



(22) Date de dépôt/Filing Date: 2010/07/08

(41) Mise à la disp. pub./Open to Public Insp.: 2012/01/08

(51) Cl.Int./Int.Cl. *E21B 19/08* (2006.01)

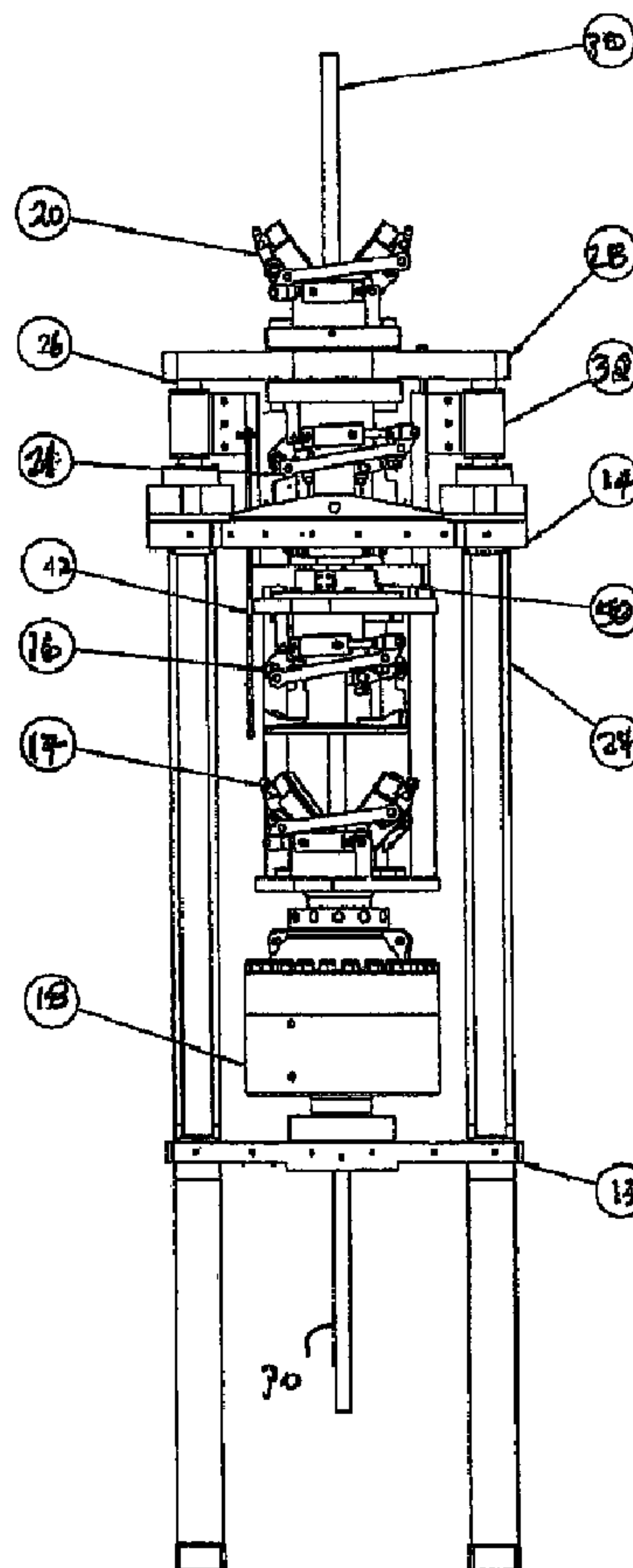
(71) Demandeur/Applicant:
SNUBCO MANUFACTURING INC., CA

(72) Inventeurs/Inventors:
MCKINNON, SHAWN, CA;
TASKINEN, JOHN, CA;
THORNELL, LANCE, CA

(74) Agent: BENNETT JONES LLP

(54) Titre : SUPPORT DE TUYAUX POUR APPAREILS DE FORAGE SOUS PRESSION

(54) Title: PIPE GUIDE FOR SNUBBING UNITS



(57) Abrégé/Abstract:

A pipe guide apparatus for guiding a pipe during snubbing of the pipe includes a pair of hydraulic cylinders and cylinder rods; a stationary guide affixed between a bottom jack plate and a top jack plate, comprising a stationary pipe guide; a travelling jack plate

(57) **Abrégé(suite)/Abstract(continued):**

affixed to the cylinder rods; a travelling pipe guide in sliding engagement with the cylinder rods and connected to the travelling jack plate by a lift rod. The stationary pipe guide and the travelling pipe guide each define a pipe opening and has a flexibly resilient guide member having an opening with a diameter closely matching the outside diameter of the pipe being snubbed.

Abstract

A pipe guide apparatus for guiding a pipe during snubbing of the pipe includes a pair of hydraulic cylinders and cylinder rods; a stationary guide affixed between a bottom jack plate and a top jack plate, comprising a stationary pipe guide; a travelling jack plate affixed to the cylinder rods; a travelling pipe guide in sliding engagement with the cylinder rods and connected to the travelling jack plate by a lift rod. The stationary pipe guide and the travelling pipe guide each define a pipe opening and has a flexibly resilient guide member having an opening with a diameter closely matching the outside diameter of the pipe being snubbed.

5

PIPE GUIDE FOR SNUBBING UNITS

INVENTOR(S): Shawn McKinnon; John Taskinen and Lance Thornell

ASSIGNEE(S): Snubco Manufacturing Ltd.

DOCKET NO.: 62013.2

10

Field of the Invention

[0001] The present invention relates to pipe guides for use in snubbing units for snubbing pipes into and from oil and gas wells.

Background of the Invention

15

[0002] Snubbing units are used to feed pipes into and out of subterranean wells. A conventional snubbing unit includes stationary snubbing slips or grippers and traveling snubbing slips to alternately grip and release a pipe as the traveling snubbing slips are moved towards and away from the stationary snubbing slips.

20

[0003] Traditional pipe guides on snubbing units used today typically employ two interlocking and telescoping tubes positioned between the stationary snubbing slips and the traveling snubbing slips. Inherent problems with these pipe guides include the space and weight of the pipe guidance systems and the heights which they add to the snubbing units. Also, approximately one half of the effective stroke of the snubbing unit is lost and snubbing operations therefore become much less efficient than would be the case if full snubbing strokes could be taken.

25

[0004] A pipe that is being snubbed into or out of a live well can only support a limited amount of compressive force before the pipe buckles. The longer the length of exposed pipe

5 between the point at which the traveling snubbing slips grip the pipe and the point at which the pipe is exposed outside of the well bore determines the allowable compressive load before buckling takes place.

[0005] When snubbing against well pressures without pipe guidance apparatus, a reasonable safety factor to prevent buckling can be obtained by not exposing a section of pipe longer than
10 the pipe can support from the generated forces with friction related to the seal point maintaining the well pressure. Additional factors, such as the speed at which the pipe is inserted into or removed from the well, are all part of typical pre-job calculations which are needed to predetermine the maximum allowable length of pipe that can be exposed while manipulating the pipe without possible bucking. Once these calculations have been made, a
15 snubbing operator uses short strokes to move the pipe into or out of the well, never allowing more unsupported exposure than calculated.

[0006] Hydraulic snubbing units generally comes in two configurations, namely a self-contained, stand-alone configuration, and a rig-assist snubbing unit. The self contained stand-alone configuration works well for live wells, where the overall height of the equipment is not
20 all that important because there is typically no spatial limitations in order to handle the pipe that is to be inserted or removed from the live well.

[0007] With a rig assist-snubbing unit, however, the overall height is critical because the snubbing unit must work within the height restraint of the top of a derrick forming part of a rig in conjunction with which the snubbing unit is being operated. The distance between the
25 top of the snubbing unit and the inside working area from the top of the rig derrick in many

5 cases eliminates the option of having pipe guidance apparatus, because the additional height that the apparatus would add to the snubbing unit would not allow sufficient space for lengths of pipe to be handled. Consequently, the operators have resorted to performing the dangerous short stroking operation on high-pressure wells, as described above.

[0008] Pipe guides which support the pipe to prevent buckling are known. These guides
10 typically guide the pipe being snubbed with a loose guide collar at a point between the stationary snubbing slips, and the travelling snubbing slips. The guide collar must have a diameter sufficient to allow tool joint connections to pass through, which have a larger outside diameter than the pipe itself.

BRIEF SUMMARY OF THE INVENTION

15 [0009] In one aspect, the invention comprises a pipe guide apparatus for guiding a pipe during snubbing of the pipe, comprising:

- (a) a pair of hydraulic cylinders and cylinder rods;
- (b) a stationary guide affixed between a bottom jack plate and a top jack plate, comprising a stationary pipe guide;
- 20 (c) a travelling jack plate affixed to the cylinder rods;
- (d) a travelling pipe guide in sliding engagement with the cylinder rods and connected to the travelling jack plate by a lift rod;

5 wherein the stationary pipe guide ^{or} ~~and~~ the travelling pipe guide ^{or both,} ~~each~~ defines a pipe guide and comprises a flexibly resilient guide member having an opening with a diameter matching the outside diameter of the pipe being snubbed.

[0010] In another aspect, the invention comprises a method of snubbing a pipe with a snubbing unit including a pair of hydraulic cylinders and cylinder rods, a traveling jack plate,
10 a top jack plate, travelling snubbing slips and stationary snubbing slips, wherein the method comprises the step of confining the pipe in a transverse direction when the pipe is being snubbed with a flexibly resilient guide member having a substantially circular opening with a diameter closely matching the outside diameter of the pipe.

BRIEF DESCRIPTION OF THE DRAWINGS

15 [0011] In the drawings, like elements are assigned like reference numerals. The drawings are not necessarily to scale, with the emphasis instead placed upon the principles of the present invention. Additionally, each of the embodiments depicted are but one of a number of possible arrangements utilizing the fundamental concepts of the present invention. The drawings are briefly described as follows:

20 [0012] FIG. 1 shows a view in elevation of a pipe snubbing unit having a pipe guide, the snubbing unit in a lowered position;

[0013] FIG. 2 shows a view corresponding to that of FIG. 1 but with the snubbing unit in an extended position;

[0014] FIG. 3 shows a plan view of a travelling pipe guide;

5 [0015] FIG. 4 shows a view in side elevation of the pipe guide of FIG. 3;

[0016] FIG. 5 shows a plan view of a stationary pipe guide;

[0017] FIG. 6 shows cross-sectional view along line A-A in Fig. 5.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0018] The invention relates to pipe guides for snubbing units. When describing the present
10 invention, all terms not defined herein have their common art-recognized meanings. To the
extent that the following description is of a specific embodiment or a particular use of the
invention, it is intended to be illustrative only, and not limiting of the claimed invention. The
following description is intended to cover all alternatives, modifications and equivalents that
are included in the spirit and scope of the invention, as defined in the appended claims.

15 [0019] As shown in Figure 1 and 2, a snubbing unit (10) comprises a bottom jack plate (12)
and a top jack plate (14). The snubbing unit (10) has stationary snubbing slips or pipe
grippers (16, 17), provided with an underlying blow-out preventor (18), travelling snubbing
slips or pipe grippers (20, 21) and a pair of hydraulic cylinder jacks (24) for moving the
travelling snubbing slips (20) vertically towards and away from the stationary snubbing slips
20 (16).

[0020] The jacks (24) each comprise a hydraulic cylinder (24) from which extends a cylinder
rod (26), the hydraulic cylinder (24) being mounted between the bottom jack plate (12) and
the top jack plate (14), and the uppermost end of the cylinder rod (26) being connected to a

5 travelling jack plate (28) to which the travelling heavy slip (20), and the travelling snubbing slip (21) are mounted.

[0021] Figure 1 shows the snubbing unit in a lowered or retracted state, where the hydraulic cylinder rods (26) are retracted. Figure 2 shows the same snubbing unit in an extended state, where the travelling jack plate (28) is pushed up and away from the top jack plate (14).

10 [0022] The pipe (30) for snubbing passes through the travelling slip bowls (20, 21), the stationary slip bowls (16, 17) and the BOP (18) as it continues downward into the wellbore (not shown).

[0023] A travelling pipe guide (32) is disposed between the travelling jack plate (28) and the top jack plate (14). The travelling pipe guide comprises a base plate (34) including a pipe
15 guide housing (38), and a pair of cylinder guides (36) on either end of the base plate (34). The cylinder guides (36) slidably engage the cylinder rods (26). The pipe guide housing (38) is preferably a split housing, and contains at least one centralizing disc (40). In one embodiment, two or more centralizing discs (40) are provided.

[0024] The discs (40) have a central opening which closely matches the outside diameter of
20 the pipe being snubbed (30). In this context, "closely matches" means that the opening permits relatively free axial (vertical) movement of the pipe (30) through the opening but confines the pipe transversely. In one embodiment, the inside diameter of the disc opening may be the same as, or slightly smaller than the outside diameter of the pipe. If the opening is slightly smaller than the outside diameter of the pipe, then the discs must be made of a
25 material which deforms to allow insertion of the pipe. Therefore, the discs (40) are preferably

5 made from a flexibly resilient material, which permits elastic deformation allowing the pipe and tool joint connects to pass through the opening. In one embodiment, the discs may be formed of a rubber or elastomeric material. Low friction materials may also be preferred to facilitate axial movement of the pipe through the opening. In practice, the inside diameter of the disc opening may be slightly larger than the outside diameter of the pipe, for example 1%,
10 2%, 3% or 4% or more. However, it is preferred that the disc opening not be much larger than the pipe, to lower the risk of buckling under larger loadings.

[0025] As one skilled in the art will appreciate, a pipe may bear significantly more compressive load in its axial direction if it is straight between the two load bearing points. If the pipe is bowed outwards, then it is far more likely to buckle than if it were straight, with the
15 same compressive force. The centralizing discs (40) ensure that the pipe (30) remains substantially straight below the travelling slips.

[0026] In one embodiment, the discs (40) have an outer peripheral ring portion and an inner opening portion, connected by a web portion which is thinner than the outer and inner portions. This web portion permits slightly more flexibility, without increasing the diameter
20 of the central opening.

[0027] An upper extension rod (44) passes through a plate (45) on the base plate (34) and is attached at its upper end to the travelling jack plate (28). The lower end of the rod (42) is enlarged so it cannot pass through plate (45). As the travelling jack plate (28) is pushed upwards, the upper extension rod (44) will pull the travelling pipe guide upwards.

5 [0028] A lower extension limit rod (42) passes through a plate (43) on the base plate (34) and is attached at its lower end to the top jack plate (14). The upper end of the rod (42) is enlarged so it cannot pass through plate (43). The lower extension limit rod (44) limits the upward range of motion of the travelling pipe guide (32).

[0029] In a preferred embodiment, a stationary pipe guide (50) is provided immediately below
10 the top jack plate (14). It is constructed similarly to the travelling pipe guide (32) except that is bolted to the same assembly as the stationary slips (16, 17), immediately above the slips. It comprises of centralizing disc or discs (40) in a similar manner to the travelling pipe guide (32), as shown in Figures 5 and 6. The stationary pipe guide (50) may comprise a split housing (52) held together by split housing retaining plates (54) bolted across the split housing
15 seams. The split housing (52) is bolted to a base plate (56) which is itself bolted to the stationary snubbing slip stack.

[0030] In operation of the snubbing unit (10), the cylinder rods (26) move the travelling snubbing slips (20, 21) vertically up and down relative to the stationary snubbing slips (16, 17), while the stationary snubbing slips (20, 21) and the travelling snubbing slips (16, 17)
20 alternately grip the pipe (30). In this way, the pipe (30) is fed into or from its well by the snubbing slips by a "hand-over-hand" operation of those slips. The snubbing unit (10), as described above, its assembly and its operation are well known in the art and, therefore, are not described herein in greater detail.

[0031] The maximum allowable stroke by which the pipe (30) is snubbed can be varied by
25 varying the length of the upper and lower extension limit rods (42, 44). These rods function

- 5 to limit the travel of the travelling jack plate (28), and to position the travelling pipe guide (32) between the travelling jack plate (28) and the top jack plate (14). The same function may of course be achieved with slings of a suitable material, such as nylon strapping.

5 CLAIMS

1. A pipe guide apparatus for guiding a pipe during snubbing of the pipe, for use with a snubbing unit including a pair of hydraulic cylinders and cylinder rods, a traveling jack plate, a top jack plate, travelling snubbing slips and stationary snubbing slips, the guide comprising:

(a) a stationary pipe guide affixed between a bottom jack plate and a top jack plate;

10 and

(b) a travelling pipe guide in sliding engagement with the cylinder rods and connected to the travelling jack plate by an upper extension limit rod;

wherein the stationary pipe guide or the travelling pipe guide, or both, defines a pipe opening and comprises at least one flexibly resilient guide member having a substantially circular opening with a diameter closely matching the outside diameter of the pipe being snubbed.

15

2. The apparatus of claim 1 wherein the at least one flexibly resilient guide member is a centralizing disc.

3. The apparatus of claim 2 wherein the stationary pipe guide or the travelling pipe guide, or both, comprises 2 or more centralizing discs.

20 4. The apparatus of claim 2 or 3 wherein the centralizing disc opening diameter is the same as or slightly smaller than the outside diameter of the pipe being snubbed.

5. The apparatus of claim 2 or 3 wherein the centralizing disc comprises a rubber or elastomeric material.

- 5 6. The apparatus of claim 2 or 3 wherein the centralizing disc comprises an outer peripheral ring portion and an inner opening portion, connected by a web portion which is thinner than the outer and inner portions.
7. A method of snubbing a pipe with a snubbing unit including a pair of hydraulic cylinders and cylinder rods, a traveling jack plate, a top jack plate, travelling snubbing slips and
10 stationary snubbing slips, the method comprising the step of confining the pipe in a transverse direction when the pipe is being snubbed with a flexibly resilient guide member having a substantially circular opening with a diameter closely matching the outside diameter of the pipe.
8. The method of claim 7 wherein the guide member opening diameter is the same as or
15 slightly smaller than the outside diameter of the pipe being snubbed.
9. The method of claim 7 or 8 wherein the flexibly resilient guide member comprises a rubber or elastomeric material.
10. The method of claim 9 wherein the flexibly resistant guide member comprises an outer peripheral ring portion and an inner opening portion, connected by a web portion which is
20 thinner than the outer and inner portions.

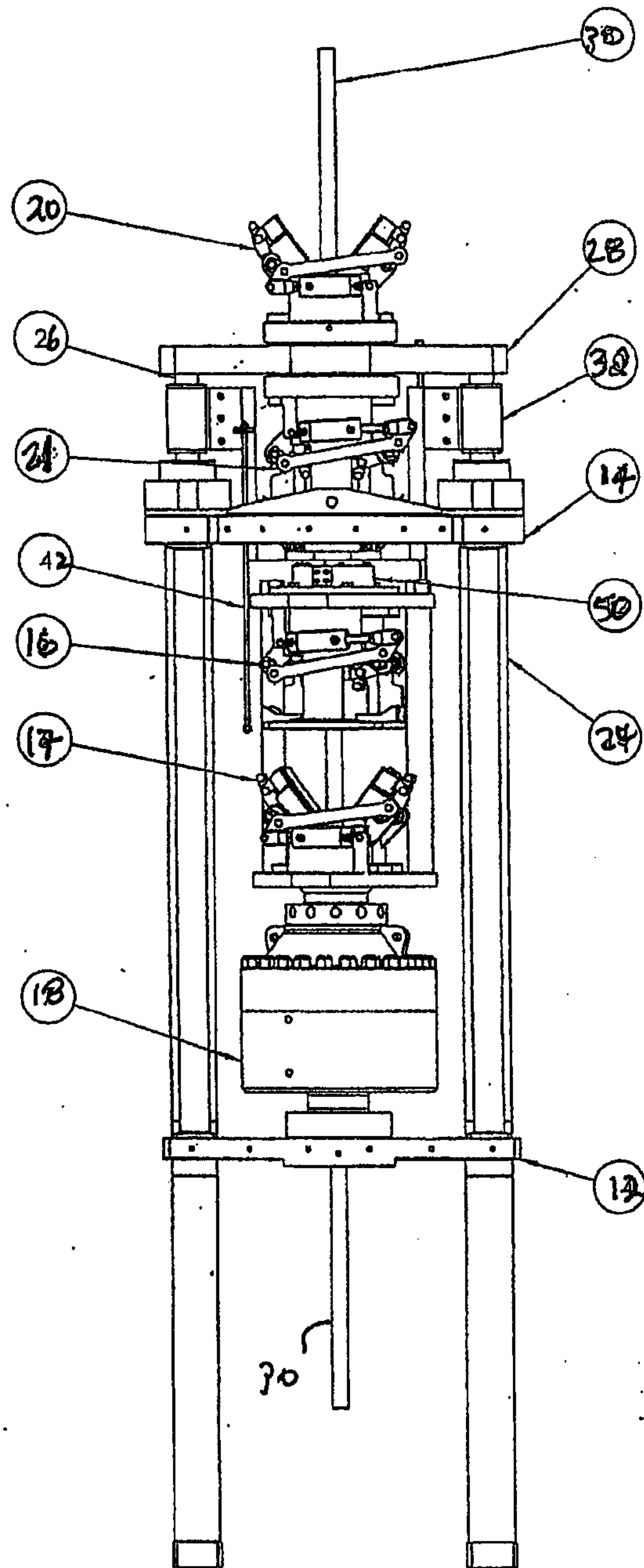
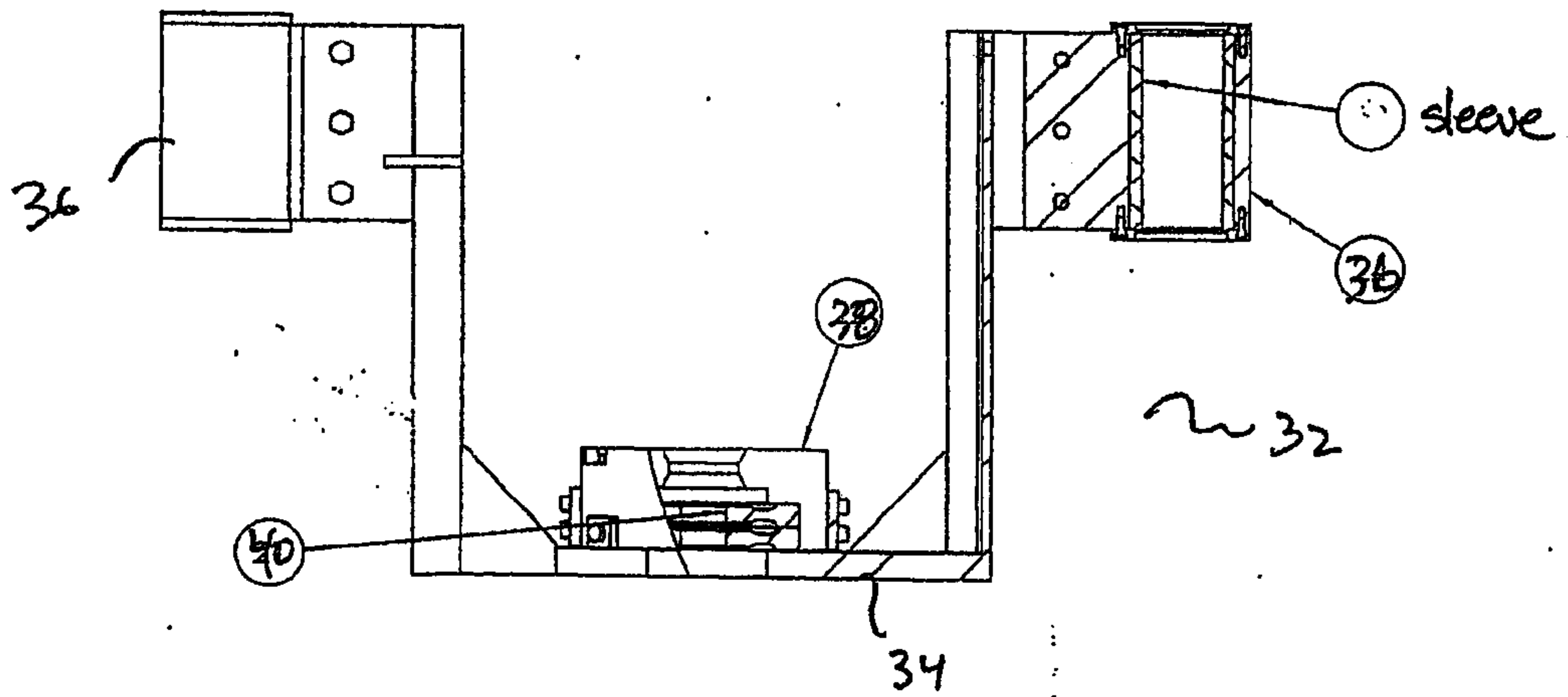
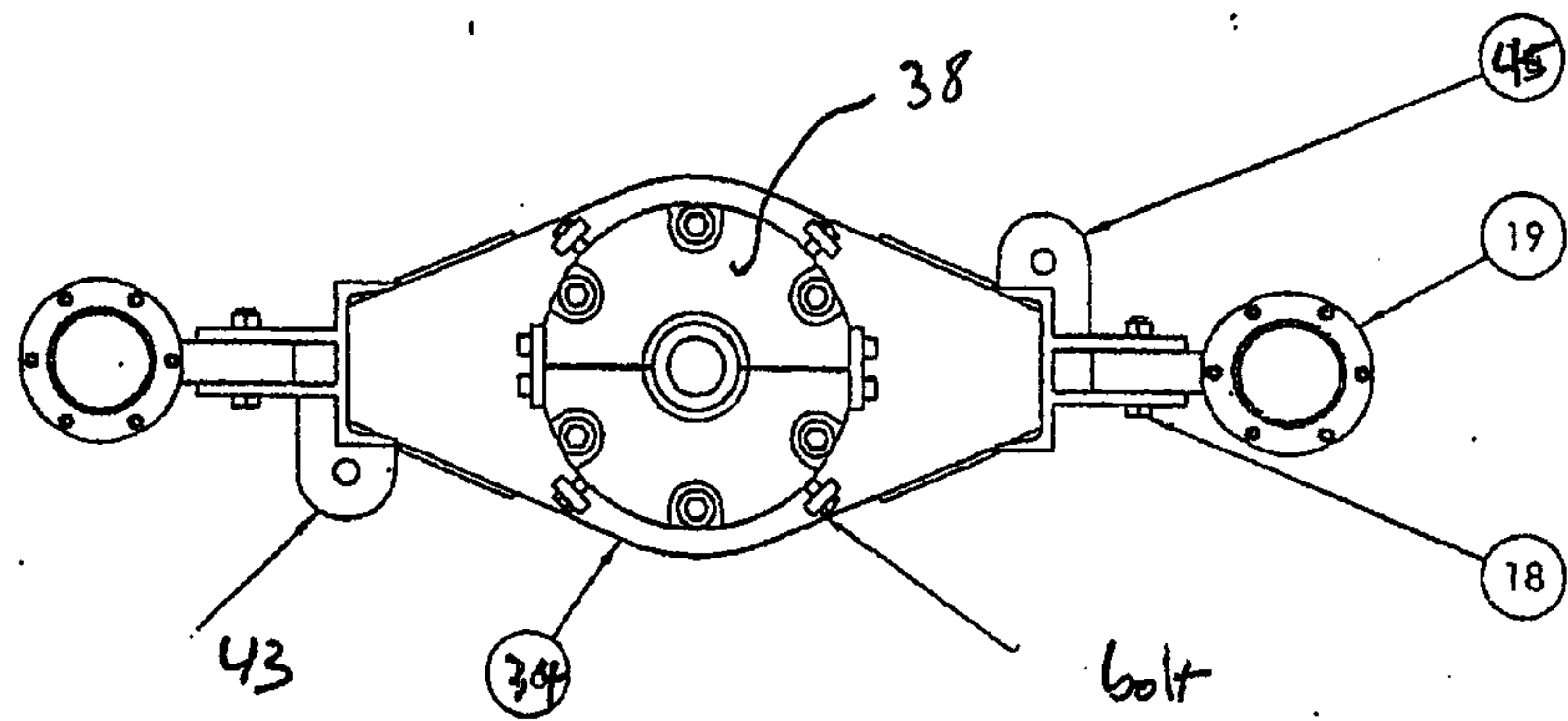
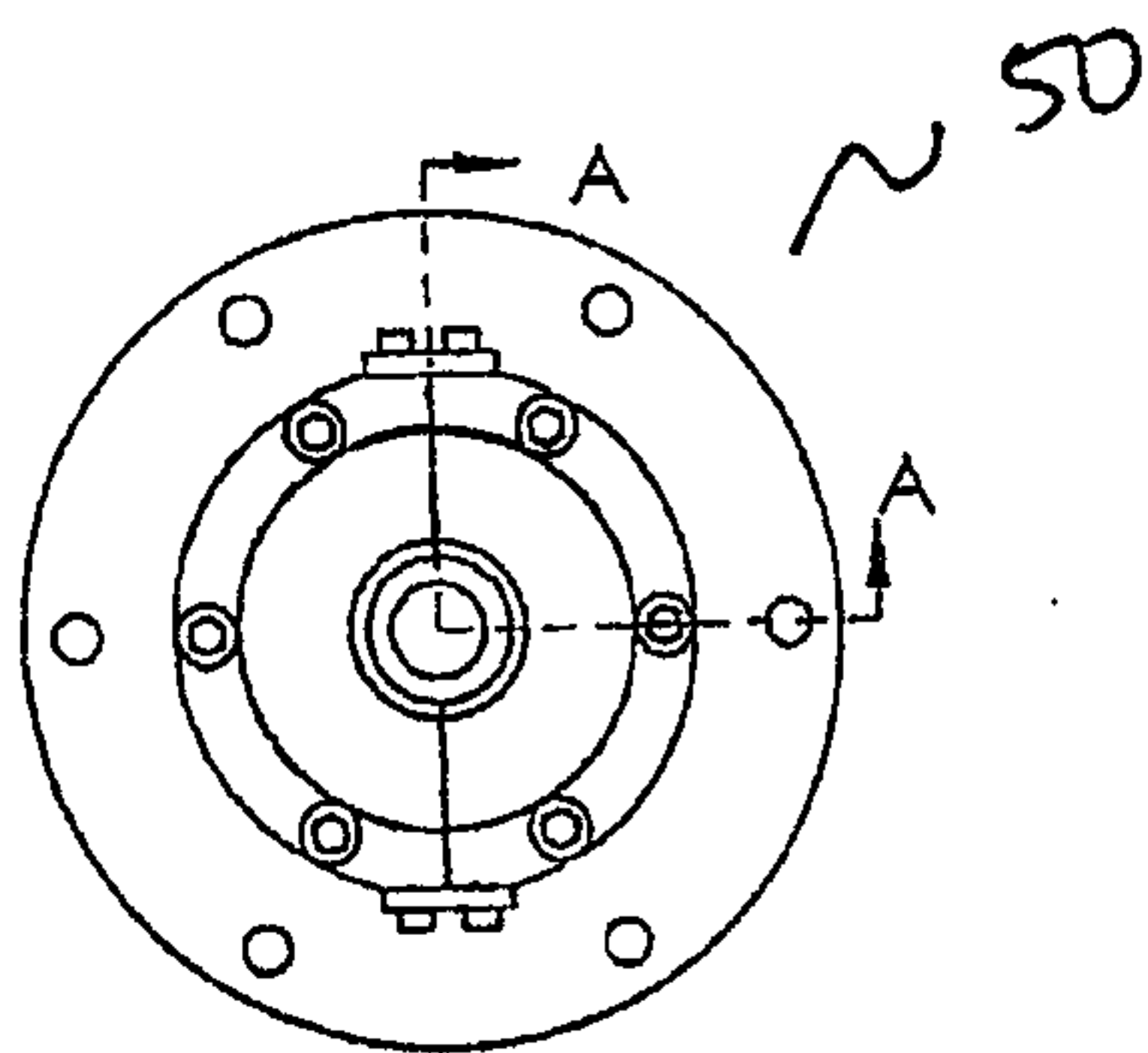
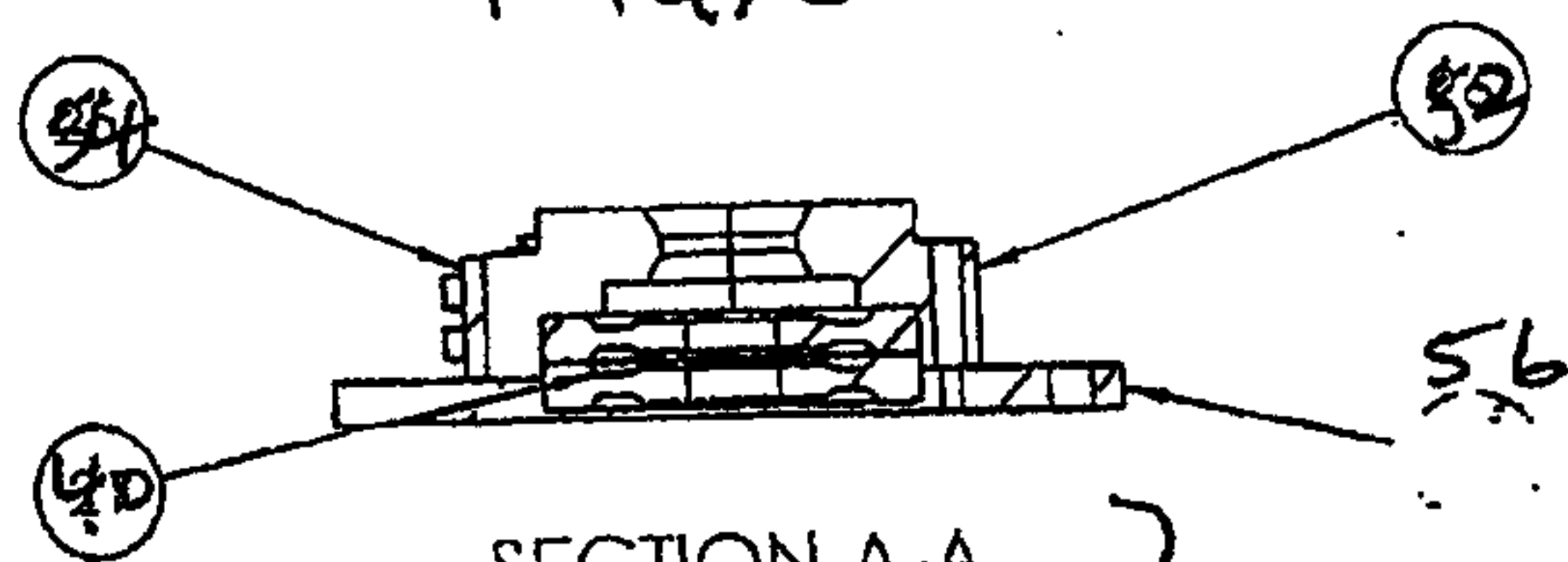


FIG. 1





F14.5



F14.6

