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[45] **June 26, 1973**

[54] **CABLE GUARD FOR RATCHET LEVER DRUM PULLER**

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[21] Appl. No.: **215,232**

Related U.S. Application Data

[62] Division of Ser. No. 2,895, Jan. 14, 1970.

[52] **U.S. Cl.** ..... **254/190 R,** 254/167

[51] **Int. Cl.** **B66d 1/00**

[58] **Field of Search** ..... 254/167, 190 R; 242/156.1

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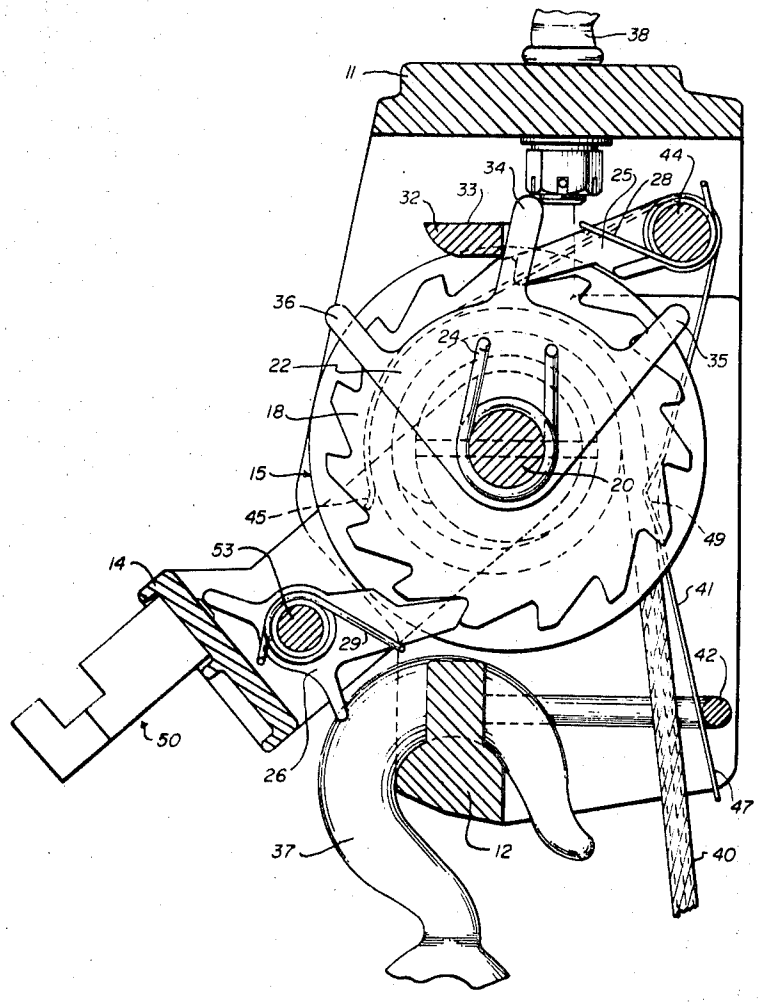
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Attorney—Dominik, Knechtel, Godula & Demeur

[57] **ABSTRACT**

A cable guard is provided for use in connection with a Ratchet Lever Drum Puller having a ratchet toothed wheel integrally cast with the drum, and having a reverse ring construction. The cable guard is provided from a single sheet of material which also assists in preserving the helical wind of the cable, and the cable guard cooperates with a cable guide to assist in securing the former, and to deter improper positioning of the dead end hook on the cable guide.

1 Claim, 14 Drawing Figures



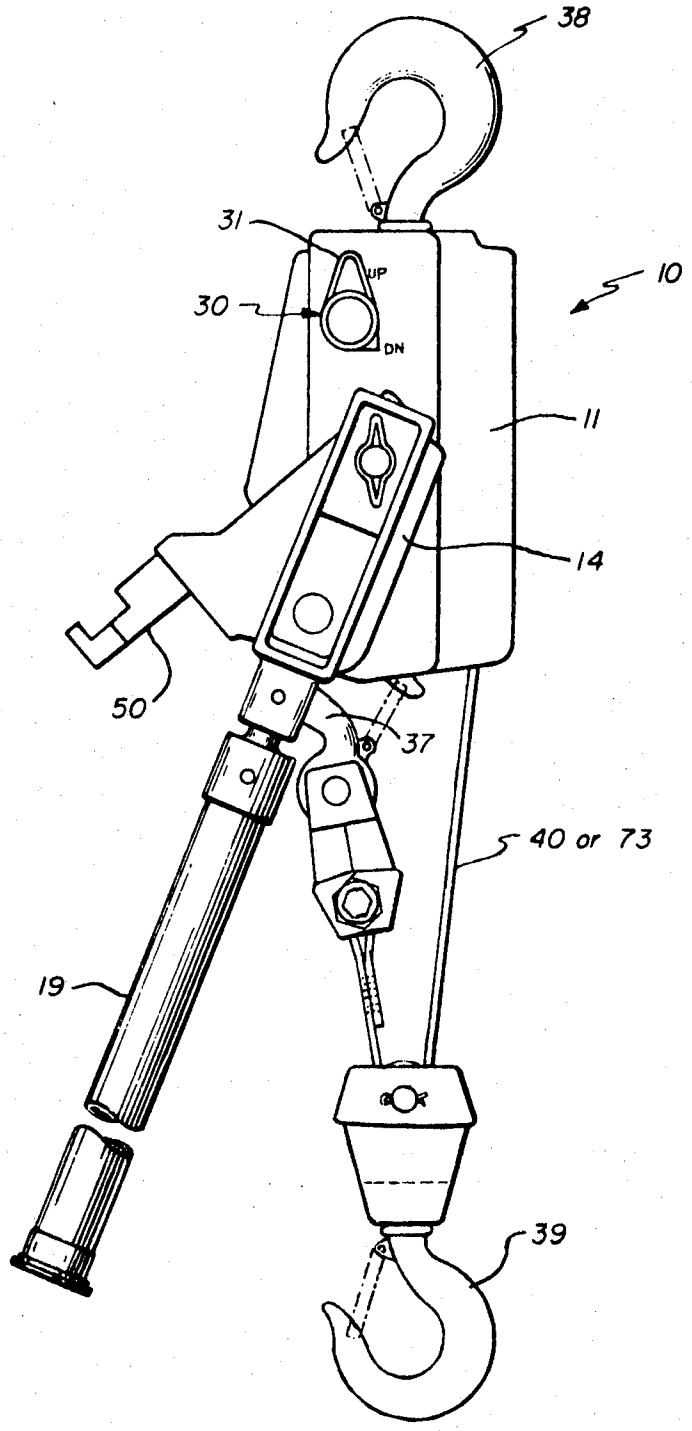


FIG. 1

FIG. 2

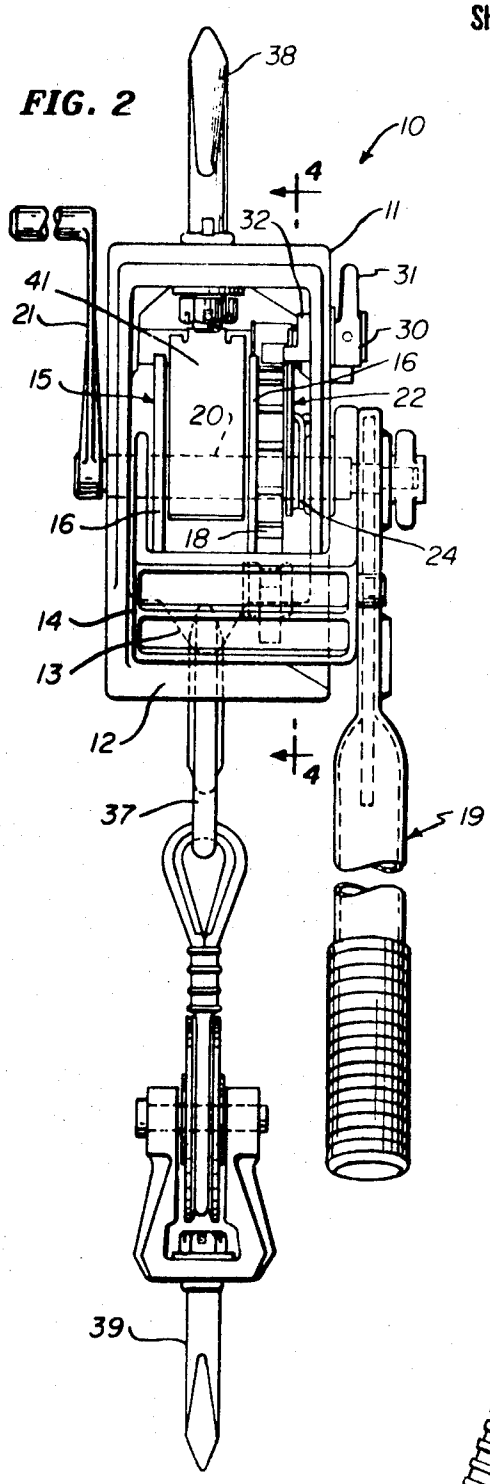
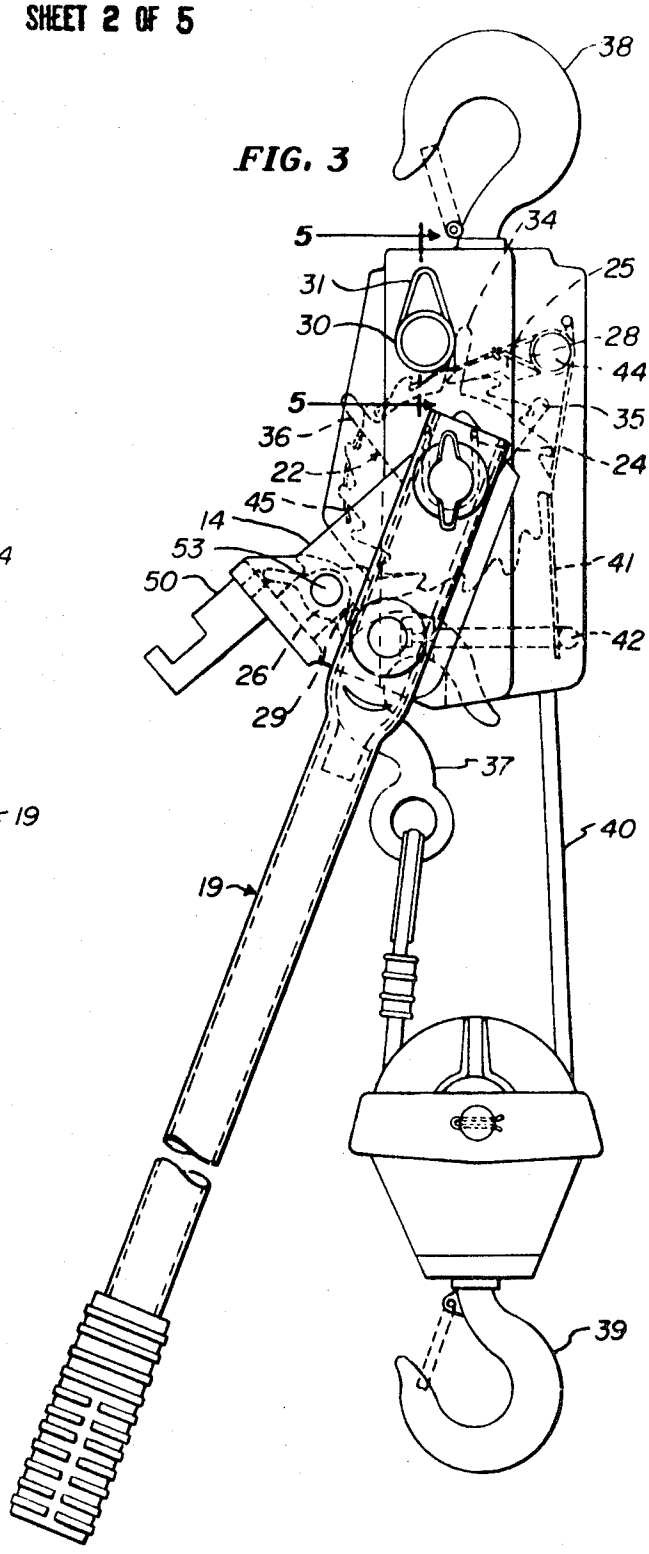

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FIG. 3


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SHEET 3 OF 5

FIG. 4

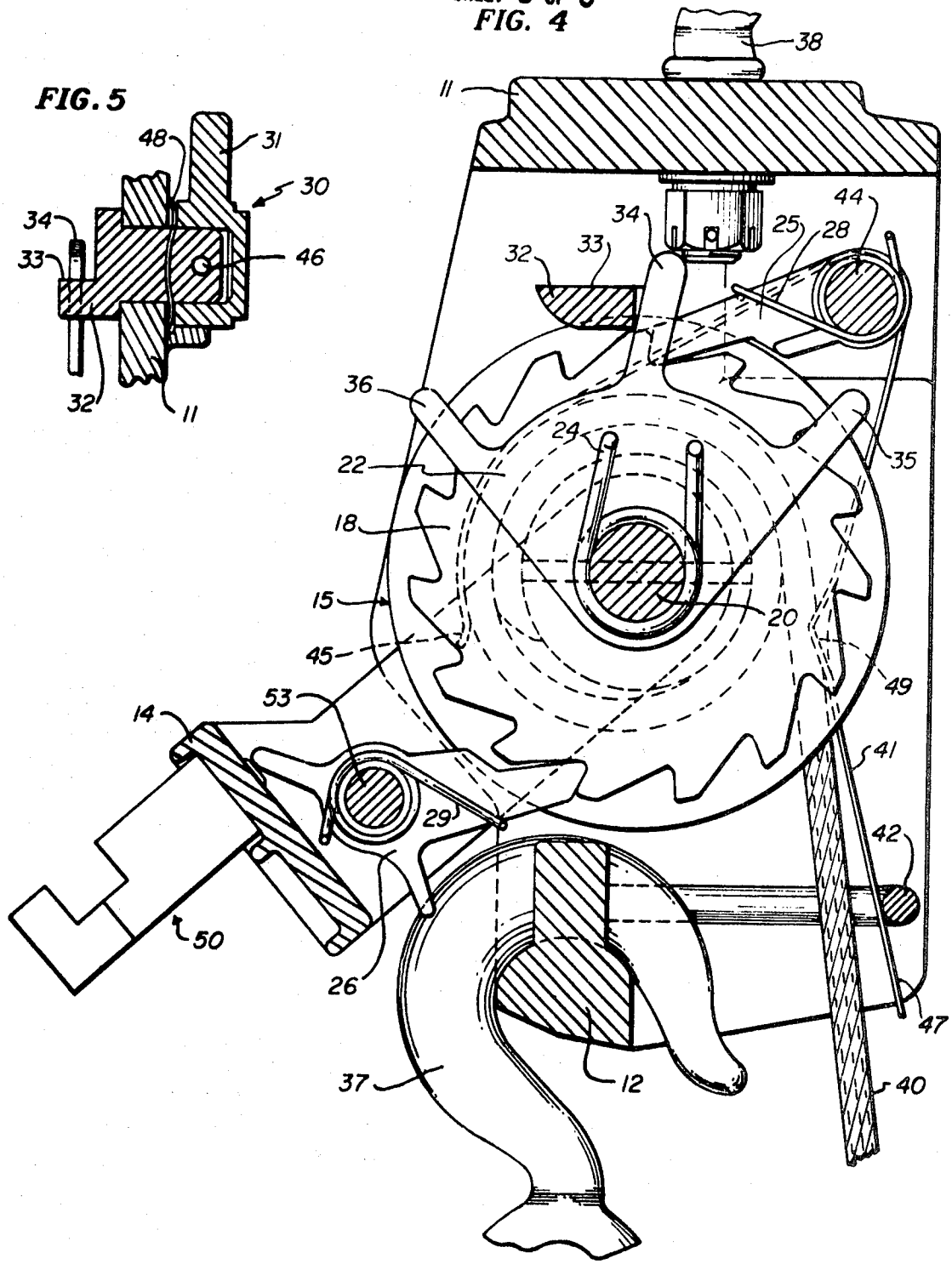


FIG. 5

FIG. 6

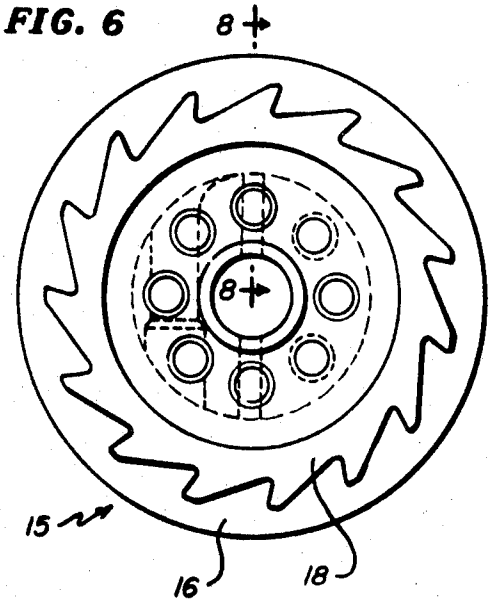


FIG. 7

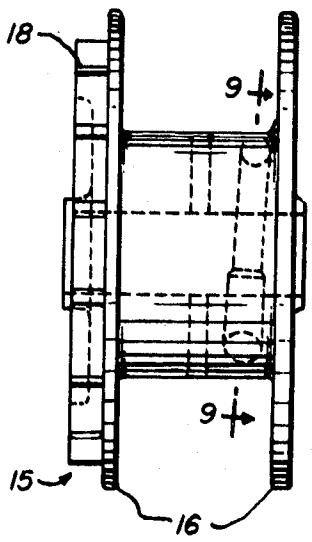
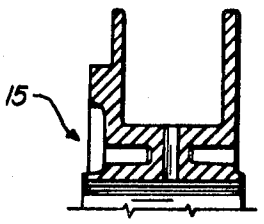


FIG. 8



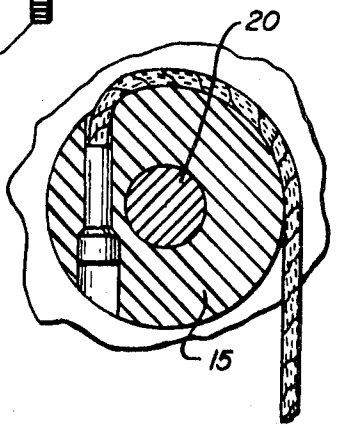


FIG. 9

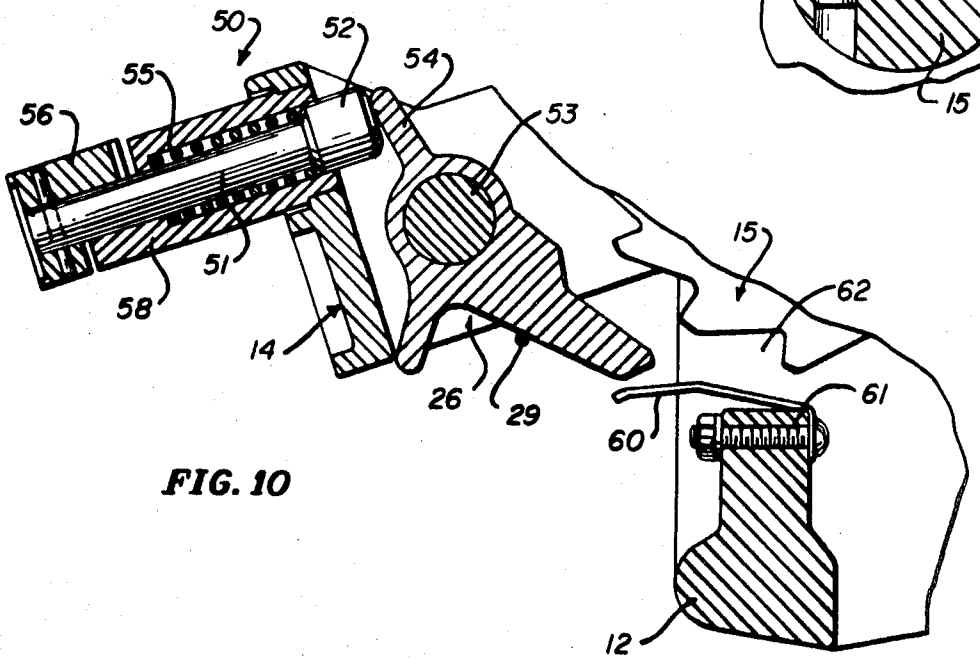


FIG. 10

FIG. 11

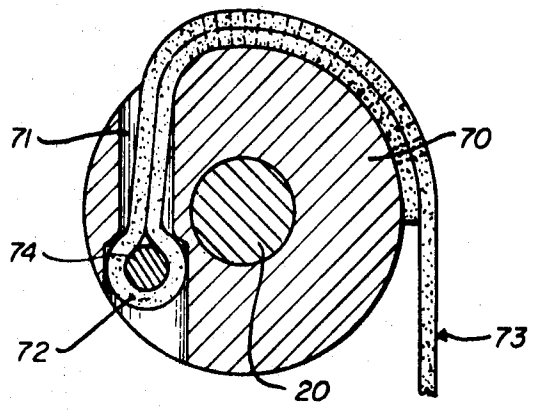


FIG. 12

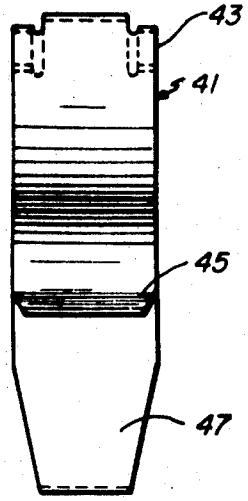


FIG. 13

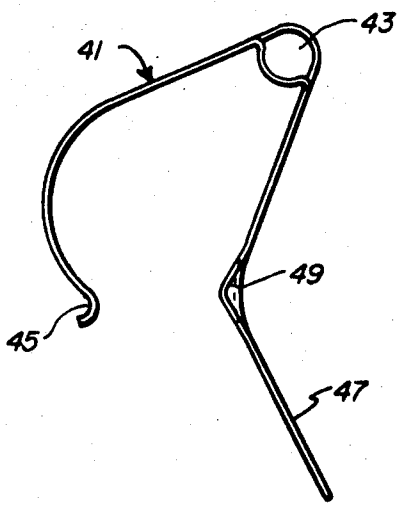
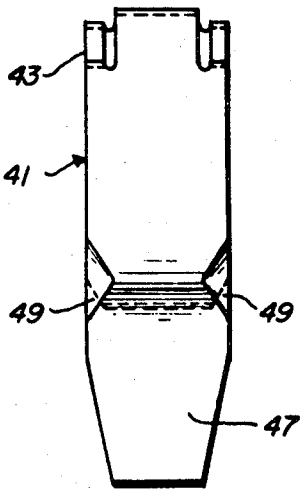


FIG. 14



CABLE GUARD FOR RATCHET LEVER DRUM PULLER

This application is a division of parent application Ser. No. 2,895 filed on Jan. 14, 1970, in the name of Anthony G. Profet, entitled RATCHET LEVER DRUM PULLER.

BACKGROUND OF INVENTION AND OBJECTS AND ADVANTAGES

The present invention relates to a ratchet lever drum puller which finds utility both as a wire rope puller and a web type puller. Heretofore pullers have been manufactured which have a variety of complex controls. Invariably the controls are oriented within the housing of the puller, and thus safety in operation by preventing the fingers of the operator from getting close to the teeth of the ratchet wheel is not achieved. Furthermore, in the ratchet lever drum puller of the type employed in the prior art a combination of free-chain, quick-release, and quick-lower are seldom achieved with a simplicity of controls, the same being susceptible of addition in the field. Additionally, because the devices currently employed do not use a reverse ring, the standard operating arc or swing of the handle cannot be oriented in its most favorable position which would be remote from the cable thereby permitting the operator to employ his hand effort in a position as remote as possible from the load.

In view of the foregoing, it is one of the principal objects of the present invention to provide a ratchet lever drum puller in which a reverse ring is employed to insure operation in that segment of the ratcheting of the lever parallel with and remote from the load line. A correlated object includes the provision of selective positioning of the operating lever so that a lower orientation can be achieved where the top of the puller is hooked directly to an overhead obstruction such as a ceiling. Additionally, the handle is reversible to provide four positions for operation, highly desirable when the ratchet lever drum puller is inverted.

A further object of the present invention is to provide an optional quick-lower device which can be readily attached in the field and is controlled by a handle control remote from the interior portion of the housing, thereby reducing substantially the risk of the operator's fingers being close to the ratchet wheel at the time of free-chaining, or selecting the quick-lower position. A more detailed object of the present invention is to provide a quick-lower mechanism in which a yieldable wedging action takes place between the load pawl and the teeth on the ratchet wheel thereby insuring secure, maximum strength, and positive engagement between the load pawl and the ratchet wheel in the quick-lower position.

Still another object of the present invention is to provide a ratchet lever drum puller in which, when wire cable is employed, shielding exists around the principal portion of the drum, for the twofold purpose of insuring a good helical wrap and shielding the cable from inadvertent finger contact.

Still a further object of the invention is to provide additional safety by orienting the holding pawl at the upper portion of the housing so that if the holding pawl engaging spring should be broken, a gravity assist in engaging the holding pawl occurs naturally and further

prevents the dropping of the load in the event of a spring failure.

Even an additional object of the invention is occasioned by locating the reverse control externally at the top right of the housing which permits readily accessible and obvious orientation of the same, and puts the single control on the outside of the housing for normal raising and lowering.

The invention, in one aspect, stems from the application of a reverse ring to a ratchet lever drum-type puller, whether of the wire rope or web type construction. The reverse ring has a body portion positioned for rotation around the drum shaft, and extending in one direction is the control finger of the reverse ring, and flanking the same at angles between 25° and 60° are the control fingers which respectively engage the operating pawl and holding pawl dependent upon the position of the control finger with regard to the reverse ring control member at the upper portion of the housing.

A quick-lower mechanism may be installed on the operating yoke, and engages one of the control fingers of the operating pawl selectively lockingly positioning the same for full engagement with the ratchet wheel teeth or fully disengaged in the "free-cable" or quick travel position.

Additionally, the ratchet wheel is cast unitarily with the drum and is exterior of a peripheral pair of parallel flanges which guide the wrap of either the wire cable or web. In those application where a web is employed, a slot is cast into the drum and a reverse fold on the web receives a transverse pin which locks the same in a precast recess within the drum. A drum shaft is pinned, keyed, or otherwise secured to the drum and passes through a box-shaped housing, and extends through the operating yoke member and journals the same with respect to the housing.

The operating yoke carries the operating pawl, and means to receive a handle is provided with a mounting position on the drum shaft, and selective pin orientations with regard to the yoke, the same being secured by means of a wing nut onto the drum shaft. The quick-lowering device provided on the operating yoke is in the form of a two position pin which engages a control finger extending rearwardly from the load pawl, which in turn is rotatably secured on an operating pawl pin which is transverse the open portion of the operating yoke. Selectively positioning the operating pawl results in free-cabling or quick lowering action; or normal lifting action of the operating pawl.

Another aspect of the invention looks to a one-piece cable guard which surrounds the major portion of the drum. A reversely punched center portion permits pivotally mounting with a single mount on the holding pawl support shaft. The cable guard cooperates with a U-shaped cable guide to further secure the mounting of the cable guard to the hoist body, and in addition to block access to the cable guard as an unintended or carelessly chosen support for the dead-end hook.

DESCRIPTION OF DRAWINGS

Further objects and advantages of the present invention will become apparent as the following description of an illustrative embodiment proceeds, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side view of the ratchet lever drum puller illustrative of the invention showing the housing, optional handle, and suspension and operating hooks.

FIG. 2 is a front elevation of the hoist in the same scale as FIG. 1, illustrating in dotted lines numerous of the internal features and also the optional quick take-up crank.

FIG. 3 is a view taken from the same elevation as FIG. 1 but showing in dotted lines more of the interior operating elements, including the standard load governor handle.

FIG. 4 is a transverse sectional view of the interior of the hoist taken along section line 4—4 of FIG. 2.

FIG. 5 is an enlarged transverse sectional view of the control cam indicating how it is pivoted within the housing and showing the same in its engaged relationship with one of the fingers of the reverse ring. The same is taken along section line 5—5 of FIG. 3 and shown in an enlarged scale.

FIG. 6 is an end view of the drum illustrating the ratchet wheel portion.

FIG. 7 is a front elevation in the same scale of the drum as shown in FIG. 6.

FIG. 8 is a cross-sectional view of the upper portion of the drum in reduced scale taken along section line 8—8 of FIG. 6.

FIG. 9 is a transverse sectional view of the drum body illustrating how the cable is anchored therein and is taken along section line 9—9 of FIG. 7.

FIG. 10 is an enlarged sectional view of the operating pawl quick-lower adaptor assembly taken generally from the lower left hand portion of FIG. 4 showing the adaptor and plunger in transverse sectional view as well as the relationship between the operating pawl and the operating pawl cam leaf spring.

FIG. 11 is an optional view showing the drum in the scale as shown in FIG. 9 illustrating a web being used as the tension member.

FIGS. 12, 13, and 14 are respectively the front, side, and rear views of the cable guard showing in phantom lines diagrammatically the relationship between the drum, cable guide, and wound cable.

DESCRIPTION OF PREFERRED EMBODIMENT

The basic organization of the illustrative ratchet lever drum puller 10 is shown in FIG. 1 where it will be seen that a housing 11 of generally inverted box-shaped configuration (see FIG. 2) is traversed at the bottom by a hook bar 12. The hook bar 12 is provided with a suspension hook notch 13 to receive the dead end hook 37 (see FIG. 2). A generally U-shaped operating yoke 14 is secured to a drum 15, the flanking drum flanges 16 of which guide the cable 40 as it is raised or lowered by being coiled around the drum 15. A ratchet wheel 18 is integral with and flanking one of the drum flanges 16, and by means to be described hereinafter, is operated by the reciprocation of the handle 19 and its associated operating yoke 14 to rotate the drum in one direction or the other to raise or lower the load hook 39. Optionally provided, as shown in FIG. 2, is a quick take-up crank 21 which can be employed to rapidly raise or lower the load hook 39 particularly when the rapid-lower mechanism 50 is employed.

Referring now particularly to FIG. 3, it will be seen that a reverse ring 22 in the shape of a quadrant (see FIG. 4) is pivoted about the drum shaft 20 and is yieldably urged by the reverse ring spring 24 into engagement with the control lever cam 32. In operation as the handle 19 is reciprocated, the operating pawl 26 engages the teeth of the ratchet wheel 18 and as the handle is moved downwardly, the drum 15 is rotated in a counter-clockwise direction as seen in FIG. 4, and the cable 40 is wrapped around the drum thereby raising the load hook 39. When the bottom of the stroke is reached, the holding pawl 25 snaps into position in the most closely adjacent tooth of the ratchet wheel 18, and the holding pawl spring 28 yieldably holds the holding pawl 25 in position. At this point the handle 19 may be raised and the operating pawl 26, even though urged by the operating pawl spring 29 into engagement with the adjacent tooth of the ratchet wheel 18, bounces over the ratchet teeth until the upper portion of the stroke has been reached. The process is then begun again as the handle 19 is pulled downwardly, and the operating pawl 26 urged by the operating pawl spring 29 re-engages its most nearly adjacent tooth of the ratchet wheel 18, and the drum 15 further rotated in a counter-clockwise direction.

When it is desired to lower the load, the control lever cam 32 of the control lever cam assembly 30 is rotated by means of the control lever knob 31 as shown in FIG. 3. The flat upper portion or control lever cam flat 33 is then turned into a vertical position, permitting the control cam finger 34 to advance in a counter-clockwise direction as shown in FIG. 4, yieldably urged by the reverse ring spring 24 in that direction. This movement is sufficient to permit the holding pawl finger 35 of the reverse ring 22 to engage the holding pawl 25 and working against the action of the holding pawl spring 28, the holding pawl 25 is disengaged from its adjacent tooth. At this point, the handle 19 is raised and the load on the cable 40 pulls the drum in a clockwise direction until the operating pawl 26 engages the operating pawl finger 36 of the reverse ring 22 and then rotates the reverse ring 22 against the action of the reverse ring spring 24 until the holding pawl finger 35 is released from the holding pawl 25, and then the holding pawl 25 is taken over by the action of the holding pawl spring 28 an the same is re-engaged with the most closely adjacent tooth of the ratchet wheel 18. At this point the operator will find that the operating pawl 26 has engaged the operating pawl finger 36 of the reverse ring 22, and then when the handle is lowered the operating pawl 26 remains disengaged from the ratchet wheel 18 until such time as the operator lowers the handle 19, and the operating pawl 26 disengages the operating pawl finger 36 and re-engages the ratchet wheel 18. In this regard it will be appreciated that when operating pawl finger 36 engages the control lever cam 32 it abruptly terminates the clockwise rotation of the reverse ring 22. Thus in lowering the drum can be rotated only one tooth at a time. On the other hand, upon raising the load by coiling the cable 40 around the drum 15, the load can be raised as much as three or four teeth on a stroke.

When the quick lower assembly 50 has been adapted to the subject hoist, as will be seen in FIG. 10, a quick-lower pin 51 is provided in the quick-lower housing 58 to slide axially against the engagement of the quick-lower spring 55 and contact the operating pawl quick-lower finger 54. Thus when the quick-lower mechanism is engaged for quick lowering, the operating pawl 26 is held out of engagement with the teeth of the ratchet wheel 18 by means of the loading of the quick-lower spring 55, which overcomes the action of the operating pawl spring 29, the latter normally tending to maintain the operating pawl 26 in engagement with the teeth.

With the quick-lower mechanism engaged the operating pawl **26** is out of engagement with the teeth and the maximum travel of the operating pawl **26** by reciprocation of the handle **19** is permitted.

In order to re-engage the operating pawl **26** into the teeth of the ratchet wheel **18**, a pawl cam spring **60** is secured to the hook bar **12**. As will be noted, a mounting bolt **61** is provided for this purpose. The pawl cam spring **60** is cantileverly supported in such a manner that it yieldably engages the front portion of the operating pawl **26** as the same rotates downwardly and wedgingly jams the operating pawl **26** into the ratchet tooth notch **62**. This action overcomes the force of the quick-lower pin spring **55** and the operating pawl **26** is then held in position by its physical engagement in the ratchet tooth notch **62** assisted by the operating pawl spring **29**. In this connection it will be observed that the ratchet tooth notch **62** is desirably provided with an undercut, preferably in the range of 5° to 15°. Immediately upon raising the handle **19**, the holding pawl **25** is disengaged from its adjacent tooth and remains disengaged until the operating pawl quick-lowering finger **54** and the adjacent quick-lower pawl finger engaging button **52** engage the operating pawl finger **36** of the reverse ring **22** thereby re-engaging the holding pawl **25**, disengaging the operating pawl **26**, the permitting the lowering of the handle to quickly traverse the arc back to the point of re-engagement with the quick-lower tooth notch **62** then presented for engagement with the operating pawl **26**.

In summary, depending upon the number of teeth on the ratchet wheel, the load is raised three or four teeth advance at one full stroke. The quick-lower assembly **50**, when attached to the subject unit, permits a three- or four-tooth lowering through the same arc and the same number of teeth as the design accommodates when raising the load. Normal lowering without the quick-lower assembly **50** is only one tooth at a time, limited by the engagement and disengagement of the holding pawl by the holding pawl finger and the control finger of the reverse ring when the control mechanism is in the lowered position.

Free cabling, in a no-load situation, to move the cable **40** outwardly and rotate the drum clockwise as shown in FIG. **4**, may be accomplished by positioning the control in the down position, and manually releasing the operating pawl whereupon the cable can be advanced. Alternatively, if the quick-lower assembly **50** has been adapted to the hoist, it is merely engaged to release the operating pawl from engagement with the ratchet teeth, the control lever then turned into the down position, and the cable may be freely removed or extended by pulling on the cable.

Finally, when a quick raise is desired under a no-load condition, the quick take-up handle **21** shown in the left hand portion of FIG. **2** is rotated and is secured sufficiently to the drum shaft to wrap the cable or webbing around the drum by overcoming the slip action of both the holding pawl and the operating pawl. It should be emphasized that the quick raise or quick take-up is only safe in operation under a no-load condition with the tare weight of the load hook and its cable assembly serving to keep the cable in alignment when the hoist is normally suspended by the suspense hook.

Additional advantageous features include a cable guard **41** which is secured at its base (see FIG. **4**) by means of the cable guide **42**. The cable guard **41** then curves around the holding pawl mounting shaft **44** presenting a cable guard free end **45** at the lower front portion of the hoist. The cable guard **41** as shown in FIGS. **12, 13** and **14** has a center section holding pawl mount which pivots on the holding pawl mounting shaft **44**. No other fastening means is required. The body portion of the guard **41** is formed of flat spring stock and shaped to squeeze the cable at the front of the hoist and the rear. This action assists in promoting a smooth helical wind of the cable **40** around the drum **15**. The first wrap of the cable against the drum normally proceeds without difficulty. Second and third wraps are susceptible of fouling. The subject cable guard **41** is proportioned to yieldably engage the cable as the second wrap is developed. Its flexibility will accommodate a third wrap as well without extensive binding. In addition, the cable guide **42** is dimensioned to provide a center slot or guideway span less than the space between the cable drum flanges **16**. The action is to constantly serve to center the cable **40** on the drum, assisted by the cable guard **41**. The necessity for special cable ramps, grooves, and the like on the drum **15** is avoided. The further advantages of being able to use the same casting die with minor modification for the cable drum **15** as the web drum **70** is also obtained.

Finally, all too many hoist users may find the cable guide **42** a convenient place to hang the load hook **39**. For example, viewing FIG. **3** it will be see that there could be a temptation to reverse the direction of the dead end hook **37** and engage the cable guide **42**, the latter not being designed to take the load. Such inadvertence is frustrated, however, as the cable guide engaging end **47** of the cable guard **41** is tapered and yieldably abuts the open end of the cable guide **42**. Thus the access to the cable guide **42** to use it as a hook anchor is blocked off by the cable guide engaging end **47** of the cable guard **41**.

Further noting the cable guard **41** as illustrated in FIGS. **12, 13** and **14**, it will be seen that the top portion is reversely punched at the edges to define a holding pawl formed recess **43**. As seen in FIGS. **3** and **13**, the holding pawl formed recess **13** permits securing the cable guard **41** onto the hoist **10** by the simple positioning of the holding pawl mounting shaft **44** through the holding pawl formed recess **43**. The free end **45** of the cable guard **41** and the cable guide engaging end are proportioned to yieldably engage the cable **40** (see particularly FIG. **3**) in the manner described above, and to further assist in level winding the cable **40**, the cable wind assist detents **49** are formed adjacent the point of tangential contact between the cable guide engaging end **47** to flank the cable winds and deflect the same centrally as the winds approach the drum flanges **16**.

In summary, then, the cable guard **41** and cable guide **42** cooperate to shield the cable from fingers and foreign items, urge a good helical wind of the cable, interchange with a belt as a lifting element, and finally frustrate the operator from hanging the load hook **39** where it should not be hung. Since the entire cable guard **41** can be formed from a single piece of low temper spring steel, and reversely punched and formed at a center section to provide the holding pawl formed recess **43**, the foregoing advantages are achieved economically.

The details of construction of the control lever knob **31** of the control lever cam assembly **30** are shown in FIG. **5**. There it will be seen that the control lever knob

31 is secured by means of a control lever pin 46 to the shaft of the control lever cam 32. The cam flat 33 is shown horizontally in FIG. 5, the remote end engaging the control cam finger 34 of the reverse ring 22. The entire unit is held in position by means of a control lever spring 48 positioned between the control lever knob 31 and the wall section of the housing 11, and the pressure of the reverse ring spring 24 against the cam.

Additionally, as shown in FIG. 11, the drum 15 may be replaced by a web drum 70 in which a web slot 71 is provided. The web is double-wrapped and stitched so that a loop 72 appears at one end of the web and a web locking pin 74 anchors the same in position on the web drum 70. Thus a hoist construction is provided which can be modified to use either a web 73 or a cable 40 in operating the load hook 39.

In review it will be seen that a ratchet lever drum puller 10 has been disclosed and described which permits ready operation with a handle in two positions, all of which are below the horizontal axis passing through the suspension hook 38. Three- or four-tooth raising and single tooth lowering is provided normally. A quick-lower conversion to lower as many teeth as with the raising arc is provided by the economical optional attachment of a quick lower assembly 50. Safety is insured by the quick-lower assembly 50 since engagement of either the operating pawl 26 is provided at one end of the stroke, or the holding pawl 25 is engaged at the other end of the stroke. The quick-lower assembly 50 coordinates with the balance of the operating portions of the hoist and may be omitted if its expense is not considered essential.

While the invention has been described in connection with specific embodiments and applications, no intention to restrict the invention to the examples shown is contemplated, but rather to include within the invention all of the subject matter defined by the spirit as well as the letter of the annexed claims.

What is claimed is:

1. In a ratchet lever drum puller of the type including an open housing, an open operating yoke, a drum having parallel flanges at both ends perpendicular to its central axis and rotatably mounted in the open housing, a ratchet wheel for operating the drum having teeth thereon, an operating pawl on the operating yoke for selectively engaging the ratchet wheel teeth, a holding pawl, a holding pawl shaft affixed to the open housing parallel with the drum axis, the improvement comprising in combination,

a cable guide secured to the open housing,

a cable guard having an overall substantially arcuate configuration and presenting a free cable end adjacent the front portion of the ratchet wheel and a cable guide engaging end at the opposed end of said cable guard,

said cable guard being secured to said cable guide at said cable guide engaging end thereof,

the central portion of said cable guard including a holding pawl mount carried on the holding pawl shaft and secured thereon such that said cable guard free end yieldable engages a cable as the same is wound about the drum thereby to assist in the level winding of the cable about the drum,

and the cable guard engaging end having an inturned detent which engages a cable as the same is wound and unwound from the drum,

said cable guard being pivotally secured to the holding pawl mounting shaft thereby to ensure constant engagement with a cable as the same is wound and unwound from the drum at both the cable guard free end and the cable guard engaging end.

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