HYDRAULIC CASING HANDLING APPARATUS
14 Claims, 10 Drawing Figs.

ABSTRACT: For use in raising, lowering or supporting large diameter casings such as used in wells or mines, a hydraulic device which preferably supports large diameter casings by means of lift rings which are engaged by upper and lower jack rings which are each independently movable upwardly or downwardly and which are equipped with radially inwardly directed support shoes for engaging the lift ring independently so as to provide an apparatus which handles massive loads even in the event of crooked support rings on the casing, misaligned casing, and other variations from perfect alignment.
HYDRAULIC CASING HANDLING APPARATUS

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RELATED APPLICATIONS

Applicant has no presently pending related applications.

SUMMARY OF PROBLEM AND INVENTION

This invention relates to a hydraulically operated apparatus which handles large diameter well casings. Large diameter holes or mine shafts must typically be lined with a casing or tubing string. An unlined or open hole engenders the possibility of partial collapse of the sidewall, in which event, the bottom of the hole is filled with an accumulation of dirt, stone and other materials which have passed through the open hole. On occasion, a drilled hole will pass through a water-bearing formation which may drain continuously into the open hole. Moreover, some formations are filled with salt water and it is generally undesirable to communicate salt water to formations filled with fresh water. Because of these and other problems, it is desirable to line the open hole with a casing.

In smaller wells such as those in the oil and gas industry, pipe joints are threaded together and lowered into the hole to form the lining or casing. However, the block and tackle draw works suitable for such small diameter pipe is not adequate for casing holes of perhaps eight or ten feet in diameter. Apparatus has been provided heretofore for such large diameter holes, but has been generally found wanting. Devices to which the present invention relates, when handling static loads or perhaps millions of pounds, have been found wanting in a means to accommodate variations from perfect pipe and lift ring formation and alignment with the apparatus and have been further found wanting in the avoidance of impacts on shifting the weight of the casing column from one lift ring to another. Moreover, devices to which the present invention relates, when handling static loads or perhaps millions of pounds, have been found wanting in the avoidance of impacts on shifting the weight of the casing column from one lift ring to another.

The rapid movement is slowed at the extreme bottom end of the jack retraction to cushion and reduce the shock when the load is shifted from the upper jack ring to the lower jack ring. Many other objects and advantages of the present invention will become more readily apparent from a consideration of the following specification and accompanying drawings in which:

FIG. 1 is an elevational view partly in section of the assembled hydraulic apparatus with a sidewall partially broken away to disclose details of internal construction;

FIGS. 2, 3, and 4 cooperatively show, in schematic form, the apparatus raising or lowering a casing string in a well bore;

FIG. 5 is a sectional view taken along the line 5-5 of FIG. 1 illustrating details of construction of the upper left ring and the lower lift ring;

FIG. 6 is a sectional view taken along the line 6-6 of FIG. 5 showing means for joining adjacent portions of the apparatus of FIG. 5;

FIG. 7 is an electrical wiring schematic diagram illustrating apparatus for ascertaining the position of the radially inwardly directed jack means;

FIG. 8 is a schematic view showing how the apparatus adjusts to a misaligned lift ring on the casing;

FIG. 9 is a schematic view of the hydraulic system of the present apparatus; and,

FIG. 10 is a hydraulic schematic diagram showing the means for inserting and retracting the lift shoes to raise or lower the casing.

In the drawings, attention is first directed to FIG. 1 where the apparatus of the present invention is indicated by the numeral 10. Briefly, the apparatus incorporates an upper jack ring assembly which is indicated by the numeral 11 and a lower jack ring assembly which is indicated by the numeral 12. A base member 13 is adapted to be rested on the ground or surface adjacent to the substantially large diameter hole being drilled for supporting the jack rings 11 and 12. A plurality of rather long jacks 14 extend from the upper jack ring 11 to the base 13 for use in operation of the present device. Additionally, the lower jack ring is supported on a plurality of jacks 15 so as to move upwardly and downwardly in cooperation with the upper jack ring 11. The casing 32 is engaged at the lift ring 34 by a plurality of radially movable shoes positioned by double acting hydraulic cylinders to engage or disengage the lift ring.

Considering the invention further in detail, the various components of the base structure 13 will be first considered. The base 13 is preferably a circular structure having a box-type cross section with a top plate 17, bottom plate 17a, outside shell plate 16, inside shell plate 16a, and intermediate shell plate 16b, which combine to provide support for the various hydraulic jacks as will be described. The base 13 also provides for adaptation of the jacks to various casing sizes to provide for proper load distribution around the hole. The base 13 provides a means of attachment of a jack guide assembly consisting of an encircling cylinder member 18 which extends upward and terminates at a horizontal plate member 19 having openings 19a which receive the lower portion of the jacks 14 as will be described. Suitable stiffening gussets 20 are spaced at locations about the perimeter of the cylinder member 18 to strengthen the structure and provide mounting flanges. A lower guide plate 19b is provided with openings 19c and 19d to respectively receive the jacks 14 and 18, the lower ends of which rest on the plate 17.

The base 13 and the jack rings 11 and 12 are preferably divisible into semicircular segments for ease of transportability. Of necessity, the apparatus incorporates the jack rings 11 and 12 substantially large since they are adapted to handle pipes ranging perhaps five feet or more in diameter. Clearly, the internal opening of the apparatus must be least exceed the diameter of the pipe being lowered into the well or mine and, of course, the apparatus has a finite thickness. To permit the apparatus of the present invention to be readily dismantled as an aid and assistance to shipping, the apparatus is preferably divided along the line 21 (FIG. 5) and is assembled at the site or location as shown in FIG. 6. FIG. 6 is a sectional view illustrating the plate 17 and the parting line 21 for the half sections of the device. In FIG. 6, the ends of the semicircular portion are fabricated to form what are essentially tongue-and-socket connections, the numeral 23 designating generally the tongue member and the numeral 24 the socket member. The tongue member 23 is constituted by the upper and lower flanges 29 and 30, respectively, and connecting end wall 26, while the socket member 24 is constituted by the upper and lower flanges 27 and 28, respectively, and the end wall 25. Appropriate keyway slots are formed in the flanges 27, 28, 29 and 30 along the center line 21 to receive the key members 31 and 32. The key members 31 and 32 are inserted into the keyways to lock the two semicircular portions together. As will be appreciated from the location of the sectional view of FIG. 6, the keys are inserted along a radius of the circular structure from the exterior and may be readily pulled from the keyway slots. This mode of assembly has been shown for the base 13 but is preferably extended to the jack rings 11 and 12 which are structurally similar. It is believed that the use of
keys in the slotted keyways readily enhances makeup or
takedown time in the use and application of the present inven-
tion. By way of contrast, bolts and flanges are cumbersome
and occupy too much space in the equipment.

Returning again to FIG. 1, it will be noted that the plates 19
and 19b encircle and hold the hydraulic jacks 14 erect. In the
preferred embodiment, eight hydraulic jacks are shown. Of
course, the number, stroke, cross-sectional area and other
measurements of the various hydraulic jacks may be varied.

However, the symmetrical arrangement of double acting
hydraulic jacks is found acceptable. The jacks 14 are
preferably double acting with the piston rod extending up-
wardly and connected to the upper jack ring. The cylinder is
at the lower end and rests on the plate 17 of the base 13. Ac-
tually, the details of fabrication and support of the various
hydraulic jacks on the base member 13 are subject to variation
and are believed within purview of one skilled in the art.

Further, it will be noted that the various hydraulic connections
required to operate the various hydraulic jacks of the lifting
apparatus 10 have been omitted from FIG. 1 for sake of clari-
ty.

The hydraulic jacks 14 are connected to the upper jack ring
11 to move it upwardly or downwardly as needed. The hydrau-
lic jacks 15 support the lower jack ring 12 to move it in like
manner. The lower jack ring 12 has reduced diameter when
compared with the upper jack ring 11 and consequently, the
hydraulic jacks 15 which move it upwardly and downwardly
are preferably located on a circle inboard of the hydraulic
jacks 14. Again, the number may vary, but the preferred em-
bodyment preferably includes eight hydraulic jacks for raising
and lowering the lower jack ring 12. Again, the hydraulic jacks
15 may vary in stroke, capacity, and many other details. It is
not necessary that the various double-acting hydraulic
jacks, although they may be used if desired. Again, the fluid
distribution system for operation of the various hydraulic
jacks associated with the lower jack ring 12 has been omitted
from FIG. 1 for sake of clarity.

Attention is next directed to FIG. 5 of the drawings. In FIG.
5, the right-hand portion of the sectional view illustrates the
upper jack ring 11. A casing 32 is shown in the center of the
apparatus 10 to be lifted by the apparatus of the present inven-
tion. The casing 32 includes appropriately spaced lift rings 34
along the length of the casing 32. Hopefully, the lift rings are
of uniform size and thickness and preferably lie in a plane per-
pendicular to the axis of the casing 32. While this is the expec-
tation, nevertheless, the lift rings may be slightly mislocated, may vary in size or thickness, may be misaligned with respect to the axis or the casing, or may become damaged or
mislocated as the casing 32 is subjected to stress. Because of all
these factors, problems of slight misalignment are often presented,
and with this in view, the apparatus of the present invention
accommodates such field conditions quite adequately.

In FIG. 5, the numeral 36 indicates a single hydraulic jack or
ram which has a piston rod radially inwardly directed toward the
casing 32. The piston rod is connected to the rear of the
housing 38 which is received within a housing 38. The hous-
ing 38 includes the sidewalks 39 and 40 joined to an upper wall
which is shown enclosing the other hydraulic shoes spaced
about the casing 32. The housing 38 is preferably anchored to
the upper surface of the jack ring 11. The shoe 37 has suffi-
cient clearance within the housing 38 to slide to and fro with
the housing serving as a guideway for directing the shoe
when subjected to dynamic forces. The shoe 37 engages a microswitch 42 when the shoe is urged forwardly by the
hydraulic jack 36. This is shown in FIG. 5 where the shoe is
contacted against the casing 32. On the other hand, when
the shoe is withdrawn from the casing 32, the rod 41 trips a
microswitch 43. The microswitch 43, when actuated, indicates
that the shoe 37 has been withdrawn or retracted. Preferably,
the microswitches 42 and 43 are duplicated about the full
perimeter of the jack ring 11 for all of the shoes to form a
signal as will be described hereinafter.

The left-hand portion of FIG. 5 includes a sectional view
through the various hydraulic jacks 14. As will be noted, each
jack includes a surrounding cylindrical barrel or sleeve 14c
and an internally located pushrod 14d. The pushrods extend
upwardly to the upper jack ring 11 as previously noted. The
connection of the pushrods to the jack ring 11 should be
noted. The devices to which the pushrods are connected are
utilized a threaded portion at the upper end of the piston rod
which typically extends through the jack ring and which is
locked in position by nuts and washers above. The rod has a
spherical seat 14e for purposes to be described subsequently.
The device of the present invention preferentially utilizes a non-
rigid connection. With all of the connections of the like mova-
ble nature, it will be appreciated that the jack ring 11 is readily
canted with respect to the hydraulic jacks 14 to accommodate
problems in misalignment and the like. Thus, it will be un-
derstood that a retaining nut is placed above the jack ring 11
as shown in FIG. 1, where it is indicated by the numeral 46.
The retaining nut 46 merely prevents the jack ring 11 from
being inadvertently lifted off the main jack 14. The jack ring
is preferably formed with the spherical socket 14b engageable
with seat 14a, and an annular clearance space is provided about
the piston rod to permit the jack ring 11 to cant with
respect to the piston rod.

Further considering the left-hand portions of FIG. 5, the
lower jack ring 12 will be observed to include a plate member
48 which surrounds the casing 32. The plate member 48 ex-
tends inwardly toward the casing and is constructed to define
a notch at spaced locations to provide clearance outside of
the casing 32 for grouting lines or other lines adjacent to the
casing string. Hence, the appropriately located notches are
formed in the plate 48 to permit grouting lines to pass between
load shoes on the jack ring 12. The same is also true of the
upper jack ring 11. As noticed in the right-hand portions of
FIG. 5, the numeral 49 indicates a similar cutout in the jack
ring 11 to provide grouting lines or other cables on the exterior
of the casing string to extend into the well bore.

The hydraulic jacks on the lower jack ring are indicated by
the numeral 50. They are preferably similar to the hydraulic
jacks 36 on the upper jack ring 11. More specifically, they are
double acting hydraulic jacks for moving the load shoes of the
lower jack ring 12 inwardly and outwardly toward the casing
32. The load shoes associated with the lower jack ring are
indicated by the numeral 51. Again, they are preferably similar
or even identical to the load shoes 37 on the upper jack ring
as previously described. The numeral 52 indicates the guide
housing which surrounds each load shoe and maintains its
alignment with respect to the hydraulic jacks 50 so that the
load shoes move radially toward or from the casing 32. The
housing 53 is supported by suitable gusset plates on the left
and right in the same manner as the guide housing 38
shown on the upper jack ring 11. The position of the load
shoes 51 on the lower jack ring is determined by apparatus
similar to that in the upper jack ring 11. That is, within each
guide housing 52, a pushrod 52a is carried by the load shoe
and actuates or trips a pair of limit switches to indicate the
location of the jack shoe. The numeral 54 indicates the forward
switch or sensor and the numeral 55 indicates the rearward
sensor.

Attention is next directed to FIGS. 2, 3, and 4 of the
drawings. They represent schematically the operation of the
device 10 to either raise or lower a casing in a well bore. Since
the apparatus is symmetrical about the casing 32, only one
side of the apparatus to be described is illustrated in the several
views. In FIG. 2, the weight of the casing string 32 bears down-
wardly and is supported at the lift ring 34 which rests on the
load shoe 51. The load shoes 51 are associated with the lower jack
ring 12 and are moved radially inwardly toward the casing 32
by the hydraulic jacks 50 previously described. It will be noted
that the load shoes are beneath the lift ring 34. The abutting
engagement rests the weight of the casing 32 and the entire
column of tubular members in the well bore on the load shoes
51.
The arrow in FIG. 2 indicates that the hydraulic jacks 14 are being extended to raise the upper jack ring 11. The load shoes 37 carried on the jack ring 11 are extended inwardly to abut against the wall of the casing 32. They slide upwardly against the wall toward the upper lift ring 34 in response to the extension of the jacks 14. When the extension of the jacks is completed, the upper lift ring 11 is at some optimum elevation and is bearing the weight of the casing. Consequently, the load shoes 51 may be withdrawn as indicated by the arrow in FIG. 3. At this juncture, the entire weight load has been shifted from the lower jack ring 12 to the upper jack ring 11. Preferably, the hydraulic jacks 14 are extended ever so slightly further upwardly after the load has been shifted to the upper jack ring to completely and freely load the load shoes 51 from abutting engagement against the lift ring 32. When this is completed, the load shoes 51 are easily withdrawn, not under load, to increase and improve the lift of the apparatus.

Attention is next directed to FIG. 4 of the drawings. To lower the casing 32 further into the well bore, the hydraulic jacks 14 are lowered and the upper lift ring 11, which bears the weight of the casing 32, is lowered. While this proceeds, the load shoes 51, having been previously withdrawn, are ready to immediately abut the well casing 32. This places them in position to assume the load of the well casing 32 when the next lift ring comes into engagement with the upper edge or face of the load shoes 51. The arrow in FIG. 4 indicates the downward movement of the casing string preparatory to placing the load on the load shoes 51 at the lower lift ring.

The drawings further disclose a limit switch 56, the function of which will be described in detail hereinafter, which detects the bottom-most position of the forward lift ring 12. Additionally, the position of the upper lift ring 11 is likewise measured or ascertained by a suitable sensor or detector such as the switch mechanisms at 57 and 58. The switch 56 is at the lowermost position. On the other hand, the switch 57 is so set, of course, actuated prior to arrival of the lift ring 11 at its bottom-most position. The early warning provided by the switch or sensor 57 is utilized in the manner to be described in detail hereinafter.

Briefly, the foregoing illustrates how the casing 32 is lowered in a stepwise manner by shifting the weight to and from the lift rings 11 and 12. Of course, to merely support the casing 32, one of the two lift rings may be maintained will fixed position indefinitely. Further, to raise the casing from the well bore, the sequential operation described above is reversed and the lift rings are engaged in like manner.

Attention is next directed to FIG. 8 of the drawings. In this view, the lower lift ring 12 is canted with respect to the plane of the base 13 of the apparatus. The canting may arise from any one of several circumstances, such as a crooked casing, a misaligned lift ring 34, or any other reason. In FIG. 8, the various hydraulic jacks 18, being on a common hydraulic line equalize pressures in the various jacks by extending the pushrods to the extent required to equalize the loads on the various jacks. The pushrods are received within spherical seats in the structure of the jack ring 12 to permit cantiing as shown in FIG. 8.

Attention is next directed to FIG. 7 of the drawings. In FIG. 7, the numeral 60 indicates a suitable power source which is battery supplied, field generator supplied, or from some other voltage source. It does not matter whether the voltage is AC or DC. The voltage source at 60 is connected through a suitable main switch 61 which turns the apparatus off or on. When the switch is closed, suitable electric power is provided to be described. Electric power is directly connected to a DPDT switch 70 which operates a double solenoid spring centered control valve 69. As mentioned before, the hydraulic jacks or rams on the upper jack ring 11 are double acting hydraulic devices. Hence, when the valve 69 is energized the hydraulic ram 36 is shifted from its position. The limit switches 42 and 43 of the upper lift ring 11 are wired in series as shown in FIG. 7 such that the limit switches 42, which indicate that the rams are fully inserted against the casing 32, energize a lamp 65 or other suitable indicating device and also provide power to half of the DPDT switch 63. The limit switches 43, which indicate full withdrawal of the hydraulic rams and load shoes, are connected to a lamp or suitable indicating device represented by the numeral 66 to indicate full withdrawal of the load shoes. In the operation of the upper jack ring 11, the upper load shoes may be inserted against the casing to engage a lift ring thereof upon actuation of the switch 70 and operation of the double solenoid control valve 69. Completion of this step is indicated when the limit switches 42 complete their series circuit and provide a visual or audible indication from the device 65. The upper load shoes may be withdrawn by actuation of the switch 70 in the opposite direction. That portion of the switch 70 is energized only if the limit switches 55 complete their series circuit, and upon this event, suitable power is applied to the control valve 69 to withdraw the upper load shoe through operation of the hydraulic ram 36. This step is completed when the limit switches 43 are closed to complete their series circuit and the device 66 is suitably energized to provide the warning or indication to the operator.

FIG. 7 further includes the limit switches 54 and 55 of the lower jack ring 12. They again are wired in series. Each series grouping is connected to indicating devices 67 and 68 as shown. Again, the devices may be audible or visual, or both, depending on the desires of the operator of the equipment. Likewise, the hydraulic rams 59 of the lower jack ring are operated by the double solenoid spring centered control valve 64 which is similar or preferably identical to the valve 69 previously described. The control valve 64 is operated by the switch 63 which is wired similarly to the switch 70 above noted. It is believed repetitious to trace operation of this portion of FIG. 7 since the wiring and the function of the various components for both jack rings are preferably identical.

Attention is next directed to FIG. 9 of the drawings which is a schematic of the hydraulic system operating the lift jacks 14 and support jacks 15. As noted above, the preferred embodiment includes eight jacks supporting each jack ring. As shown in FIG. 9, the jacks 14 are double acting jacks, the position of each being controlled by four way valves indicated by the numeral 72 and pilot operated check valves 76 along with system unloading valves 77b. The jacks 14 are to be contrasted with the hydraulic jacks 15. For retraction, gravity forces working against reduced fluid pressures can be counted on to lower both jack rings as desired. However, operating speed is enhanced by making the hydraulic jacks 14 double acting. Of course, the jacks 15 may be made double acting as desired. But, the hydraulic schematic of FIG. 9 shows cooperation with single acting jacks.

The numeral 73 indicates a main control valve supplying pressure fluid in a line 74. An isolation valve 75 communicates with each individual jack. The other jacks are likewise connected through an isolation valve. The pressure fluid is provided to the lower end of the cylinders to prevent bottoming out of the piston on retraction of the lifting apparatus.

Preferably, multiple supply means, including a check valve 73, line 74, and isolation valve 75, are provided for each hydraulic jack. The lines 74 are drained by pilot operated check valves 76 to permit retraction of the hydraulic jacks 14. Any number of pilot operated valves 76 may be connected to the lines 74. For instance, four or more may be used. As the upper jack ring is lowered at a rapid pace, the valves 76 sequentially block flow to gently slow the upper jack ring as it is lowered by the hydraulic jacks 14. The valves 76 are controlled by the limit switches 57 and 58 shown in FIG. 4. The deceleration prevents metal to metal contact at the bottom of the stroke to thereby prolong the life of the apparatus and to prevent damage to it. Even more important, shock loading of the casing string might tear loose the whole string; the shock loading is prevented by this invention. The valves 76 communicate with suitable fluid flow lines 77 which return the fluid to the reservoir by way of the pressure compensated flow control valves 77a which are adjusted to maintain a constant volumetric flow rate regardless of pressure.
The lower portions of FIG. 9 show the single acting valves 15. Each support jack 15 is supplied from a common line 78 through isolation valves 79. Again, the fluid is supplied to the lower end of the hydraulic jacks 15. Fluid is supplied from the pump by a hydraulic line 80 through a check valve 81 and then through a pilot operated check valve 82. Additionally, another pilot operated check valve 82 is connected for returning the fluid to the sump. As pressure is applied from the pump through the line 80, the jacks 15 may be extended. During their extension, load equalization of the various hydraulic jacks on the common line 78 permits the apparatus to assume any posture with respect to the horizontal as shown in FIG. 8 so long as pressure equalization is achieved in each hydraulic jack. Consequently, the problems of misalignment are relatively easily compensated for by function of the present invention. Moreover, when the hydraulic jacks 15 are lowered, the pilot operated check valves 82 merely drain fluid from the lines 78 at a controlled rate by way of the pressure compensated flow control valve 77a and then to the reservoir as shown in FIG. 9. The limit switch 86 shown in FIG. 4 controls the pilot operated check valves 82 to prevent the piston from bottoming out on the down stroke.

Attention is next directed to FIG. 10 of the drawings. In FIG. 10, a supply line 81 from a source of pressure fluid is communicated with the valves 64 and 69. It should be recalled that the valves 64 and 69 as shown in FIG. 7 are double solenoid spool valves. Also, a return line to the sump is indicated by the numeral 82. The lines 81 and 82 communicate with both the valves 64 and 69. Considering the lower jack ring, it is provided with a plurality of double acting hydraulic rams 50. A common hydraulic line 83 delivers fluid under pressure from the valve 64 to withdraw the load shoes of each ram 50. A line 84 delivers pressure fluid to manipulate the hydraulic rams in the opposite manner. The pilot operated check valve 83 is placed in the return line 84 to prevent the load shoes from being withdrawn unintentionally from creeping away from below the casing lift ring. This check valve 83 is opened by pilot pressure from line 83 only when the latter is pressurized up to withdraw the load shoes by operating valve 64.

In operation, the high pressure line 81 is connected to the feed lines 83 or 84 dependent on the position of the spool of the valve 64. The spool position is determined by the spring centered solenoid connected to each end of the spool for operation of the valve 64. When the spool is so positioned, the high pressure is supplied to either line 83 or 84. The remaining line is then connected to the low pressure line 82 to return fluid forced from the hydraulic rams 80 to the sump. It is believed that operation of the hydraulic rams 50 is readily explained in conjunction with the previous discussions devoted to mechanical operation.

The remaining portions of FIG. 10 show the hydraulic apparatus associated with the upper jack ring 11. The valve 69 is connected to the same two lines to obtain fluid under high pressure and to return the fluid to the sump. The hydraulic rams 50 of the lower jack rings are communicated to the feed lines 87 and 88 connected to the various hydraulic rams. A pilot operated check valve 86 again blocks the return line 88 to prevent the load shoes from being withdrawn, creeping, etc. The operation of the valve 69 and the hydraulic apparatus is similar to that described above. Of course, the control and operation of the valve 69 is coordinated with the valve 64 as was discussed in relation to FIG. 7.

While both the upper and lower jack ring are movable upwardly and downwardly, the preferred embodiment contemplates that only one of the upper jack ring is repeatedly raised and lowered while the lower jack ring is a support for the casing string when the upper jack ring is being repositioned adjacent a lift ring.

It is believed that operation of the various portions of the apparatus has been adequately explained. Moreover, operation of the unit is believed to apply apparent from the foregoing. Consequently, the preferred embodiment is set forth with the view that modifications and alterations are readily apparent to one skilled in the art.

The scope of the present invention is defined by the claims appended hereto. I claim:

1. An apparatus for raising, lowering or supporting a casing member having a lift ring thereon in a well or mine which comprises:
   a. an upper jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   b. a lower jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   c. first hydraulic jack means for raising and lowering said upper jack ring with respect to the well or mine;
   d. second hydraulic jack means for supporting said lower jack ring with respect to the well or mine; and
   e. said first hydraulic jack means operating independently of the second jack means to raise and lower the upper jack ring and further positioning said jack rings in a plane determined by the lift ring without regard to misalignment or mallocation thereof.

2. An apparatus for raising, lowering or supporting a casing member having a lift ring thereon in a well or mine which comprises:
   a. an upper jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   b. a lower jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   c. first hydraulic jack means for raising and lowering said upper jack ring with respect to the well or mine;
   d. second hydraulic jack means for supporting said lower jack ring with respect to the well or mine; and
   e. said first hydraulic jack means operating independently of the second jack means to raise and lower the upper jack ring and further positioning said jack rings in a plane determined by the lift ring without regard to misalignment or mallocation thereof.

3. An apparatus for raising, lowering or supporting a casing member having a lift ring thereon in a well or mine which comprises:
   a. an upper jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   b. a lower jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   c. first hydraulic jack means for raising and lowering said upper jack ring with respect to the well or mine;
   d. second hydraulic jack means for supporting said lower jack ring with respect to the well or mine; and
   e. said first hydraulic jack means operating independently of the second jack means to raise and lower the upper jack ring and further positioning said jack rings in a plane determined by the lift ring without regard to misalignment or mallocation thereof.

4. An apparatus for raising, lowering or supporting a casing member having a lift ring thereon in a well or mine which comprises:
   a. an upper jack ring including:
      1. at least two load shoes adapted to engage a casing member having lift rings thereon;
      2. hydraulic means for moving said load shoes to a position engaging the casing member;
      3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
   b. a lower jack ring including:
1. at least two load shoes adapted to engage a casing member having lift rings thereon;
2. hydraulic means for moving said load shoes to a position engaging the casing member;
3. said load shoes being spaced about the perimeter of the casing member in a manner to support the weight thereof;
4. first hydraulic jack means for raising and lowering said upper jack ring with respect to the well or mine;
5. second hydraulic jack means for supporting said lower jack ring with respect to the well or mine;
6. said upper and lower jack rings including fully encircling structural members;
7. a fully encircling base support adapted to be positioned at the well or mine bore, and having means for positioning said first and second hydraulic jack means; and,
8. said base support being formed in at least two portions which are joined together to define the whole base support and which are separable from one another.

5. The invention of claim 4, including hydraulic fluid supply means communicated with said first and second hydraulic jack means to supply hydraulic fluid thereto for operation, said supply means cooperating with said hydraulic jack means to lower said jack means at a predetermined rate during the mid-stroke portion of operation and slowing the rate of operation as said jack means approaches the bottom of the stroke.

6. The invention of claim 2 including hydraulic fluid supply means communicated with said hydraulic ram means of said upper jack rings, said hydraulic ram means of said upper jack ring extending said load shoes toward the casing member to contact the outer surface thereof, and also retracting said load shoes therefrom, there being a common fluid supply line to said hydraulic rams for actuating said hydraulic ram means simultaneously.

7. The invention of claim 3 wherein said upper jack ring is formed in at least two portions which are joined together to define the whole of said jack ring.
8. The invention of claim 3 wherein said lower jack ring is formed in at least two portions which are joined together to define the whole of said jack ring.
9. The invention of claim 3 wherein the portions of said base support include key way slots, which cooperatively receive a key member therein for joining the portions together.
10. invention of claim 2, including:
   a. means for sensing operation of said hydraulic jack means nearing the bottom of the stroke thereof; and,
   b. valve means operated by said sensing means for decreasing hydraulic fluid flow from said hydraulic jack means on sensing approach of said hydraulic jack means toward the bottom of the stroke.
11. The invention of claim 1, including:
   a. first sensor means for sensing extension of said hydraulic rams of said upper jack ring;
   b. second sensor means for sensing retraction of said hydraulic rams of said upper jack ring;
   c. double solenoid, spool valve means supplying pressure fluid to said hydraulic rams to extend and retract same;
   d. said valve means being actuated by signals conditioned on the operative states of said first and second sensor means to interlock said hydraulic rams on operation to obtain simultaneous extension and retraction.
12. The invention of claim 3 wherein said upper jack ring is formed in at least two portions which are joined to one another and which are separable from one another.
13. The invention of claim 3 wherein said lower jack ring is formed in at least two portions which are joined to one another and which are separable from one another.
14. The invention of claim 1 wherein the areas of load-supporting contact between the first and second jack means and the related jack rings comprise complementary spherical surfaces.