June 19, 1956 A. B. SCHULTZ 2,751,229

RELEASABLE GRIPPER FOR HOLDING AN ARTICLE SUSPENDED

Filed Nov. 16, 1953

3 Sheets-Sheet 1

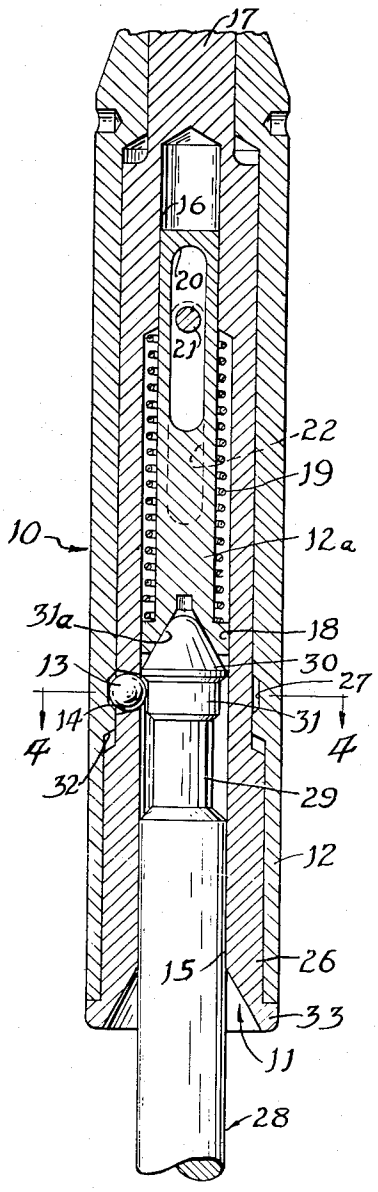

FIG. 1

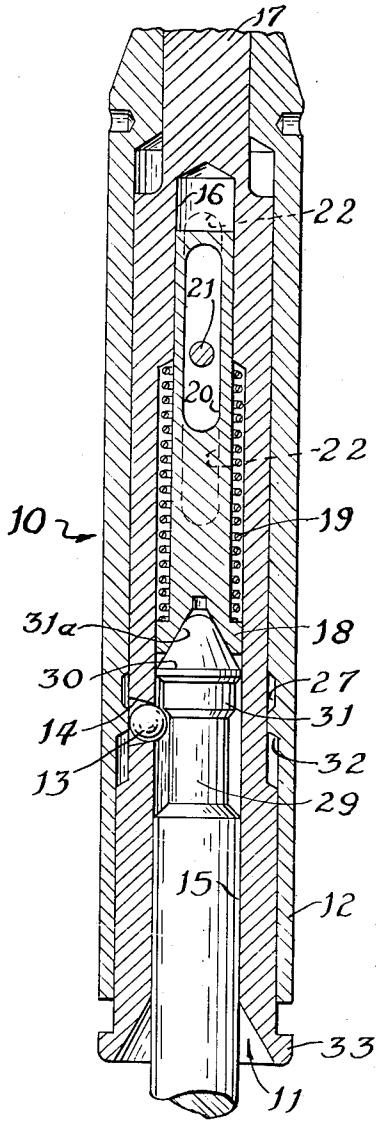

FIG. 2

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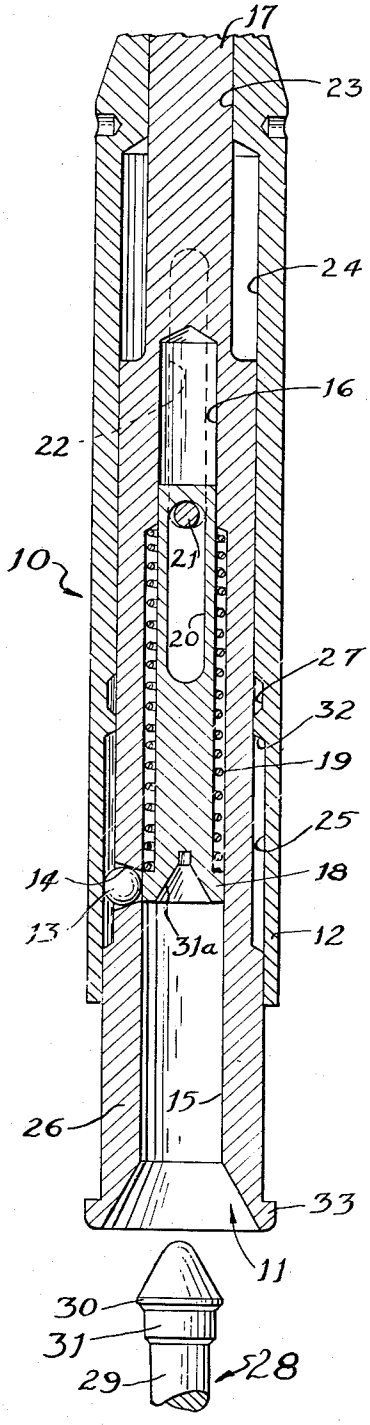

FIG. 3

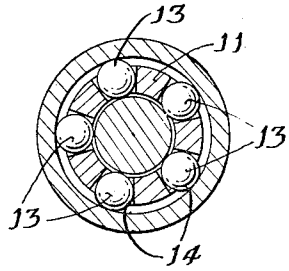

FIG. 4

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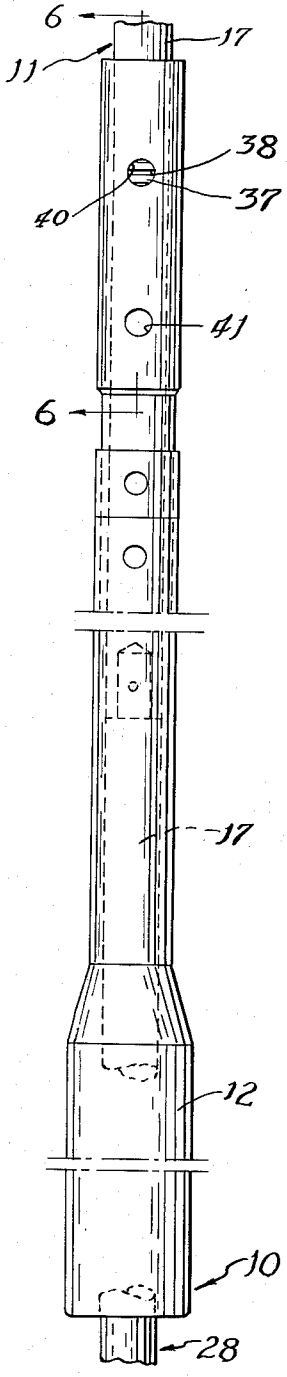

FIG. 5

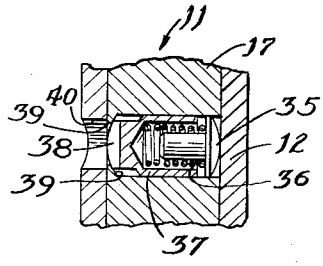

FIG. 7

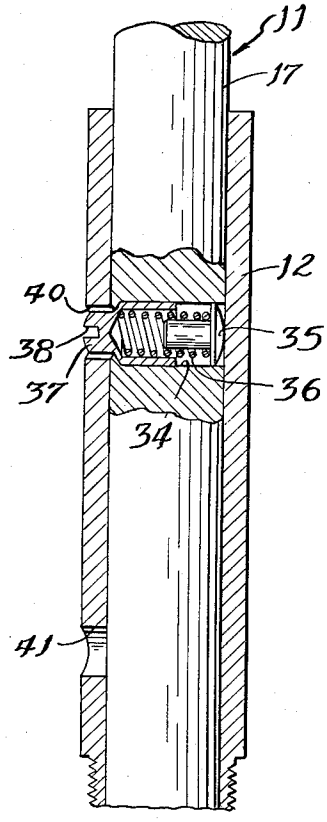

FIG. 6

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RELEASABLE GRIPPER FOR HOLDING AN ARTICLE SUSPENDED

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Application November 16, 1953, Serial No. 392,531

2 Claims. (Cl. 279—75)

This invention relates to a releasable holding device and more specifically to a device of this type which is also capable of supporting the article held.

If an article is held in a holding device that releases the article by relative movement of one part of the holding device with respect to another, it may be important to prevent such relative movement when the device holds the object suspended in order that the article may not drop and thus do damage to itself or other articles.

An object of the present invention is to prevent release of a holding device when it is holding an article suspended. According to the invention, the relation of the device to the article in its suspended condition is such as to prevent release from the holding device.

Other objects will become apparent from the detailed description that follows and from the attached drawings, in which:

Fig. 1 is a vertical sectional view of an embodiment of the holding device of the present invention and of an article suspended from the holding device;

Fig. 2 is a similar view showing the article in a self-supporting position in the holding device;

Fig. 3 is a similar view showing the article removed from the holding device;

Fig. 4 is a horizontal sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is an elevational view of the holding device and the article held and includes a portion of the holding device remote from the article;

Fig. 6 is a vertical sectional view taken on the line 6—6 of Fig. 5; and

Fig. 7 is a vertical sectional view similar to Fig. 6 but showing only a portion of what is shown in Fig. 6 and that portion in a different position.

The holding device of Figs. 1–3 is designated by the reference character **10** and comprises a hollow inner member **11**, an outer member **12** in the form of a sleeve, a plunger **12***a*, and a plurality of elements **13** in the form of balls. As indicated in Fig. 4, the balls **13** are five in number and are positioned in openings **14** which are formed in the inner member **11** with about equal angular spacings between one another. The openings decrease in diameter from outside to inside of the member **11** and are smaller than the balls toward the inside of the member **11** so that the balls may protrude interiorly of the member **11** to the extent shown in Fig. 1.

The hollow inner member **11** has a large bore **15** and a small bore **16** formed as an extension thereof and terminating in a closed end. The member **11** has a long reduced rod-like extension **17** which begins near the closed end of the small bore **16**. The plunger **12***a* has a sliding fit in the small bore **16** and is provided with an enlarged head **18** which has a sliding fit in the large bore **15**. A coil spring **19**, which surrounds the plunger **12***a* in the larger bore **15** and acts against the shoulder of the inner member **11** forming the juncture between the large and small bores **15** and **16** and against the head on the plunger **12***a*, urges the plunger downwardly as viewed in Fig. 1

with respect to the inner member **11**. Such movement in this direction of the plunger **12***a* is limited to the position of Fig. 3 by means of a longitudinal through slot **20** formed in the plunger **12***a* and a pin **21** extending through the slot **20** and attached to the inner member **11**. The ends of the pin **21** extend outwardly of the inner member **11** and into opposed longitudinal slots **22** formed in the outer member **12**. Movement of the outer member **12** in the direction that is upward as viewed in Fig. 3 is limited by engagement of the ends of the pin **21** with the slots **22** at one end, as viewed in Fig. 3.

The outer member **12** has a small bore **23** slidingly receiving the rod extension **17** on the inner member **11**, a bore **24** of intermediate size slidingly receiving the inner member **11**, and a large bore **25** slidingly receiving an enlarged portion **26** of the inner member. The outer member **12** also has an internal groove **27** which is formed in the intermediate bore **24** adjacent the large bore **25** and into which the balls **13** protrude in the position of Fig. 1.

The holding device **10** is adapted to grasp an article such as a rod **28**, for example, for lifting it out of a confined space in which it may be located or for lowering it into the space. It is contemplated that between times of lifting and lowering the device **10** may be released from the rod. The rod **28** has at one end a reduced neck **29**, a head **30** which is larger in diameter than the neck, and an intermediate shoulder **31** which is located between the head **30** and the neck **29** and is respectively smaller and larger in diameter than the head and the neck. In the position of Fig. 1 the intermediate shoulder **31** engages the elements **13** so as to cause them to protrude exteriorly from the inner member **11** into the groove **27** in the member **12**, and rod head **30**, which is conical, is received in a conical recess **31***a* in the plunger **12***a*.

It is contemplated that in the position of Fig. 1 the rod **28** will be suspended in the holding device **10**, that is, without being supported from the lower end of the rod. Engagement of the rod head **30** with the balls **13** prevents movement of the rod **28** in one direction with respect to the holding device **10**, and the plunger **12***a* and the spring **19** resist movement of the rod **28** in the opposite direction. As long as the rod **28** remains suspended from the device **10**, the rod shoulder **31** stays opposite the balls **13**, which remain forced to protrude into the groove **27**. By remaining protruding externally into the groove, the balls **13** continue to be forced to protrude internally so as to prevent the rod shoulder **31** from moving downwardly past the balls **13** and the rod **28** from getting out of the holding device **10**.

When the rod **28** is to be released from the holding device **10**, it is necessary that the elements **13** move outwardly sufficiently for the rod head **30** to clear the elements **13**. The elements **13** can move outwardly sufficiently only if the large bore **25** of the outer member **12** is brought opposite the elements **13**. This requires temporarily moving the elements **13** inwardly out of the groove **27** in the outer member **12**. Such inward movement can take place only if the rod **28** is moved with respect to the inner member **11** as far as the position of Fig. 2 in which the reduced neck **29** of the rod **28** is brought opposite the elements **13**. This can happen only if the rod **28** is supported from below independently of the holding device **10**. It cannot happen when the rod is suspended in the holding device.

After the rod **28** is brought to the position of Fig. 2, force is applied to the outer member **12** to shift it with respect to the inner member **11** to the position of Fig. 3 where the ends of the slots **22** in the outer member **12** engage the ends of the pin **21** attached to the inner member **11**. Continued application of force to the outer member **12** causes the outer member and the inner member to move conjointly with respect to the rod **28** to the

position of Fig. 3 in which the rod is out of the holding device. This being so, the plunger 12*a* moves to its position of Fig. 3 in which the plunger head 18 is opposite the elements 13, forcing them to protrude externally of the inner member 11 so far that when the outer member 12 is allowed to move with respect to the inner member 11 so as to bring the shoulder 32, formed by the junctures between the bores 24 and 25 in the outer member 12 back to the elements 13, the elements 13 will engage the shoulder 32. When the rod 28 is out of the holding device 10, the plunger head 18 will be directly opposite the elements 13 as shown in Fig. 3, because the spring 19 urges the plunger head as far as this position and engagement of the pin 21 with one end of the slot 20 in the plunger prevents the plunger head from moving beyond this position.

When the rod 28 is to be reattached to the holding device 10, the device and the rod are brought together at least as far as the position of Fig. 2, in which the rod has moved the plunger head 18 away from the elements 13 and the rod neck 29 is brought opposite the elements 13. Now the shoulder 32 on the outer member 12 forces the elements 13 inwardly against the rod neck 29 and the outer member moves to the position of Fig. 1 in which the groove 27 is opposite the elements 13. This position is determined by engagement of the end of the outer member 12 with an outwardly extending flange 33 formed on the end of the inner member 11. Now force is applied to the inner member 11 to bring the inner member to the position of Fig. 1 with respect to the rod 28 in which position the rod shoulder 31 is brought opposite the elements 13. The shoulder 31 makes the elements 13 protrude into the groove 27, and the outer member cannot move with respect to the inner member. The rod 28 is again locked in the holding device 10, as it was at the start of the description of the operation, and the holding device may lift the rod without the possibility that the rod may be accidentally released from the holding device and dropped.

Release of the rod from the holding device is accomplished by movement of the outer member 12 with respect to the inner member 11 from the position of Fig. 1 to that of Fig. 3, but such movement is impossible as long as the rod is suspended in the holding device, because the rod shoulder 31 stays opposite the elements 13 so as to keep them in the groove 27.

The holding device 10 is also provided with means for positively preventing relative shifting of the inner and outer members 11 and 12, which means is independent of suspension of the rod in the holding device. As seen in Figs. 5, 6, and 7, a portion of the rod extension 17 of the inner member 11 which happens to be considerably removed from the hollow portion thereof in which the rod 28 fits, is provided with a transverse opening 34, in which are mounted a headed member 35, a coil spring 36 surrounding the stem of the headed member 35, and a latch 37 having a hollow end receiving the spring 36. The head of the latch is wider in one transverse dimension than in the other, as is to be observed from a comparison of Figs. 6 and 7. The latch head is seen as relatively narrow in Fig. 6 and as relatively wide in Fig. 7, the latch being rotated through about 90 degrees from the position of Fig. 6 to that of Fig. 7. The latch head has a slot 38 which is adapted to receive the end of a suitable tool such as a screw driver which is employed to rotate the latch between the two positions and to force it completely into the aperture 34 as shown in Fig. 7. The latch 37 is held in the depressed position of Fig. 7 by means of two opposed inwardly directed flanges 39 formed on the rod extension 17 at one end of the aperture 34. The spacing between the flanges 39 is less than the larger transverse dimension of the latch head and at least as large as the smaller transverse dimension thereof. Thus when the latch 37 is to be shifted from the protruding position of Fig. 6 to the depressed position of Fig. 7, the latch is first depressed against the spring 36 by the tool applied to the slot 38 and then rotated through about 90 degrees by the tool. When the latch 37 is to protrude again, it is rotated through about 90 degrees, and the spring 36 pushes the latch head out. When the latch 37 is depressed as in Fig. 7, it does not interfere with relative longitudinal movement between the inner and outer member 11 and 12. The outer member 12 is provided with two openings 40 and 41 spaced lengthwise thereof. When the latch head protrudes into the opening 40, the inner and outer members 11 and 12 are locked in the position of Fig. 1. When the latch head protrudes into the opening 41, the members are locked in the position of Fig. 3.

The intension is to limit the invention only within the scope of the appended claims.

What is claimed is:

1. In combination, an article having at one end a head, a reduced neck, and a shoulder lying between the head and the neck and being larger in diameter than the neck, and smaller in diameter than the head, and a holding device comprising a hollow inner member receiving the said one end of the article, a hollow outer open end member receiving the said inner member and having internal shoulders formed by concentric bored portions progressing from the said open end of a relatively larger diameter, a relatively smaller diameter and an intermediate diameter, and holding elements mounted in the inner member and being of a size large enough to protrude internally against the shoulder on the article and simultaneously externally into the portion of intermediate diameter bore in the outer member, and small enough to be contained within the outermost portion of the inner member when protruding internally against the narrow neck on the article.

2. In combination, an article having at one end a head, a reduced neck, and a shoulder lying between the head and the neck and being larger in diameter than the neck, and smaller in diameter than the head, and a holding device comprising a hollow inner member receiving the said one end of the article, a hollow outer open end member receiving the said inner member and having internal shoulders formed by concentric bored portions progressing from the said open end of a relatively larger diameter, a relatively smaller diameter and an intermediate diameter, and holding elements mounted in the inner member and being of a size large enough to protrude internally against the shoulder on the article and simultaneously externally into the portion of intermediate diameter bore in the outer member, and small enough to be contained within the outermost portion of the inner member when protruding internally against the narrow neck on the article, and a plunger mounted in the inner member and spring urged against the said one end of the article so as to be enabled to move along the inner member to a position adjacent the holding elements when the article is removed from the holding device for restraining the holding elements from protruding internally of the inner member and thus causing them to protrude externally of the inner member into the said large diameter bore portion of the outer member whereupon the holding elements may engage the shoulder formed by the juncture of the said larger diameter and smaller diameter bores and restrain movement of the inner member with respect to the outer member.

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