the closing line and the holding line remain tight during bucket lowering operations, thus eliminating twisting and fouling of these lines. During the lowering of the bucket, the two shells of the bucket remain in a fixed relation to each other, as the movements of the closing line and holding line are substantially equal.

IN THE DRAWINGS

FIG. 1 is a side elevational view of a clamshell hoist machine equipped with the clamshell bucket control system of the invention;

FIG. 2 is a schematic plan view of the hoisting assembly including the drive engine therefor;

FIG. 3 is an enlarged view, partly sectioned, taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken along line 4—4 of FIG. 3 showing the clutch and brake structure; and

FIG. 5 is a diagrammatic view of the clamshell bucket control system.

Referring to the drawings, there is shown in FIG. 1 a material handling machine, known as a clamshell hoist machine, indicated generally at 10, equipped with the bucket and boom control system of the invention. The machine 10 has a horizontal platform or deck 11 rotatably mounted for movement about a generally upright axis on a track assembly 12 or other suitable base. The base may be a pedestal on a support, as a barge or a fixed foundation. Pivotally mounted on the forward portion of the deck 11 is an elongated boom 13. A hoist assembly, indicated generally at 14, is mounted on the deck 11 rearwardly of the boom 13. The machine has a power mechanism (not shown) operative to swing deck 11 and boom 13 about the upright axis.

Positioned under the outer end of the boom 13 is a material handling clamshell bucket, indicated generally at 16, attached to a closing line 17 and holding line 18. A boom line 19 connects the upper end of the boom 13 to the hoist assembly 14. Both the closing line 17 and holding line 18 are trained over sheaves 21 rotatably mounted on the outer end of the boom 13. From the sheaves 21, the lines 17 and 18 extend downwardly to the hoist assembly 14.

The bucket 16 has two generally U-shaped half sections or shells 22 and 23 which move relative to each other to an open position and a closed position. Opposite outer portions of the sections 22 and 23 are connected to upwardly extended links 24 and 26 pivotally connected to a clevis 27. A short arm 28 is pivotally connected with pivot 29 to the upper inner ends of the sections 22 and 23. A sheave assembly 31 is rotatably mounted on the clevis 27 and upper end of the arm 28. The closing line 17 is trained over the sheaves 21 down into a sheave assembly 31 and anchored thereto. The lengthening or relaxing of the closing line 17 will open the bucket by allowing the half sections 22 and 23 to pivot outwardly away from each other, as indicated by arrows 32. The half sections 22 and 23 pivot in an opposite direction on the shortening of the closing line 17.

Referring to FIG. 2, there is shown the hoist assembly 14 mounted on a portion of the deck 11. The hoist assembly has a closing drum 33 rotatably mounted on a shaft 34. Bearings 36 associated with supports mount the shaft 34 on the deck 11. Positioned rearwardly of the closing drum 33 are dual drums comprising a holding drum 37 and a boom drum 38. Both drums 37 and 38 are rotatably mounted on a single shaft 39. Bearings 41 associated with supports rotatably mount the shaft 39 on the deck 11. The shafts 34 and 39 are drivably connected together with a power transmission means including a gear train comprising a first large spur gear 42 secured to one end of the shaft 34 and a second large spur gear 43 secured to the end of shaft 39. An intermediate small drive spur gear 44 engages both gears 42 and 43 so that shafts 34 and 39 rotate together at substantially the same speed. The drive gear 44 is secured to a shaft 46 mounted on the deck 11 with bearings 47. Shaft 44 is located between drum 33 and dual drums 37 and 38. Space on the machinery platform 11 is conserved by mounting the dual drums 37 and 38 on a single shaft and positioning the drive shaft 46 between drum 33 and dual drums 37 and 38.

All of the drums 33, 37, and 38 are driven by an internal combustion engine 48 mounted on the deck 11 rearwardly of the drums 37 and 38. The engine 48 is connected to a torque converter 49 which transmits power to an air operated master clutch 51. A power output shaft 52 extended from the clutch 51 is connected to a roller chain drive 53 operative to transmit power to the shaft 46. The master clutch 51 is placed between the torque converter 49 and the drive sprocket of the chain drive so that the entire drive mechanism is responsive to the operation of the master clutch 51. The master clutch can be located on the power input side of the torque converter 49. When the clutch is released the torque converter functions as a retarding means or hydraulic brake on the power transmitting means 14 and thereby aids the brakes controlling the descent of the bucket 16. Master clutch 51 operates generally as a power disconnecting means between the engine 48 and power transmitting means 14 to the drums 33, 37, and 38. Other types of power disconnecting means can be used to interrupt the power train from the engine 48 to the drums 33, 37 and 38.

Referring to FIG. 3, there is shown the holding drum 37 and boom drum 38 rotatably mounted on the shaft 39. The drum 37 has an outwardly directed inside flange 54 and an outside flange 56 forming with a cylindrical base an annular groove for accommodating the layers of line 18 wound about the base. The flange 56 has an outside annular ring 57 and an inside annular ring 58 spaced from ring 57 to accommodate cooling air. Located within the ring 58 is a clutch, indicated generally at 59. The clutch 59 is secured to a collar 51 splined to the shaft 39. The clutch 59 is operative to transmit power

from the shaft 39 to the drum 37. Positioned around the outside of the ring 57 is a band brake 62. The inner portions of the flanges 54 and 56 are rotatably mounted on bearings 63 concentrically mounted on the shaft 39.

The boom drum 38 is slightly smaller than the holding drum 37. Drum 38 has a first inside flange 64 located adjacent the flange 54 and an outside flange 66. Integral with the outer peripheral portion of the flange 66 is an outside ring 67 and an inside ring 68. Rings 67 and 68 are radially spaced from each other to provide for the flow of cooling air between the rings. A clutch 69, located within the flange 68, is secured to a collar 71 splined to the shaft 39. Trained about the outside ring 67 is a band brake 72. A pair of bearings 73 rotatably mount the drum 38 on the shaft 39.

As an example of the relative size between drums 37 and 38, the drum 37 has a length of 14⅞ inches, while the drum 38 has a length of 11 9/16 inches. The relative sizes of the drums can vary according to the amount of cable required to be stored on the drum. The unequal lengths of the closing drum 33 and the holding drum 37 can be proportioned so that both drums 33 and 37 change from first layer wrapping to second layer wrapping at the same instant. Closing drum 33 is longer to allow winding of the closing line 17 to close the bucket 16.

Referring to FIG. 4, there is shown the clutch 69 in the released position and the brake 72 applied. The clutch 69 comprises a spider secured to the collar 71. The spider has diametrically opposed arms 74 and 76 providing anchors for the arcuate clutch bands 77 and 78. The clutch band 77 has a dead end or heel 79 connected through a link and anchor pin 81 to the upper end of arm 74. A spring 82 connected to the heel and spider arm 74 holds the heel in engagement with an adjustable stop 83. The opposite end of the band 77 is connected to an actuator lever 84. A pivot pin 86 pivotally mounts the lever 84 on the arm 76. A link 87, pivotally connected to a small portion of the arm directed radially outwardly from the pin 86, joins the lever 84 to the band 77. The opposite end of the lever 84 is connected to a fluid motor 88 having a movable rod 89 pivotally joined to the end of the lever 84. The motor 88 is mounted on the bracket 91 secured to the spider. The bracket has a first adjustable stop 92 which engages the lever 84 to position the lever 84 in a release position. The outer end of bracket 91 has a second stop 93 which engages the midportion of the band 78 to establish a minimum clearance between the midportion of the band 78 and the inside clutching surface of the ring 68. The forward or actuated end of the band 77 is held against a stop 94 with a spring 96 connected to the band 77 and the spider at a point adjacent the arm 76.

The band 78 is identical to the band 77 and has a heel 97 connected with a link and pin 98 to the outer end of arm 76. A stop 99 maintains the release clearance position between the rear end of the shoe and the drum. A spring 101, connected to the heel 97 and the spider arm 76, biases the heel into engagement with the stop. The opposite end of the band 78 is connected to an actuator lever 102. A pivot pin 103 pivotally mounts the lever 102 on the spider arm 74. A link 104 carrying pivot pins pivotally connects the forward end of the band 78 to an outwardly directed portion of the lever 102. The link 104 is biased into engagement with a stop 106 by a spring 107 connected to the band 78 and the spider arm 74.

The opposite end of the lever 102 is operatively connected to a fluid motor 108 having a movable rod 109. The outer end of rod 109 is pivotally connected to the end of lever 102. The fluid motor 108 is mounted on a bracket 111 secured to the spider. The bracket has a first adjustable stop 112 adapted to be engaged by the lever 102 to position the lever in its release position. Mounted on the outer end of bracket 111 is a second adjustable stop 113 which is engageable with the midportion of the band 77 to maintain a clearance between the midportion of the band 77 and the inside clutching surface on the ring 68. Lines 114 connect the motors 88 and 108 to a common coupling, as a quick release valve 110, to direct fluid, as air or liquid, from a passage along the axis of the shaft 39 and provide for rapid exhaust of fluid from the motors.

The brake 72 has a circumferential band 116 which engages approximately 270 degrees of the outer or braking surface of the outside ring 67. The dead end of band 116 has an anchor connector 117 pivotally connected to an anchor bolt 118. The bolt 118 projects through suitable holes in a bracket 119. Nuts 121 threaded onto the bolt 118 secure the bolt to the bracket. Located adjacent the bolt 118 is an upright bracket 23 carrying an adjustable stop 122 engageable with a portion of the band 116. A release spring 124, connected to the bracket 123 and band 116, holds the band 116 in engagement with the stop 122.

The opposite end of the band 116 is secured to an actuator connector 126 pivotally connected to an upright arm 127. The arm 127 is secured to a transverse shaft 128 rotatably mounted in a stationary support. A portion of the shaft 128 is connected to a bell crank 129. The bell crank 129 has a forwardly directed arm 130. A fluid motor 131 has a movable member 132 connected to the arm 130. Fluid motor 131 is mounted on a fixed bracket 133. A downwardly directed rod 134 is pivotally connected to the outer end of the arm 130. A spring 136, positioned about the rod 134, engages the bracket 133 and a nut on the rod 134 to bias the bell crank to a release position. The arm 130 is moved in the direction of the arrow 138 by the application of fluid under pressure to the motor 131 to apply the brake. A fluid line 139 directs fluid under pressure to the motor 131.

The bell crank 129 has a downwardly directed arm 137 connected to a safety spring actuated fluid pressure release unit, indicated generally at 141. The actuator 141 has a housing 142 mounted on a support 143. A movable rod 144 connected to arm 137 projects into the housing. A head or piston 145 is secured to a sleeve 146 within the housing telescoped over the rod 144. Sleeve 146 moves with piston 145 relative to the housing 142 and rod 144. The forward end of sleeve 146 abuts against a stop nut 144A mounted on the rod 144 so that the rod is moved only in a forward direction with the piston 145 to apply the brake. The piston 145 and sleeve 146 are biased by a spring 147 located in the rear of the housing against the piston in a forward brake applying direction. A fluid line 148 directs fluid under pressure into the housing 142 on the side of the piston 145 opposite the spring 147. Upon application of fluid under pressure into the housing 142, the spring 147 is held inoperative. The fluid motor 131 operates independently to release the brake since the rod 144 is free to slide in the sleeve 146. The safety spring actuator unit 141 is mechanically tied into the brake actuating linkage in an overriding arrangement so that upon loss of fluid pressure anywhere in the system, the brake will automatically be applied.

The holding drum 37 has a clutch 59 with a motor 108A and a band brake 62 with a motor 131A. Closing drum 33 has a pair of clutches 69B and 69C with motors 108B and 108C and a pair of band brakes with motors 131B and 131C. Clutches 59, 69B and 69C are identical to clutch 69 and the brakes are identical to band brake 72.

The diagrammatic outline of the control system, indicated generally at 149, is shown in FIG. 5. The control system is connected to a pressurized fluid supply, as a compressed air supply 151. An adjustable pressure regulator valve 152 is connected in a line 153 leading to a manually operated closing valve 154. The closing valve 154 is a graduated pressure valve having a hand lever 154A located in an offset or stepped slot 155 to delay the full actuation of the valve until the master clutch 51 is engaged. In other words, the master clutch 51 is always engaged under no-load. The air regulator valve 152 can be adjusted to regulate the supply of air so that the clamshell bucket will close on movement of closing line 17 but will not lift out of the material without assistance from the holding line 18.

The graduated pressure closing valve 154 is connected to a line 169 which supplies the air under pressure to the double check valve or shuttle valve 171 connected to the clutch motors 108B and 108C for the clutches 69B and 69C on the opposite sides of the closing drum 33. Valve 171 is also connected to line 172 connected to the opposite side of the clos-

ing valve 154. Line 172 is further connected to a normally open pilot valve 176 in a line 177. The line 177 is connected to air supply 151 and a master clutch fluid motor 178 for master clutch 51. Motor 178 is operable to actuate the master clutch 51 to couple the torque converter 49 to the chain drive 53.

Located in line 177 between the pilot valve 176 and the air supply 151 is a master clutch valve 179 manually operable to regulate the supply of air under pressure into the line 177 operating the master clutch 51. A manually operated graduated pressure holding valve 181 in line 182 connects the air supply 151 with a double check valve 183 connected to a line 184 and line 172. Line 184 is connected to the fluid motor 108A for the clutch 59 on the holding drum 37. The brake of the holding drum is operable in response to a holding graduated pressure treadle valve 186 in a line 187 connected to the air supply 151. Downstream of the treadle valve 186, line 187 is connected to a normally closed pilot valve 188 connected to line 172. Pilot valves 176 and 188 receive control signals from the air pressure in line 172.

The air supply 151 is connected to a closing graduated pressure treadle valve 189 located in a line 191 connected to a double check valve 192. Check valve 192 is connected to a line 193 leading to the fluid motors 131B and 131C for the brakes on the opposite side of the closing drum 33. Pilot valve 188 is also connected to the check valve 192 whereby the holding treadle valve 186 controls both the brakes on the closing drum and holding drum.

The lowering of boom 13 is controlled with a boom graduated pressure treadle valve 194 located in line 196 connected to the air supply 151 and the brake fluid motor 131 for the boom drum 38. A manually operated graduated pressure boom drum valve 197 connects the air supply 151 with a line 198 leading to the boom drum clutch cylinder 108 and to double check valve 202. Normally open pilot valve 199 interposed in line 198 receives a control signal from the air pressure in line 172 directed through a flow control valve 201 connected to line 172. A line 173 connects valve 201 to valve 199. The exhaust of pilot air from valve 199 is controlled by valve 201 to insure master clutch 51 engagement before the boom clutch 69 is engaged. Double check valve 202 is connected to the line 148 leading to the spring applied pressure released unit 141 of the boom drum brake and line 203 connected to the forward port of valve 197. Valve 202 supplies air to the spring applied brake release unit 141 to release the boom drum brake when the boom 13 is either raised or lowered.

The control system 149 is operative to provide free fall lowering of a clamshell bucket 16 under the control of the three brakes of the closing drum and holding drum. During the lowering of the bucket, both the closing line 17 and the holding line 18 are kept tight to eliminate twisting and fouling of these lines. Also, the two shells 22 and 23 of the bucket 16 remain in a fixed relative position to each other during the lowering. The shells may be fully open, partially open or closed, dependent upon the position that the bucket is in at the time the coordinated lowering lever 154A is energized. The system is also arranged so that the master clutch 51 always engages under no-load.

The operation of the control system 149 is as follows. In a typical operating cycle with the machine 10 used to unload bulk material from a ship's hold to a hopper located on shore, the cycle is started with an open bucket resting on the material in the ship's hold. Initially, the operator holds back the hand lever on the closing valve 154. This engages the closing drum clutches 69B and 69C to rotate the closing drum 33. The line 17 will wind on the closing drum until the clamshell bucket 16 is closed. The air regulator valve 152, located in the supply line to the closing valve 154, limits the air pressure to the valve 144. This limited air pressure can be adjusted so that the clamshell bucket will close but will not lift out of the material without assistance from the holding line 18.

To raise the closed bucket 16, the operator pulls the hand lever 181A on the holding valve 181. This engages the holding drum clutch 59 to provide the additional force necessary to raise the bucket out of the material. As soon as the bucket 16 clears the hatch, the platform or deck 11 swings to move the bucket 16 toward the hopper. When the bucket is high enough to clear the hopper, the operator depresses the holding and closing treadle valves 186 and 189 while simultaneously returning the holding and closing levers 181A and 154A back to their neutral positions. This will stop the hoisting motion of the loaded bucket. When the bucket approaches the center of the hopper, the swing controls are reversed to start the boom swinging back toward the ship. By manipulation of the closing treadle valve 189, the closing brakes are slipped, thereby opening the bucket 16 and allowing its contents to drop in the hopper. When the bucket reaches its desired open position, the closing treadle valve 189 is depressed, thereby braking the closing drum 33. When the bucket is over the hatch, the swing controller is reversed to stop the motion of the boom.

To lower the bucket, the operator pushes the hand lever 154A of the closing valve 154 forward to the coordinated lowering position. This will (1) disengage master clutch 51, (2) engage holding drum clutch 59, (3) engage closing drum clutches 69B and 69C, (4) supply air from holding brake treadle valve 186 to the holding brakes and closing brakes, and (5) block the control line from boom valve 197 to boom clutch 69. The operator will then remove his foot from the closing treadle valve 189 and control the descent of the open bucket 16 by manipulating the holding treadle valve 186 which is supplying air under pressure to the three brake motors 131A, 131B, and 131C, via lines 187 and 193. The gears 42, 43 and 44 and roller chain drive 53 turn backwards during the descent of the bucket 16 and the holding and closing drums are forced to rotate at exactly the same speed. When the bucket 16 reaches the material in the ship, the operator depresses the holding treadle valve 186 to stop its motion and returns the closing valve 154 to its neutral position. The bucket is now back at its initial position on the material in the ship's hold.

If it is necessary to boom out while lowering the bucket 16, the operator will simply push the hand lever 197A of the boom valve 197 forward to release the spring set safety brake unit 141 and then control the descent of the boom 13 by manipulating the boom brake treadle valve 194. The bucket 16 will continue its descent in coordinated lowering.

Spring applied fluid pressure release actuators, identical to the actuator unit 141, are provided on the holding and closing drum brakes as a safety feature. These actuators are not shown, since their actuation is independent of the other features of the control system.

If it is necessary to raise the boom 13 while lowering the bucket 16, the operator will pull the hand lever 197A of the boom valve 197 back and return his foot to the closing brake treadle valve 189 and then return the hand lever 154A of the closing valve 154 to its neutral position. This last motion will first engage the master clutch 51, then engage the boom hoist clutch 69, while releasing the boom safety actuator unit 141. The flow control valve 201 insures the timing of the actuation of these brakes. The operator now manually coordinates the holding and closing drum speeds to keep the bucket 16 in its open position. To stop the boom motion, the operator must return the hand lever 197A of the boom valve 197 to its neutral position. The hand lever 154A of the closing valve 154 can then be returned to the coordinated lowering position to continue the coordinated lowering of the bucket 16.

In summary, the forward position of the closing valve 154 automatically functions to engage both the holding clutch 59 and the closing clutches 69B and 69C, releases the master clutch 51, and permits the holding brake treadle valve 186 to operate both the holding drum 37 and the closing drum 33 brakes at a common control pressure. The offset slot 155 in the closing valve 154 assures master clutch 51 engagement ahead of closing drum clutch engagement in case of a reversal of motion when the operator stops the lowering of the bucket and commences the closing of the bucket.

The interlock in the boom control will not permit boom clutch **69** engagement while the gears **42**, **43**, and **44** are turning in the reverse direction. This permits boom movement during the coordinated lowering of the bucket. The closing drum, the holding drum, and the boom drum can be mounted on separate shafts connected to each other with a power transmitting means, as a gear drive, chain drive or the like. Each drum can be provided with a pair of clutches and brakes, as shown on closing drum **33**, so that the coordinated lowering of the bucket **16** will be controlled by four brakes on the closing drum and holding drum. The additional brakes with their braking surfaces increase the thermal capacity of the entire braking system. When the master clutch **51** is located between the engine and torque converter, the torque converter also functions as a hydraulic brake to assist the braking action of the brakes on the closing drum and holding drum. Each drum can have a single brake and clutch for use with lighter loads and smaller buckets.

The description and drawings are directed to preferred embodiments of the control system for a hoist machine. Changes, modifications and use of different standard parts, valves and the like, may be made by those skilled in the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A hoist assembly and associated control for a hoist machine comprising: a closing drum having first brake means, a holding drum having second brake means, power transmitting means connecting the closing drum and the holding drum whereby said drums rotate at substantially the same speed, a shaft connected to the power transmitting means, said closing drum being rotatably mounted on said shaft, a pair of clutches drivably coupling the closing drum with the shaft, power disconnecting means for controlling power input to the power transmitting means, and fluid pressure control means for said first brake means, said second brake means, and said power disconnecting means, said control means having a closing drum clutch, valve means operable to actuate said clutches, and means operable to simultaneously actuate both said first and second brake means and release the power disconnecting means so that the holding drum is under the control of both the first brake means and the second brake means, said power disconnecting means is a master clutch means having the control means coupled to the closing drum clutch valve means, said control means is operable to actuate the master clutch before actuation of the closing drum clutches.

2. The structure of claim **1** wherein: said first brake means comprise a pair of brakes for braking the closing drum.

3. The structure of claim **1** wherein: said first brake means comprise a pair of brakes and said second brake means comprise a pair of brakes.

4. The structure of claim **1** wherein: said shaft means includes a first shaft rotatably carrying the closing drum, a second shaft rotatably carrying the holding drum, closing clutch means coupling said first shaft with the closing drum, and holding clutch means coupling the second shaft with the holding drum, said power transmitting means connecting the first shaft with the second shaft.

5. The structure of claim **4** wherein: said power transmitting means includes a gear train connecting the first shaft with the second shaft.

6. The structure of claim **1** wherein: the power disconnecting means includes a torque converter located between the power source and the power transmitting means.

7. The structure of claim **6** wherein: the master clutch is between the power source and the torque converter.

8. A hoist assembly and associated control for a hoist machine comprising: a closing drum having first brake means, a holding drum having second brake means, power transmitting means connecting the closing drum and the holding drum whereby said drums rotate at substantially the same speed, a first shaft rotatably carrying the closing drum, closing clutch means coupling said first shaft with the closing drum, a second shaft rotatably carrying the holding drum, holding clutch means coupling the second shaft with the holding drum, said power transmitting means connecting the first shaft with the second shaft, power disconnecting means for controlling power input to the power transmitting means, and fluid pressure control means for said first brake means, said second brake means and said power disconnecting means, said fluid pressure control means including means operable to simultaneously actuate both of said first and second brake means and release the power disconnecting means so that the holding drum is under the control of both the first brake means and the second brake means, said means of the fluid pressure control means comprising a closing clutch control, a holding clutch control, a power disconnecting means control coupled to the closing control and the holding clutch control and operable to actuate the power disconnecting means before actuation of either the closing clutch or the holding clutch.

9. The structure of claim **8** wherein: said first brake means comprise a pair of brakes and said second brake means comprise a pair of brakes.

10. The structure of claim **8** wherein: the power disconnecting means includes a master clutch and torque converter located between the power source and power transmitting means.

11. The structure of claim **10** wherein: the master clutch is between the power source and torque converter.

12. A hoist assembly and associated control for a hoist machine comprising: a closing drum having first brake means, a holding drum having second brake means, power transmitting means connecting the closing drum and the holding drum whereby said drums rotate at substantially the same speed, power disconnecting means for controlling power input to the power transmitting means, and fluid pressure control means for said first brake means, said second brake means and said power disconnecting means, said fluid pressure control means including means operable to simultaneously actuate both of said first and second brake means and release the power disconnecting means so that the closing drum and holding drum are under the control of both the first brake means and the second brake means, said means of the fluid pressure control means for the first brake means and second brake means comprising a holding brake valve for directing fluid under pressure to the second brake means and to a pilot valve operable to permit fluid under pressure to flow from the holding brake valve to the first brake means, a closing valve operable to provide fluid under pressure to release the power disconnecting means and to actuate the pilot valve whereby the first brake means and second brake means are both controlled by the operation of the holding brake valve.

13. The structure of claim **12** wherein: the power transmitting means has a first clutch means coupled to the closing drum and a second clutch means coupled to the holding drum, said closing valve also operable to provide fluid under pressure to actuate both the first clutch means and the second clutch means whereby the closing drum and holding drum are drivably coupled together.

14. The structure of claim **12** wherein: the first brake means comprise a pair of brakes for braking the closing drum.

15. The structure of claim **12** including: shaft means connected to the power transmitting means, said closing drum being rotatably mounted on said shaft means, and a pair of clutches drivably coupling the closing drum with the shaft means, said control means having a closing drum clutch and valve means operable to actuate said pair of clutches.

16. The structure of claim **15** wherein: said shaft means includes a first shaft rotatably carrying the closing drum and a second shaft rotatably carrying the holding drum.

17. The structure of claim **16** wherein: said power transmitting means includes a gear train connecting the first shaft with the second shaft.

18. The structure of claim **12** wherein: the power disconnecting means includes a master clutch and torque converter located between the power source and the power transmitting means.