July 9, 1968 R. G. VOGELSANG 3,391,907

MARINE WINCHES

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FIG. 1

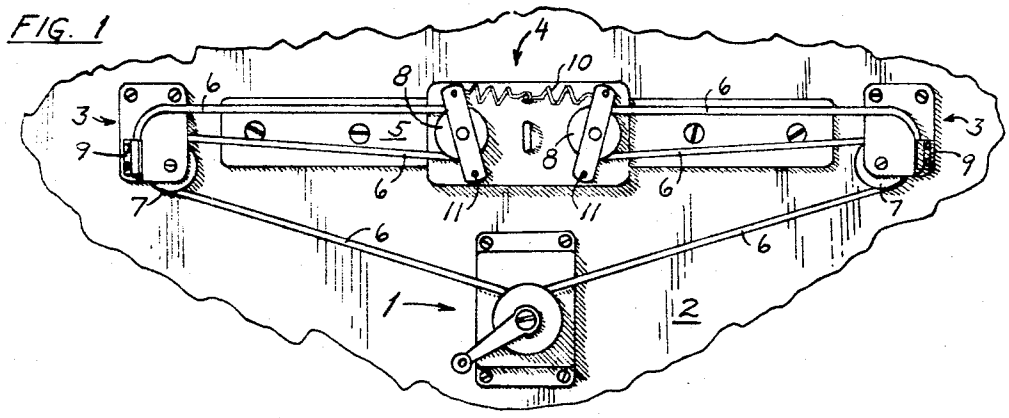

FIG. 2

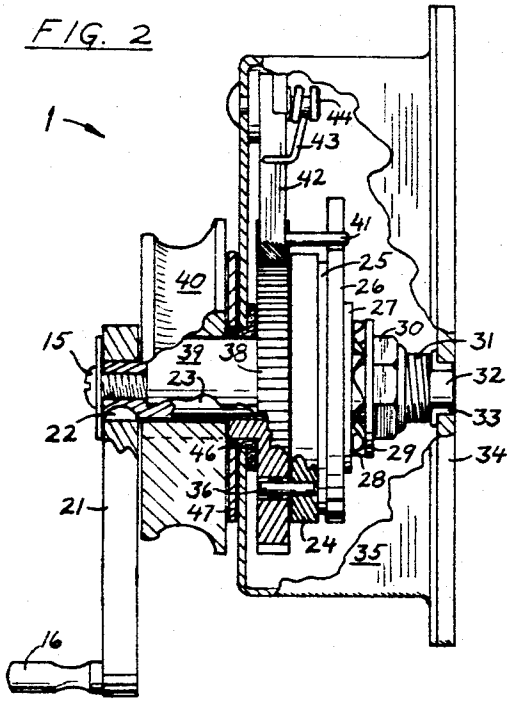

FIG. 3

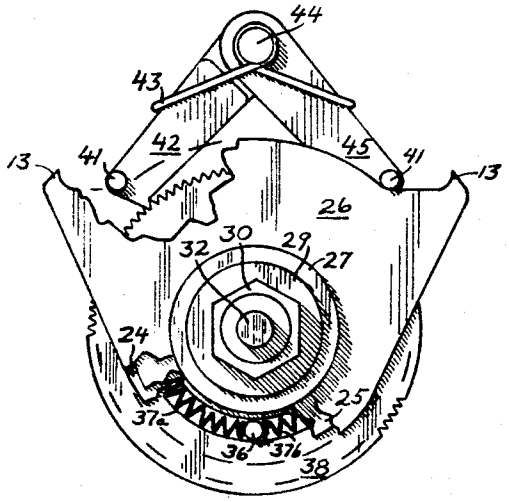

FIG. 4

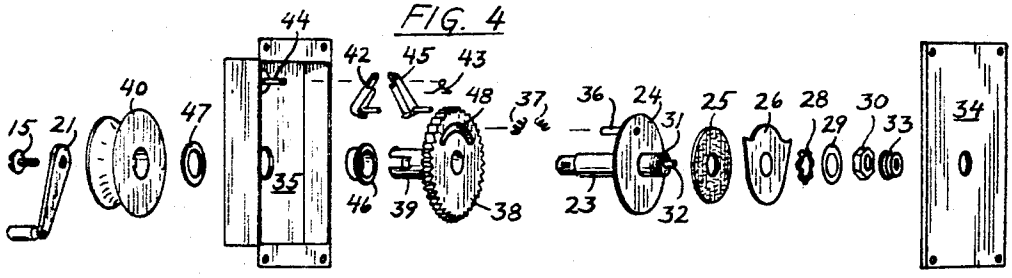

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FIG. 5

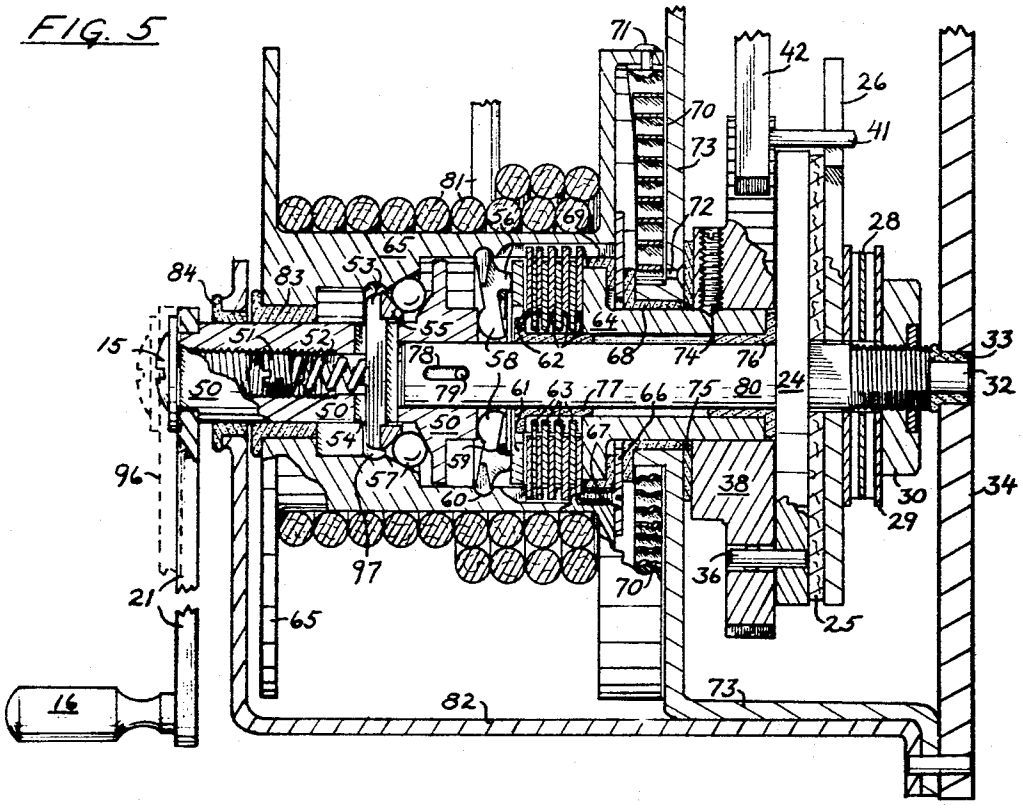
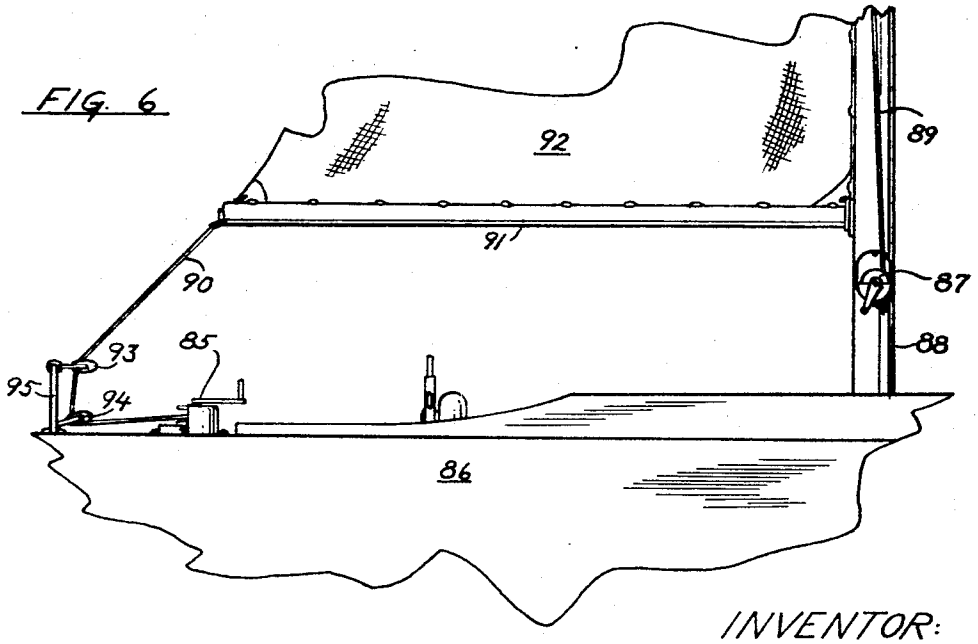


FIG. 6



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MARINE WINCHES

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10 Claims. (Cl. 254—150)

ABSTRACT OF THE DISCLOSURE

A marine winch with a self-releasing ratchet device which includes an input drive shaft coupled to a toothed ratchet wheel through a mechanism affording a limited amount of lost motion therebetween and also coupled to a cam through a frictional clutching mechanism, such that upon initial motion of the input shaft the ratchet wheel is not moved but the cam is and during such movement the cam disengages a pawl which otherwise holds the ratchet wheel against any motion in the direction of movement of the input shaft. Following disengagement of such pawl, the limited lost motion between the input shaft and the ratchet wheel ends, whereupon the input shaft drives the ratchet wheel while the clutching mechanism disengages the cam from further movement by the input shaft.

This invention relates to winches, in particular to marine craft application for controlling cable, rope or chain.

The object of this invention is to make capable the automatic bi-directional locking or ratcheting of a winch capstan or drum, yet permit automatic release of said locking or ratchet means upon application of a cranking force on its normal input.

Secondary objects are to make this winch adaptable to various marine applications such as sail boat traveler control, halyard hoist winch and sheet winch.

As great lengths of rope are required in multiple block combinations to obtain the great hauling forces required on boom control, the said lengths of rope or line become hazardous to personnel when lying about deck areas while rapid sailing maneuvers are being undergone. As this invention permits accumulation of this line or finer cable with further greater response, such great lengths of rope are replaced by a higher tensile strength wire cable and directly coiled upon a winch drum for storage or to preclude said problem of excess line about deck.

Also as typical of halyard handling cable winches, this invention permits rapid cable with sail release for safety measure by a simple alternate crank position instead of turning said crank in reverse many revolutions to accomplish the same end.

Finite adjustment of a traveler block on a sheet line traveler may be had by a simple single winch control, and can be of definite asset under competitive sailing where such finite sail position is required and little physical motion in behalf of the personnel operating same is required.

Of the many related advantages and objectives obtainable within the scope of this invention by the use of the varied combinations of elements described in the appended following text, the implied or reflected singular object as disclosed herein does not limit the application of these elements to these said singular objects. To illustrate a few such applications in the marine field, the drawings herewith are given.

FIGURE 1, a compound ratcheting sail-boat traveler winch as mounted on the deck of a sail-boat.

FIGURE 2 shows a partially sectioned compound ratchet winch.

FIGURE 3 shows a rear end view of the compound ratchet assembly with its automatic cam actuating mechanism.

FIGURE 4 reflects an exploded view of a compound ratcheted winch.

FIGURE 5 shows a cross sectional side view of a clutching type compound ratcheting winch.

FIGURE 6 shows two alternate modes of sail-boat applications of the clutching type compound ratcheting winches as mounted on a sail-boat.

In FIGURE 1, a typical sail boat deck **2** has adjustable traveler **4** on slide track **5** and is positioned and held by winch **1** and line **6** which traverses over positioning control winch **1** capstan, block pulleys **7** on cheek block assemblies **3** and pulleys **8** as affixed to levers pivoted at **11** on traveler **4**, thence said line **6** is terminated at its ends at said cheek blocks **3** under clamps **9**. Springs **10** maintain tension of line **6** to prevent slippage of said line about capstan of winch **1**, and also permit shock absorption of such abrupt lateral motion as may occur with slackened sheet lines as attached to eye **12** of the traveler block assembly **4**.

As winch **1** is compound ratcheted and will hold line **6** stationary, said traveler **4** will also remain stationary on slide **5**. If it is desired to move said traveler to trim such sail as attached thereto, simple cranking action on said winch **1** will automatically release the ratchet in the direction of effort or rotary motion to permit said rotary input with subsequent capstan turning by manual means, and when physically released, said released ratchet will re-engage, holding the winch capstan from further motion.

In FIGURES 2, 3 and 4, hand crank **21** with handle **16** will turn shaft **23** by key **22** as held thereto by screw **15**. Shaft **23** has trunnion **32** which rotates in bearing **33** seated in housing base **34**, and shaft **23** is affixed to a flat drive disc **24** having a laterally extending drive pin **36**. Consequently, initial rotary motion of said shaft **23** will move drive pin **36**, and this pin is caged between two compression springs **37***a* and **37***b* located in a slot **48** of ratchet gear **38**. Further, said drive disc **24** will turn compound cam **26** through friction plate **25** as is held tightly therebetween because of concentric spring washer **28**, thrust washers **27** and **29** and adjusting nut **30** on reference drive shaft **23** threads **31**. Ratchet gear **38** is held by pawl **42** which in turn are maintained in position by spring **43** on pin **44** which is integral with housing **35**.

As the external hollow concentric output shaft **39** turns in bearing **46** with ratchet gear **38** and is keyed to capstan **40**, it may be seen that capstan **40** is held rotationwise with said ratchet gear **38**. Washer **47** limits end play of capstan **40** to housing **35**.

In FIGURE 3, rear view of the ratcheting winch assembly shows trunnion **32**, adjusmtent nut **30**, thrust washers **27** and **29** with compound cam **26**. Pawls **42** and **45** engaging ratchet gear **38** have finger projections **41** which ride on cam **26** to permit raising of said pawls alternately depending on relative rotational displacement and limitation of said cam **26**. Projections **13** at the extremities of cam **26** prevent continued rotation of said cam in either direction thereby permitting a slipping action by the prime rotational motivator drive disc **24** and said cam **26** by frictional drive disc or plate **25**. As nut **30** may be adjusted to permit degree of slippage, enough friction is thereby adjusted to only raise pawl **42** or **45** against spring **43**.

As drive pin **36** compresses either one of the two speings **37***a* or **37***b*, the spring rate of these said springs permits enough rotational excursion of drive disc **24** with cam **26** to raise one of the two pawls **42** or **45**, depending on direction of rotation. It may thus be seen that continued rotational input on input shaft **23** will motivate the output shaft **39** when the proper restraining pawl has released the ratchet gear **38**, in effect the manual cranking will be coupled directly to the capstan **40** which such

residual sliding friction between cam 26 and drive disc 24 will be of minor importance. When this manual cranking is stopped with manual release of the crank, said cammed pawl will return or re-engage to lock ratchet gear 38 and prevent any further motion of capstan 40.

In FIGURE 5, a spring returned clutching type capstan integrated to the compound ratcheting winch 1 of the previous figures is shown, the modification of said compound ratchet winch portion being where said ratchet 38 is set-screwed 74 to hollow shaft 64 which drives capstan drum 65 through alternate series of clutching discs 62 and 63, the former key splined to said capstan 65, and the later to shaft 64.

It may be seen that any rotational input on crank 21 through shaft 50 thence to shaft 80 by key pin 79 in slot 87, will turn drive disc 24 as affixed to said shaft 80. As typical operation is described prior in the compound ratchet winch assembly, it may be seen that capstan drum 65 will turn with crank 21 provided clutching is engaged as shown between said capstan and shaft 64.

Engagement of clutch discs 62 and 63 is maintained by the axial thrust of washer 61 which is acted upon by projections 56 on a plurality of thrusting spiders 58. The said spiders pivot in peripheral groove 60 within capstan hub bore and maintained therein by snap ring spring 59 as is captivated and thrusts outward in a groove within said projection 56. An inner radius of spider 58 contacts the end of shaft 50 which may be axially displaced manually as shown in phantom line 96. A plurality of balls 57 permit detenting as well as maintain thrust between capstan 52 acting on cross bar 53 in slot 54 of shaft 50, and bearing race 55. As crank handle 21 is pulled outward to position 96, balls 57 force inward compressing said spring 52 against its adjustment set screw 51 and subsequently with enough axial movement, said balls snap into bearing race groove 97 in capstan hub or drum 65 bore.

It may be seen that with shaft 50 now in an outward position, no axial thrust is given to spiders 58 and declutching is obtained between capstan 65 and drive shaft 64.

Spiral spring 70 is disposed between and anchored to capstan drum 65 by rivet 71 and stationary housing 73 by pin 72 so as to permit a limited winding action as coiled line or cable 81 is pulled out. If slack is permitted on said line or cable 81 with the device in a declutched condition, or handle in position 96, spring 70 will reel in such slackened line and maintain a small degree of tautness.

Capstan drum 65 turns on bearings 83 and 69, the former on shaft 50, which is journaled in housing 82 by bearing 84, the latter between said capstan female spline for clutch discs 62 and drive shaft 64. The entire assembly turns on bearings 84, 68 and 33, and bearings 76 and 77 permit ease of initial pawl releasing rotational movement between input shaft 80 and output shaft 64. Keeper plate 66 as affixed to capstan 65 by screws 67 prevents independent endplay of said capstan 65 when declutched from drive shaft 64.

By removing crank handle 21 screw 15 in shaft 50, access to adjustment set screw 51 may be had to dictate relative holding power of clutch assembly. As various applications may dictate greater or lessor holding power, such adjustment may be desired. Further, to prevent shock breakage of line or cable 81, the said minimum clutch holding power adjustment may be of advantage to permit a degree of reel-out upon said abrupt tautness. Very high winds creating a hazard to the sail craft would also allow such line payout preventing possible capsizing of the craft as would be the case if such line were held rigidly affixed.

Such gearing to give rotational mechanical advantage as may be required or desired may be employed by interposing between ratchet gear 38 and its output shaft 64 thereby giving further usefulness of this device.

As spring 70 is used to maintain a nonslackened lined when "coming about" in normal sail craft maneuvers, then used as a sheet winch, said spring 70 may be deleted when this type of winch is employed as a halyard winch where mere release of all line as coiled thereon is required promptly and with little manual effort.

Simple manual outward pulling action on handle 21 permits ease of sheet line handling when such "coming about" maneuver is accomplished, as when such sail will luff when the boom is free, prompt automatic line slack will be taken up, and when the final portion of the craft's turn is executed and sails refill with wind from the opposite side, simple axial replacement of the crank 21 locks such sheet line to make the completed maneuver without such normal extensive sheet line handling. If for any reason such further sail trimming is desired, simple cranking operation in either direction may be employed to suit the sailor.

In FIGURE 6, sail boat 86 with mast 88 contains halyard winch 87 with halyard line 89. If for any emergency requiring prompt lowering of such sail as maintained by halyard line 89, said winch 87 which incorporated the de-clutching mechanism, may be quickly released by the aforesaid handle manipulation. As either wind pressure in sail 92 or typical roller reefing may employ integral winding spring such as employed in typical roller shades, line 89 will promptly payout of winch 87. For simple reefing operation or trimming of main sails, winch 87 may be cranked manually in either direction to obtain the wanted results.

Sheet winch 85 is shown controlling boom 91 by line or cable 90 through blocks 93 and 94, the earlier as mounted on traveler 95. As this winch 85 may be secured to the sail craft near the craft's pilot, such "coming about" maneuver may be accomplished by said pilot alone rather than other required personnel as is normally required.

Various applications utilizing the various combinations as disclosed herewith may be seen by those skilled in the art, so whether employed on boat trailers to facilitate ease of launching and retrieving craft on such trailers with inherent automatic securing of same by using the compound ratcheting winch, or other industrial cable control applications, whether powered or manually operated using rope, cable, wire or chain on wildcat capstans, and to obtain all benefits of this invention within the reasonable scope and spirit of these novelties, I claim:

1. A self-releasing ratchet device, comprising in combination: a driving means including a movable drive member and a cam means coupled to said drive member to be moved therewith; a driven means including a movable ratchet member having a plurality of teeth thereon; means engaging said drive member with said ratchet member to provide limited relative motion therebetween upon initial movement of said drive member and to move the latter in response to movement of the former in at least a first direction following such limited relative motion occurring therebetween in the same direction; pawl means engageable with the teeth on said ratchet member to prevent movement of the latter in said first direction when so engaged; said pawl means having a cam-follower portion in camming engagement with said cam means; said cam means having a cam surface for moving said pawl means by its said cam follower out of engagement with said teeth during said relative motion; and said cam means maintaining said pawl means out of engagement with said teeth upon further motion of said drive member, such that the latter may then move said ratchet member.

2. The self-releasing ratchet device of claim 1, wherein said means engaging said drive member and said ratchet member comprises a drive pin means secured to one such member and extending into a slot formed in the other, said slot being elongated a predetermined extent in said first direction to thereby provide said limited relative motion, and said slot terminating in at least one end wall for engaging said pin means to provide motion and force transfer between said drive member and ratchet member.

3. The self releasing ratchet device of claim 2, further

including a resilient biasing element located at least partially within said slot, between said end wall and the said drive pin means, such that said element is elastically deformed by movement of said pin means within said slot toward said end extremity, said element thereby cushioning and resiliently opposing such movement.

4. The self-releasing ratchet device of claim 1, wherein said cam means is coupled to said drive member by a frictional engagement, and wherein said cam surface includes a stop which engages said pawl means cam follower after the pawl means has been moved out of engagement with said teeth, said frictional engagement providing slippage between said cam means and drive member upon engagement of said cam surface stop with said cam follower, such that said cam means continues to hold said pawl means out of engagement with said teeth upon further movement of said drive member but said cam means slips with respect to said drive member during further movement.

5. The self-releasing ratchet device of claim 1, wherein said device is bi-directional and bi-directionally self-releasable, said drive member engaged with said ratchet member to move the latter in either a first or a second mutally opposite direction following limited relative motion occuring therebetween in the same such direction upon initial movement of said drive member in that direction, said pawl means preventing movement of said ratchet member in either of said directions when engaged with the said teeth thereof, and said cam surface configured to move said pawl means by its cam-follower portion out of engagement with said teeth upon movement of said drive member in either of said directions during such initial relative motion.

6. The self-releasing ratchet device of claim 5, wherein said drive member and said ratchet member are engaged by a drive pin means secured to one such member and extending into a slot formed in the other, said slot being elongaged a predetermined extent in both said first and said second direction to thereby provide said limited relative motion, and said slot being closed in nature and having a pair of spaced end walls, each for engaging said drive pin means at the extremity of said relative motion to provide motion and force transfer between said drive member and said ratchet member.

7. The self-releasing ratchet device of claim 6, further including a pair of resilient biasing elements, each located at least partially within said slot between said drive pin means and one of said end walls, such that either of said elements is elastically deformed by movement of said pin means within said slot against such element, such deformation resiliently cushioning such movement.

8. The self-releasing ratchet device of claim 1, wherein said driving means includes a drive shaft connected to said drive member for imparting movement thereto, said shaft having a loss-motion joint therein providing first and second shaft positions, said driven means including a capstan and a clutching mechanism, said clutching mechanism having a clutch means connected between said capstan and said ratchet member for transmitting force therebetween when engaged and for providing slippage therebetween when disengaged, and said clutching mechanism further including an operating structure operatively coupled to said drive shaft for causing engagement and disengagement of said clutching means at said first and second shaft positions repectively such that said shaft when in said first position and moved will drive said capstan through said drive member said ratchet member and said clutch means, such that said capstan when said shaft is in said first position and not moved will be held by said ratchet member and pawl means, and such that said shaft when in said second position will disengage said clutch means, thereby permitting a load then placed on said capstan to immediately move the latter through said slippage.

9. The self-releasing ratchet device of claim 8, wherein said clutch means comprises at least a pair of friction plates engageable and disengageable with each other, wherein said operating structure includes shiftable dog elements for bearing against at least one of said plates to force it against the other and create a frictional engagement therebetween, said operating structure further including a shift structure for acting against said dog elements to shift the same into and out of bearing relation with said plates, wherein said drive shaft structure for actuating said shift structure to initiate the said shifting of said dog elements, and said operating structure further including an index means for holding said shift structure in a selected shift position until said actuating structure of said shaft actuates the shift structure to another such shift position.

10. The self-releasing ratchet device of claim 8, wherein said driven means further includes a resilient driving element operatively connected between said capstan and said ratchet member, said element being resiliently deformed to create a spring force therein by relative motion between said ratchet member and capstan occurring when said clutch means is disengaged and said capstan is moved by said load, and said spring force acting upon said capstan to automatically return the latter toward its original position upon removal of said load from the capstan.

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