

CLAIMS

What Is Claimed Is:

1. A liner hanger top packer, comprising a body and, an adjusting sleeve, a retaining apparatus, a base-sealing apparatus, a base-hanging apparatus and a locking mechanism which are sleeved sequentially from top to bottom on the body, wherein, the locking mechanism is
5 arranged between the base-sealing apparatus and the base-hanging apparatus, the locking mechanism comprising:

a locking ball sleeve sleeved on the base-sealing apparatus with its upper end abutting against the base-sealing apparatus;

10 a ball socket arranged at a junction of the base-sealing apparatus, the locking ball sleeve and the base-hanging apparatus, and which is formed of a first ball socket arranged in the base-sealing apparatus, a second ball socket arranged in the locking ball sleeve and a third ball socket arranged in the base-hanging apparatus which close up facing one another; and

15 a steel ball arranged in the ball socket to restrict the axial relative movement between the base-sealing apparatus, the locking ball sleeve and the base-hanging apparatus, wherein when the base-sealing apparatus moves downward relative to the body, the steel ball falls into the ring slot in the outer surface of the body, thereby removing the restriction to the axial relative movement between the base-sealing apparatus, the locking ball sleeve and the base-hanging apparatus.

2. The liner hanger top packer according to claim 1, wherein the adjusting sleeve is
20 provided with an elastic serrated thread for connecting a piston tool.

3. The liner hanger top packer according to claim 2, wherein the base-sealing apparatus comprises:

an upper gauge ring sleeved on the body and abutting against a step of the body and the retaining apparatus, wherein the upper gauge ring is provided with the first ball socket;

25 a plastic cylinder sleeved on the upper gauge ring with its upper end abutting against the shoulder of the upper gauge ring; and

a lower gauge ring sleeved on the upper gauge ring and abutting against the lower end of the plastic cylinder and the upper end of the locking ball sleeve.

30 4. The liner hanger top packer according to claim 3, wherein the outer diameter of the upper gauge ring and the lower gauge ring are greater than the outer diameter of the plastic cylinder.

5. The liner hanger top packer according to claim 3, wherein the base-hanging apparatus comprises:

an upper conical body provided with the third ball socket, which is in screw connection with the lower gauge ring and presses against the locking ball sleeve;

5 a baffle ring sleeved on the upper conical body;

a slip sleeved on the body and abutting against the conical surface of the upper conical body and the baffle ring;

10 a slip cage sleeved outside the slip, the baffle ring and the upper conical body in a connecting way, which is in screw connection with the upper conical body, and which is in pin connection with the baffle ring through a baffle ring shear pin, and

a lower conical body sleeved on the body, which is fixedly connected with the body and which abuts against the slip, wherein when the upper conical body transfers force to the slip, the latter protrude along the conical surface of the lower conical body so as to achieve the base-hanging.

15 6. The liner hanger top packer according to claim 5, wherein the outer diameter of the lower gauge ring is the maximum outer diameter of the liner hanger top packer.

7. The liner hanger top packer according to claim 5, wherein a longitudinal flow slot is formed in the surface of the lower conical body.

20 8. The liner hanger top packer according to claim 3, wherein the retaining apparatus comprises:

a connecting sleeve sleeved on the body and abutting against the upper gauge ring, wherein the connecting sleeve and the body are in pin connection through a connecting sleeve pin, and when the packer is set, the connecting sleeve pin is sheared;

25 a retaining ring sleeved on the body and abutting against the connecting sleeve, wherein ratchets arranged on the inner surface of the retaining ring match with ratchets of the body to prevent the retaining ring from moving upward relative to the body; and

a base-sealing sleeve sleeved on the body and abutting against the connecting sleeve and the retaining ring, the base-sealing sleeve and the connecting sleeve being connected by a countersunk screw.

30 9. The liner hanger top packer according to claim 8, wherein the adjusting sleeve and the

base-sealing sleeve are fixed by an anti-rotational screw, and a fixed hole formed in the adjusting sleeve is a long hole.

10. The liner hanger top packer according to any one of claims 1-9, wherein a seal is provided between the connecting sleeve and the body, between the upper gauge ring and the body, as well as between the lower gauge ring and the upper gauge ring by a seal ring.

CLAIMS

1. A liner hanger top packer, comprising a body, wherein the liner hanger top packer further comprises an adjusting sleeve, a retaining apparatus, a base-sealing apparatus, a base-hanging apparatus and a locking mechanism which are sleeved sequentially from top to bottom on the body, wherein, the locking mechanism is arranged between the base-sealing apparatus and the base-hanging apparatus, the locking mechanism comprising:

a locking ball sleeve sleeved on the base-sealing apparatus with an upper end abutting against the base-sealing apparatus;

a ball socket arranged at a junction of the base-sealing apparatus, the locking ball sleeve and the base-hanging apparatus, and which is formed of a first ball socket arranged in the base-sealing apparatus, a second ball socket arranged in the locking ball sleeve and a third ball socket arranged in the base-hanging apparatus; and

a steel ball arranged in the ball socket to restrict the axial relative movement between the base-sealing apparatus, the locking ball sleeve and the base-hanging apparatus, wherein when the base-sealing apparatus moves downward relative to the body, the steel ball falls into a ring slot in an outer surface of the body, thereby removing the restriction to the axial relative movement between the base-sealing apparatus, the locking ball sleeve and the base-hanging apparatus.

2. The liner hanger top packer according to claim 1, wherein the base-sealing apparatus comprises:

an upper gauge ring sleeved on the body and abutting against a step of the body and the retaining apparatus, wherein the upper gauge ring is provided with the first ball socket;

a plastic cylinder sleeved on the upper gauge ring with an upper end abutting against the shoulder of the upper gauge ring; and

a lower gauge ring sleeved on the upper gauge ring and abutting against the lower end of the plastic cylinder and the upper end of the locking ball sleeve.

3. The liner hanger top packer according to claim 2, wherein an outer diameter of the upper gauge ring and the lower gauge ring are greater than the outer diameter of the plastic cylinder.

4. The liner hanger top packer according to claim 2, wherein the base-hanging apparatus comprises:

an upper conical body provided with the third ball socket, which is in screw connection with the lower gauge ring and presses against the locking ball sleeve;

a baffle ring sleeved on the upper conical body;

a slip sleeved on the body and abutting against the conical surface of the upper conical body and the baffle ring;

a slip cage sleeved outside the slip, the baffle ring and the upper conical body, which is in screw connection with the upper conical body, and which is in pin connection with the baffle ring through a baffle ring shear pin; and

a lower conical body sleeved on the body, which is fixedly connected with the body and which abuts against the slip, wherein when the upper conical body transfers force to the slip, the slip protrudes along the conical surface of the lower conical body so as to achieve the base-hanging.

5. The liner hanger top packer according to claim 4, wherein an outer diameter of the lower gauge ring is the maximum outer diameter of the liner hanger top packer.

6. The liner hanger top packer according to claim 4, wherein a longitudinal flow slot is formed in a surface of the lower conical body.

7. The liner hanger top packer according to claim 2, wherein the retaining apparatus comprises:

a connecting sleeve sleeved on the body and abutting against the upper gauge ring, wherein the connecting sleeve and the body are in pin connection through a connecting sleeve pin, and when the packer is set, the connecting sleeve pin is sheared;

a retaining ring sleeved on the body and abutting against the connecting sleeve, wherein ratchets arranged on an inner surface of the retaining ring match with ratchets of the body to prevent the retaining ring from moving upward relative to the body; and

a base-sealing sleeve sleeved on the body and abutting against the connecting sleeve and the retaining ring, the base-sealing sleeve and the connecting sleeve being connected by a countersunk screw.

8. The liner hanger top packer according to claim 7, wherein the adjusting sleeve and the base-sealing sleeve are fixed by an anti-rotational screw, and a fixed hole formed in the adjusting sleeve is an elongate hole.

9. The liner hanger top packer according to claim 7, wherein a seal is provided between the connecting sleeve and the body.

10. The liner hanger top packer according to claim 2, wherein a seal is provided between the upper gauge ring and the body, as well as between the lower gauge ring and the upper gauge ring by a seal ring.