Feb. 1, 1966 E. W. EASTER 3,232,127

RATCHET DEVICE

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FIG. 1.

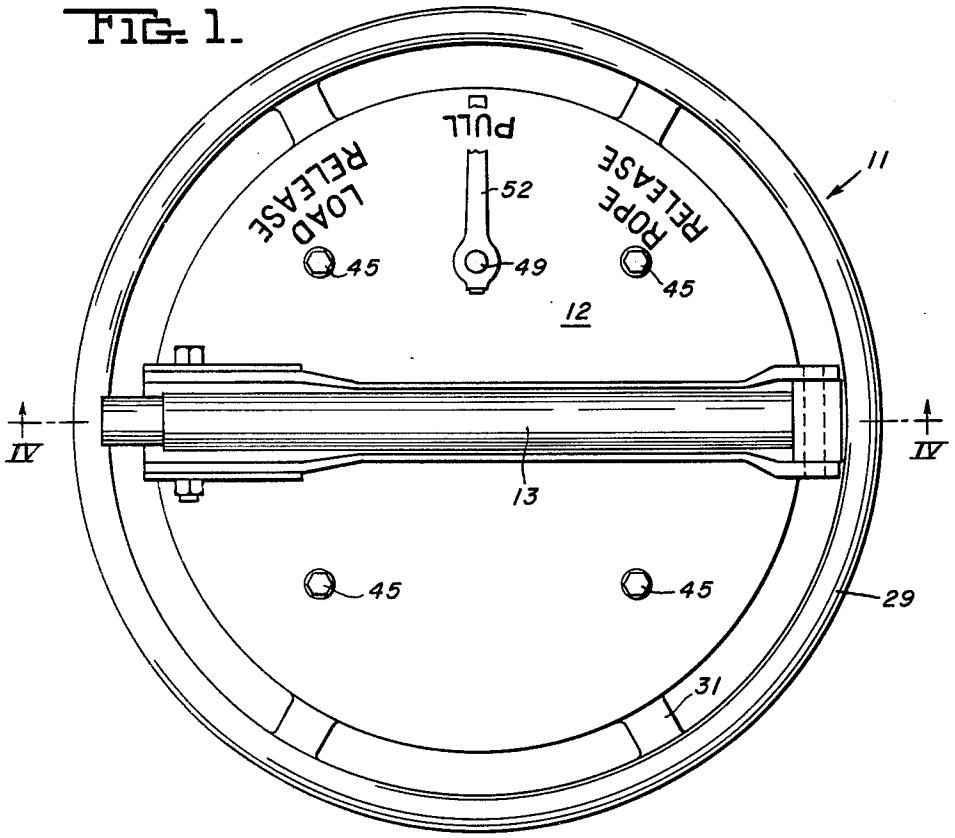

FIG. 2.

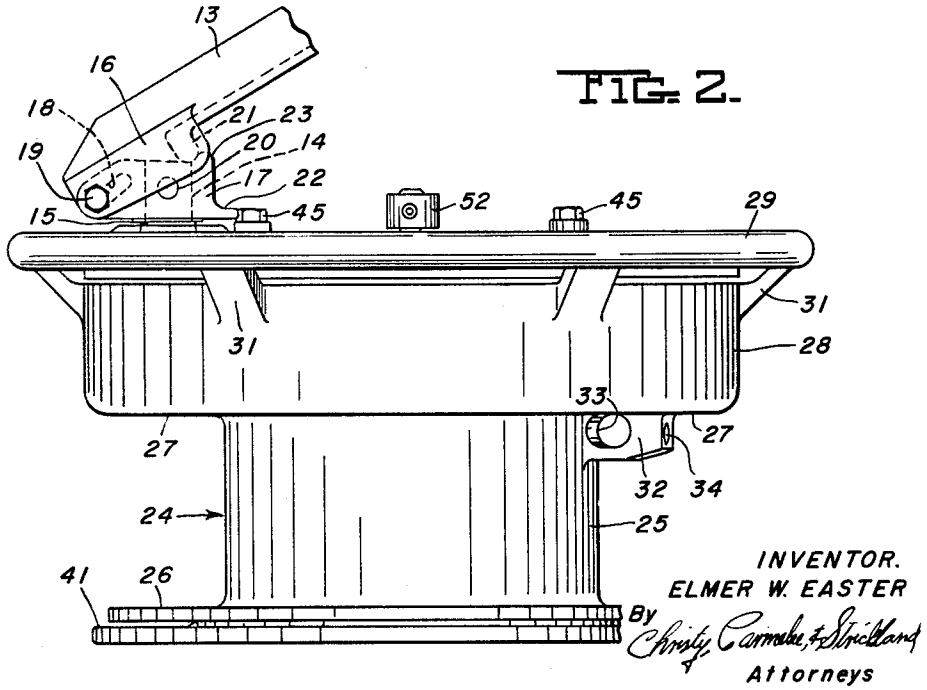

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FIG. 3.

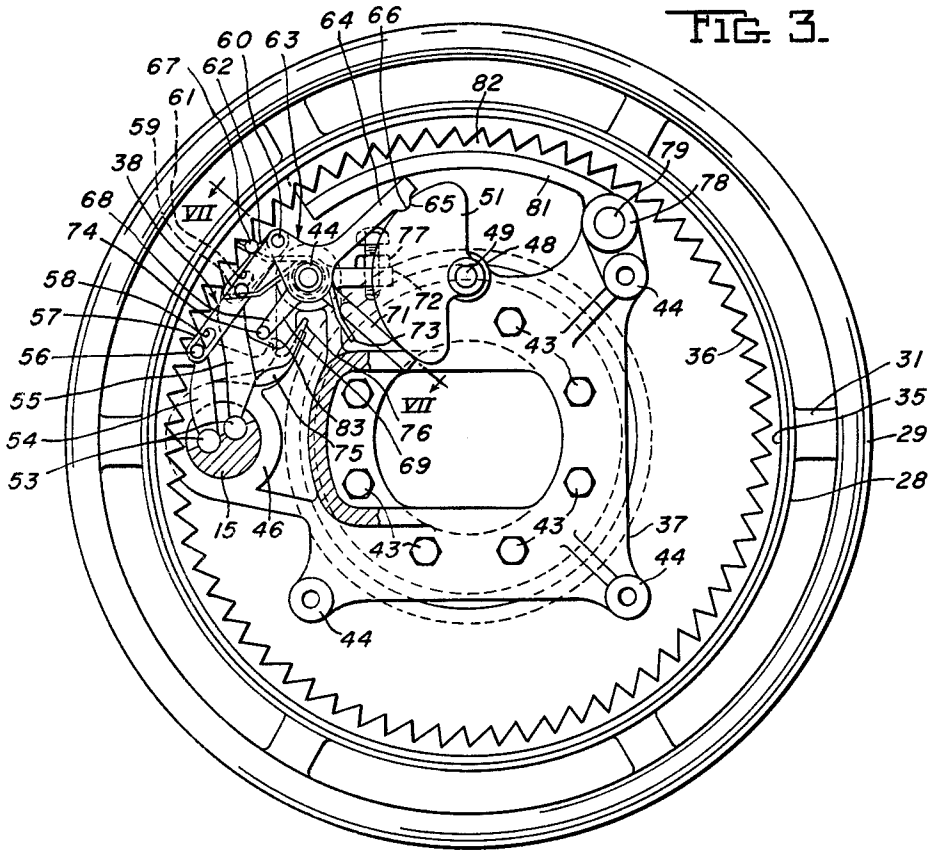
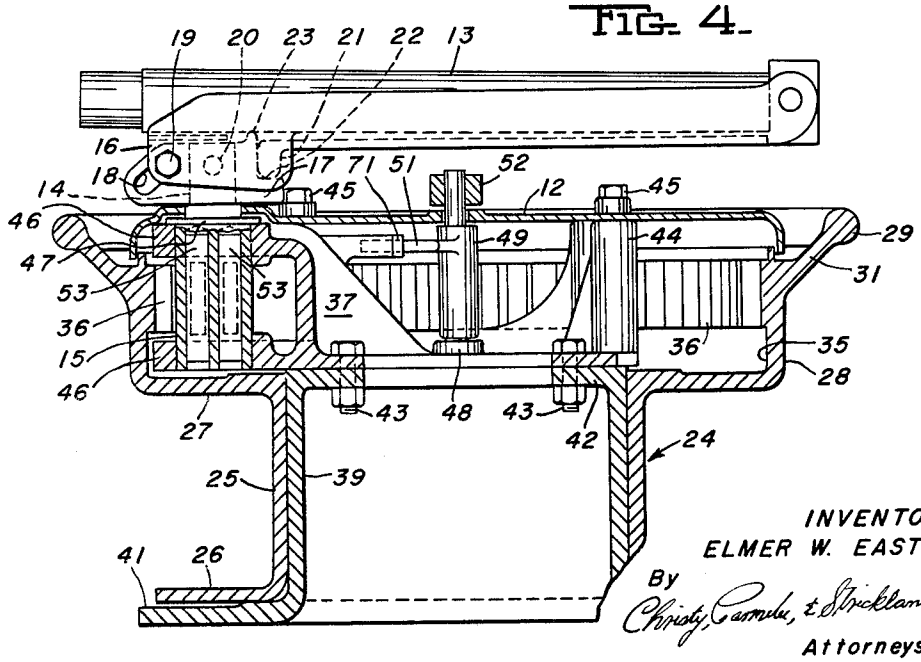


FIG. 4.



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RATCHET DEVICE

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FIG. 5.

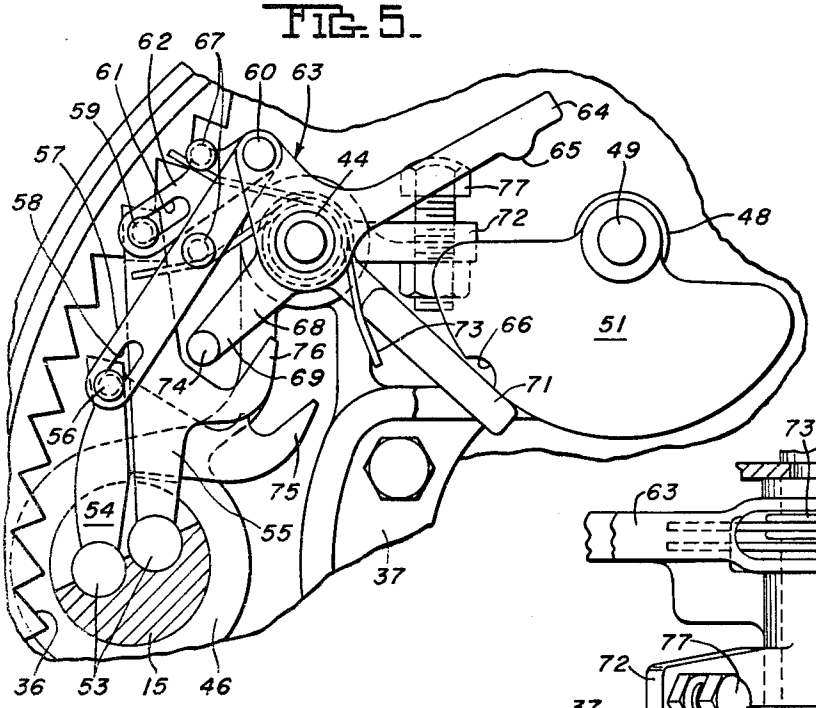


FIG. 7.

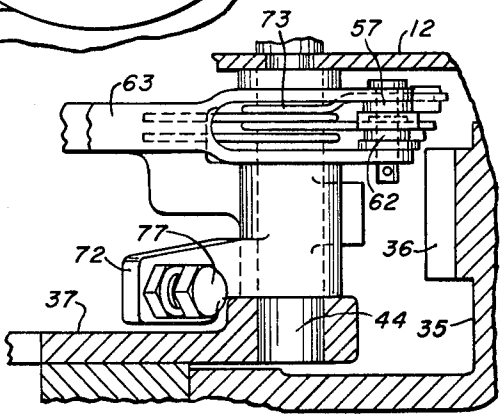
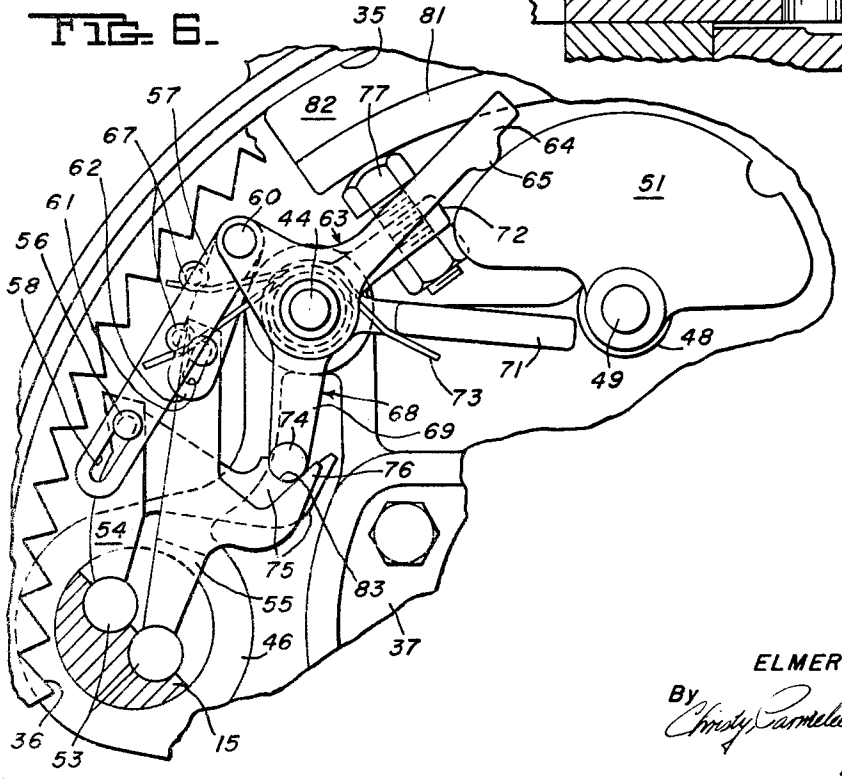


FIG. 6.



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3,232,127

RATCHET DEVICE

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12 Claims. (Cl. 74—143)

This invention relates to ratchet devices and more particularly to a manually operated ratchet device for the winding and reeling of cables and the like onto a drum whereby tension on a cable wound on the drum is adjustable by selectively tightening or slackening the cable through controlled rotation of the drum.

It is ofttimes desired to lash barges and other floating vessels to one another or to landings and decks by the means of rigging such as winches and the like. In the accomplishment of this function, customary rigging such as ratchets, guide frames, deck pads and the like are used which submit operating personnel to the hazards of open gearing and other exposed mechanisms as well as to dangerous flying rigging occasioned when weakened elements placed under stress break. Also, the operation of customary rigging normally requires that hand tools and extra gear be brought to the site of the device in order to manipulate it, and the necessity for such becomes a burden and a hazard especially in consideration of the station of employment of such devices where operating personnel must be unencumbered for quick movement to avoid accidents.

It is the principal object of the instant invention to provide a new and improved ratchet device.

Another object is to provide a rotary ratchet device with a strong holding and pulling power for lines wound onto the device.

A further object is the provision of a ratchet device having all mechanical elements enclosed within a housing for protection against the weather and for the safety of operating personnel.

Another object is the provision of a ratchet device having a unique ratchet dog assembly wherein a safe and positive pulling and locking of a rope load is possible through double-acting dog elements operative with large ratchet teeth to control the cable drum rotation.

Still another object is the provision of a ratchet device which is compact in design for mounting onto deck surfaces and the like wherein maximum overhead clearance is required.

Still another object is the provision of a ratchet device having a cam controlled ratchet dog assembly such that the function of holding, pulling, or releasing of a cable is made selective with ease and simplicity of action.

A still further object is to provide a ratchet device which is constructed to withstand cable shock loads without failure.

A complete understanding of the instant invention may be had from the following detailed description of a specific embodiment thereof when read in conjunction with the appended drawings, wherein:

FIG. 1 shows the device in plan view with the mechanism thereof completely enclosed by a housing;

FIG. 2 is a side elevational view of the device with an operating handle thereof elevated into a position for oscillation;

FIG. 3 is a plan view of the device with the top cover plate removed exposing the ratchet mechanism and support frame therefor;

FIG. 4 is a longitudinal cross-section of the device, partly broken away, taken along the line IV—IV of FIG. 1;

FIG. 5 shows the ratchet dog assembly conditioned for

incremental release of a load or tension on a cable wound on the device;

FIG. 6 depicts the ratchet dog assembly conditioned for release of a rope or cable from the ratchet with parts arranged for braking action of such release; and

FIG. 7 is a sectional view of the attachment of dog assembly elements to a support post taken along line VII—VII of FIG. 3.

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a housing generally designated numeral **11** having a cover plate **12** with a manually operable handle **13** which is folded on itself in its retracted or rest condition. As best shown in FIGS. 2 and 4 the handle is connected to a pin **14** protruding through the cover plate **12** and which is integrally formed, for example, with a shaft **15** mounted for oscillatory movement within the housing **11**. The handle **13** is provided with a bifurcated bracket **16** which is suitably connected to a block or support **17** fixed to the pin **14** by fastening means such as a wedge pin **20**, FIG. 2. The support **17** includes an elongated slot **18** to which the handle bracket **16** is slidably bolted by a fastener **19** fixedly located on the bracket.

When the handle is raised in the position shown in FIG. 2, and thrust in a direction toward the left end of the slot **18**, the bolt **19** slides within the slot **18** and the handle moves in such direction so that a projection **21** depending from the lower surface of the handle **13** is removed from a notch **22** of the support **17** into an elevated position above and behind an abutment **23** fashioned in the top of the support **17**. Thus, the handle is maintained in its elevated condition as depicted in FIG. 2 until it is pulled upwardly and over the abutment **23** and lowered into the notch **22** into the rest position shown in FIG. 4. The support **17** and the bracket **16** of the handle are in close fitting engagement such that arcuate movement of the handle **13** oscillates the shaft **15** through an angle above and below the line IV—IV of FIG. 1 about the fixed axis of the shaft.

The ratchet device **11** includes a cable drum **24** as best illustrated in FIGS. 2 and 4 which includes a reel portion on barrel **25** with side flanges **26** and **27**, the latter flange being integrally formed with an upwardly directed continuous hub **28**. A hand wheel or outer rim **29** is connected fixedly to the hub **28** by spokes **31** whereupon rotation of the hand wheel **29** simultaneously rotates the drum barrel **25** for a purpose to be explained more completely hereinafter. A fairlead **32** is provided on the barrel **25** as shown in FIG. 2, having a bore **33** through which an end portion of a cable, not shown, is secured to the barrel by a set screw or the like engaged within an aperture **34** opening into the bore **33**. A cable, rope or the like can be attached securely to the cable drum **24** rapidly by utilization of the fairlead **32**.

The hub **28** forms a side enclosure for the mechanical elements associated with the ratchet device **11** as indicated in FIGS. 3 and 4. The hub inner wall **35** has ratchet teeth **36** circumferentially arranged about a casting or support frame **37** to which is engaged a ratchet dog assembly **38** and other elements of the device to be explained subsequently. The barrel **25** of the cable drum **24** is mounted for free rotation about a post **39** having a circumferential flange or skirt **41** which is secured to a deck of a vessel, for example, by suitable means such as welding to fix the ratchet device **11** in location for use. The post **39** is hollow with a top circumferential flange **42** inwardly directed which functions as a support ledge for the frame **37** which is attached thereto by suitable means such as bolts **43** passed through a lower inwardly directed flange of the frame. The frame **37**

includes posts 44 which are each provided with a tapped bore or opening into which mounting bolts 45 are engaged for securing the cover plate 12 in position spaced above the hub 28 with the periphery of the cover 12 overlapping the periphery of the hub to shelter the mechanism therein. The casting or support frame 37 has integrally formed therewith a pair of vertically spaced sleeves 46 in which the shaft 15 is slidably set for rotary motion brought about by oscillation of the handle 13 through arcs of swing as described previously. The shaft 15 is shouldered as at 47 for retaining the shaft coaxially in position within the aligned pair of sleeves 46. Also formed integrally with the casting or support 37 is a bearing boss 48 on which is pivoted an end of a cam pin 49 of a control cam 51. The upper end of the cam pin 49 extends through an aperture of the cover plate 12 for attachment to a control lever 52, FIGS. 1, 2 and 4, for the purpose of rotating the control cam 51 arcuately to various positions for changing the action of the ratchet device whereby the ratchet is in a condition for holding, pulling or releasing of a cable lead selectively.

Referring now to FIGS. 3 and 4, there is shown the dog assembly 38 for manipulation of the ratchet device 11 in the selected conditions as aforementioned, with the shaft 15 positioned coaxially within the spaced pair of sleeves 46. A pair of dog pins 53 are rotatively seated within parallel longitudinal bores fashioned in the shaft 15 between which lies the shaft axis in parallel relation. The pins 53 may be removably inserted into the parallel bores which extend partially through the length of the shaft 15, and a central portion of the shaft 15 is removed for exposure of the pins 53 fitted within the bores.

Each pin 53 has an integral dog or pawl extending radially therefrom, one of these pawls being designated 54, and the other 55. Both have terminal portions for cooperation with the ratchet teeth 36. For convenience in explaining their operation, the shorter pawl 54 is sometimes herein referred to as a "dog," and the longer one, 55, as a "pawl," although both function generally in the same way and form a part of the assembly hereinafter sometimes referred to as "the ratchet-dog assembly 38." When the shaft 15 is oscillated by the handle 13 through a small arc, the axes of the pins 53 alternately fall below and above a line passing through the center of the shaft 15 coincident with line IV—IV of FIG. 1, and the resultant mechanical connection of the dog 54 and the pawl 55 to the shaft 15 is sometimes referred to as a whiffletree organization. The dog 54 is provided with an upstanding rivet 56 approximate its acting end adjacent the ratchet teeth 36, and a control plate 57, which is slotted as at 58, is slidably connected to the rivet 56 for motion transmission. Similarly, the pawl 55 has provided on its upper surface an upstanding rivet 59 which is engaged within a slot 61 of a control linkage 62. At the respective ends of the control plate 57 and linkage 62 opposite their respective slots 58 and 61 is one arm of a bifurcated bell crank lever 63 engaged by a pin 60 to both the linkage 62 and the plate 57 for pivotal movement, FIG. 7. The plate 57 with its slotted end 58 and the link 62 with its slotted end and the rivets 58 and 69 on the dog and pawl respectively engaged in the slots provide a lost motion linkage between the dog and pawl and the pivot pin 60 whereby arcuate movement of the pin 60 by rotation of the bell crank on its supporting post changes the attitude of the linkage with respect to the pawl and dog from a drum winding attitude to a drum escapement action, as hereinafter more fully described. The bell crank 63 includes a second arm 64 which is provided with a protuberance 65 in frictional engagement with the periphery of the cam 51, the protuberance 65 being received within an arcuate notch 66 formed in the peripheral surface of the arcuate cam as shown best in FIG. 3. The linkage 62 and the control plate 57 are each provided with an upstanding projection or rivet 67 for a purpose to be more fully described hereinafter.

The bell crank 63 is mounted for rotary action on a post 44 located at the upper left corner of the support frame 37 as viewed in FIG. 3. Also mounted for rotary movement on the same post is a release and brake control lever 68 which includes three arms 69, 71 and 72 radiating from a central hub which is rotatively connected positions. The arm 71 is in biasing engagement with lowing engagement with the cam 51 as it is rotated by manipulation of the handle 52 to any one of three selected positions. The arm 71 is in biasing engagement with one tang of a spring 73 having three tangs, and a coil coaxially arranged on the post 44. The other two tangs of the spring radiate from its coil portion outwardly into urging engagement with rivets 67 upstanding on the control plate 57 and linkage 62 biasing the acting ends of the dog 54 and the pawl 55 outwardly and continuously into yieldable abutment with the ratchet teeth 36. When the arm 71 is moved arcuately by rotation of the cam 51, the force applied against the end of the spring 73 is changed accordingly, which either urges the acting ends of the dog 54 and pawl 55 continuously toward the teeth 36 with a firm pushing contact, or with a slight force of yieldable engagement.

The arm 69 of the lever 68 is provided at its terminal with a lug 74 which is swung selectively as a stop member into abutment with lateral fingers 75 and 76 of the dog 54 and the pawl 55, respectively to hold the ends of the dog and pawl out of engagement with the ratchet teeth 36 by the force of the spring 73 acting on the arm 71 when the cam 51 is positioned as shown in FIG. 6. The arm 69, biased to move counterclockwise by the spring 73 urging against the arm 71, enables a toggle action to be effected both of the dog linkage and the pawl linkage, dejending on the orientation of the pins of the dog 54 and the pawl 55 as effected by the rotation of the shaft 15. The acting ends of the dog and the pawl slide against the teeth 36 toward the center of the device.

The third arm 72 of the lever 68 is suitably apertured to receive threadedly therein a stop member 77 which projects laterally toward the hub inner wall 35 which carries the teeth 36. The frame 37 includes a socket 78 into which is fitted for rotation a pin 79 to which is secured an arcuate brake 81 having a brake arm 82 arranged to swing into frictional engagement with the wall 35 of the hub 28 beneath the plane of the circumferential ratchet teeth 36. The stop 77 is urged against the brake 81 both by the force of spring 73 directed against the arm 71 and by force exerted on the handle 13 transmitted through the lug 74 and arm 69 when the lug is located within a notch 83 formed in the finger 75 of the dog 54. The latter action occurs only when the cam 51 is rotated such that the arm 71 is permitted to move toward the brake 81, at which time the arm 69 of the lever 68 is moved by the spring 73 acting on the arm 71 to disengage by toggle action the acting ends of the dog 54 and pawl 55 from the teeth 36, as shown best in FIG. 6, when the load is alternately released on such ends by swinging of the handle 13 to cause counterclockwise rotation of the hub 28.

OPERATION

The ratchet device as depicted in FIG. 3 has the ratchet dog assembly 38 in condition for taking up a line secured to the drum 24. The handle 13 is oscillated to rock the shaft 15 to alternately move the acting ends of the dog 54 and pawl 55 into and out of engagement with the ratchet teeth 36. The dog 54 and pawl 55 are shown in FIG. 3 in holding condition with their ends in face-to-face contact with the ratchet teeth 36. When the dog 54 is rocked upwardly (as viewed in this figure) by simultaneeous arcuate movement of the handle 13 and shaft 15, the dog pushes against a ratchet tooth in a clockwise direction to move the drum the increment of one tooth.

At the same time, the pawl 55, which is biased outwardly toward the teeth 36 by the spring 73, drops into holding engagement with the next lower tooth whereupon arcuate movement of the handle 13 in a counterclockwise direction urges the pawl 55 upwardly to thrust against a tooth 36 in a clockwise direction to move the drum another increment equal to one tooth while the dog 54 drops downwardly into the next tooth for a subsequent thrust when the handle is again swung in a clockwise direction. In this fashion, the ratchet dog assembly 38 is double-acting with either the dog or the pawl forcing the drum in clockwise direction on the arcuate motion imparted to the handle in one direction or the other. If at any time it is desired to stop the take-up or winding of the rope onto the drum 24, the dog 54 and the pawl 55 will resist counterclockwise rotation of the drum 24 by reason of both having their acting ends in abutment with two ratchet teeth 36 with holding force applied by a cable load being equally distributed against these members; accordingly, the device is made fail-safe in that holding action is performed by both the dog and the pawl 54 and 55, respectively.

Assuming the rope wound on the drum 24 is to be released, the control handle 52 is rotated to point to the "rope release" position indicated by suitable markings on the cover plate 12, FIG. 1, whereupon the cam 51 is rotated through a clockwise angle of approximately 90 degrees, FIG. 6. This causes the proturberance 65 on the arm 64 of the bell crank 63 to be removed from the notch 66 to change the position of the pin 60 to which the attachment of the control plate 57 and linkage 62 is made with the bell crank 63. Also, the arm 71 of the brake and control lever 68 follows the cam surface in a direction counterclockwise, FIG. 3, with the one tang of the spring 73 urging the arm 71 in such direction. Movement of the arm 71 carries the arms 69 and 72 in the same direction or rotation on the post 44 such that the former arm has its lug 74 brought into holding engagement against the fingers 75 and 76 of the dog 54 and the pawl 55, respectively, effecting a toggle action and maintaining the acting ends of such members out of contact with the ratchet teeth 36 when the load on these ends is removed by swinging of the handle 13 first in one direction, and then in the opposite direction. The simultaneous movement of the arm 72 with the arms 69 and 71 brings the stop 77 of such arm into urging contact with the brake 81 to retard the counterclockwise rotation of the drum 24. Accordingly, the drum 24 is allowed to rotate counterclockwise inasmuch as the holding force of the dog 54 and pawl 55 no longer is applied. Control of the counterclockwise rotation of the drum is maintained, however, through manipulation of the handle 13 whereby the braking force of the stop 77 is varied against the brake 81 by force exerted through the handle 13, to urge the pawl 55 against the lug 74 in a counterclockwise motion, thus swinging the arm 72 and stop 77 into contact with the brake arm 82.

When the control handle 52 is moved to the "load release" position which is suitably marked on the cover plate 12 of the device, the cam 51 in the condition shown in FIG. 3 is rotated approximately 90 degrees counterclockwise to rest in the position as depicted in FIG. 5, whereupon the bell crank arm 64 is released from its frictional contact with the cam 51. The pin 60 on the crank 63 is moved by such action about one post 44, FIG. 5, to a position whereat the acting end of the dog 54 is withdrawn from a tooth 36.

The disengagement of the dog 54 from a tooth 36 on oscillation of the shaft 15 is achieved by reason that the pawl 55 in its engagement with a tooth 36 is urged to release the force of a tooth 36 acting counterclockwise against the acting end of the dog 54. As mentioned previously, the cable on the drum barrel 25, when under load, creates a force which tends to rotate the drum 24 counterclockwise, and the teeth 36 in turn distribute

the force of the load equally against the acting ends of the dog 54 and the pawl 55. When the force against the dog 54 is removed by movement of the pawl 55 clockwise from its holding position with a tooth 36, the control plate 57 linked to the dog 54 and to the pin 60 is pulled clockwise by the urging of the end of the tang of the spring 73 clockwise against the rivet 67 on the plate 57. The bell crank 63 is free to oscillate about the post 44 clockwise to the limit established by the positionment of the cam 51 as shown in FIG. 5, the crank arm 64 being stopped when its swings into abutting relation with the cam periphery. The rivet 56 of the dog 54 slides relative to the slot 58 within which it is captured, urging the plate 57 inwardly as the crank 63 and the position of the pin 60 move clockwise by the urging action of the spring 73 against the rivet 67 on the plate 57. In this manner, a toggle action takes place by which the acting end of the dog snaps out of engagement with a tooth 36 when the load thereagainst is relieved by the acting end of the pawl 55 when moved clockwise past a holding position.

The handle 13 is oscillated or permitted to freely oscillate clockwise whereupon the pawl 55 is backed down by the force of the tooth 36 with which it is engaged, the tendency being for the teeth 36 to be rotated counterclockwise when the cable is under tension. This movement pulls the pin 60 and crank 63 counterclockwise, and the spring 73 forces against the rivet 67 of the dog 54 while the rivet 56 of the dog 54 slides clockwise with relation to the slot 58. The spring 73 urges the dog 54 into engagement with an adjacent tooth 36. The acting end of the dog thus is by toggle action disengaged from contact with a tooth, the tooth moves past the dog acting end counterclockwise, and then the acting end is urged into contact with another tooth by spring action.

The toggle action of the pawl 55 takes place when the dog 54 has assumed the force of both the tooth against which it abuts, and the force of the tooth which reacted against the pawl 55. At this time, the linkage 62 through the motion transmitting rivet 67 and the pawl 55 is pulled toward alignment of its longitudinal axis with that of the pawl 55. In other words, the angle included by the linkage 62 and the pawl 55 increased toward 180 degrees by the downward or clockwise movement of the pawl pin 53, FIG. 5, which pulls the pawl rivet 59 to move the linkage 62 downwardly and inwardly. As the latter motion occurs, the spring 73 acting against the rivet 67 of the linkage 62 provides a snap action which actuates the toggle action of the linkage 62 and pawl 55 by which the pawl 55 is disengaged from a tooth. Subsequently, the pawl 55 is engaged by reversal of the toggle action described.

It can be appreciated, accordingly, that the drum 24 is permitted to rotate counterclockwise by the alternate toggle action of the pawl 55 and the dog 54 as above-described. In this movement, either the dog 54 or the pawl 55 is engaged with a tooth 36 such that at no time is the drum freely rotatable as it is when the cam 51 and dog assembly elements assume positions as shown in FIG. 6.

By the concept of the instant invention, there is provided a safe and reliable means of take-up and paying out of a line wound on the drum 24. The device is double-acting on cable take-up. Upon pendulous motion of a foldable handle, the device maintains tension on a line connected to the drum by positive holding action of the acting ends of a ratchet dog assembly. Also, the tension may be released on a rope wound on the drum 24 selectively by means of the positioning of a control cam 51 which changes the biasing engagement of the dog 54 and pawl 55 in relation to the ratchet teeth 36. The stop 77 is swung against the brake 81 when the cam 51, FIG. 6, is placed in the position shown, the arm 71 being spring-biased by the spring 73 toward the brake 81. Force exerted through the dog 54 when the lug 74 is re-

ceived within the notch 83 of the dog finger 75 controls the braking force applied by brake 81 against the surface 35 of the hub 28.

The compact arrangement of the ratchet device comprising the invention assures against damage from crosswires and rigging which must pass over the device when it is secured on the deck of a barge, for example, with the ratchet device serving as a means of lashing the barges to one another, or to landings and docks. Although the device is compact, the unique double-acting dog assembly 38 enables it to exert a strong pulling force and makes it possible for the device to be versatile in operation by offering a cam controlled means of either taking up a cable onto the drum or relieving the tension on the cable at a controlled rate.

It is manifest that the above-described embodiment of the invention is merely illustrative and that numerous modifications may be made within the spirit and scope of the invention. Further, it will be understood that the particular operating handle illustrated is only an example of one type of power means which may be operated upon in practicing the invention, and that the invention is not limited to use with the manual power means illustrated.

What is claimed is:

1. A ratchet device comprising a post, a drum with a barrel mounted for rotation on the post, the drum having a hub co-extensive with the barrel and defining a recess, a support frame fixed to the post and located within the recess, a shaft pivotally connected to the frame, a ratchet dog assembly linked to the shaft with a dog and a pawl having acting ends oscillated by rocking of the shaft, lever means for rocking the shaft, ratchet teeth coaxially fixed on the hub and in operative contact with the acting ends of the dog and the pawl for unidirectional incremental rotation of the drum, resilient means for urging the dog and pawl acting ends into yieldable contact with the teeth, a control cam mounted pivotally on the support, a bell crank having one arm in cam following engagement with the cam periphery, an elongated control plate slidably connected in motion-transmitting relation to the dog, a linkage slidably connected in motion-transmitting relation to the pawl, the other arm of the crank being pivotally connected to the plate and to the linkage, and a control lever fixed to the cam for rotation thereof to a position whereupon the bell crank is pivoted to change the location of the pivotal connection of the plate and linkage with the crank to the arm whereby the acting end of the pawl is disengaged from the teeth and the rotation of the drum in the one direction is reversed.

2. A ratchet device comprising a post, a drum mounted for free rotation on the post, ratchet teeth coaxially positioned on the drum, double-acting dog assembly means supported on the post and having acting ends engaged to the teeth for rotation of the drum in one direction, control cam means connected to the dog assembly means for engaging and disengaging selectively the acting ends of the dog assembly means with the teeth, motion-transmitting means connected to the dog assembly means for thrusting alternately against the teeth with one acting end of the dog assembly means and then the other acting end whereby the drum is rotated incrementally, and urging means in biasing contact with the dog assembly means for forcing the acting ends into frictional contact with the teeth.

3. A ratchet device comprising a post, a drum coaxially mounted for rotation on the post and having a hub extending above the post and defining a recess, ratchet teeth formed on the inner wall of the hub and arranged coaxially with the drum and post, a support frame mounted within the recess and fixed to the post having spacer posts extending above the hub portion of the drum, a cover plate fixedly mounted on the spacer posts and covering the recess formed by the hub above the post, a shaft mounted on the frame for rocking action and with a portion extending above the cover plate, a dog connected at one end to the shaft, a pawl connected at one end to the shaft, both the dog and the pawl being mounted to the shaft to pivot about parallel axes on opposite sides of the axis of the shaft, a control plate slidably attached to the dog's other end, a linkage slidably attached to the pawl other end, the other ends of the dog and the pawl being in engagement with the ratchet teeth in one condition for rotating the drum incrementally in one direction, a bell crank connected to a spacer post for pivotal movement with one arm of the crank attached to both the control plate and to the linkage, a spring in biasing engagement with the plate and linkage for urging the dog and the pawl other ends into frictional contact with the ratchet teeth, and manually operable means connected to the shaft for rocking the shaft whereby the other ends of the dog and the pawl alternately force against the teeth in one direction to rotate the drum.

4. A ratchet device as in claim 3 including a control cam mounted for rotation on the support frame, a manually operated lever fixed to the cam for selective rotation of the cam to operative positions, a control lever having a first arm in cam following engagement with the cam, and a second arm in contact with the dog and pawl for holding the other ends out of engagement of the ratchet teeth, the control lever having a third arm, and a brake connected pivotally to the frame and urged into braking contact with the hub by the third arm when the second arm is in holding engagement with the dog and pawl.

5. A winch comprising,

(a) a hollow cylindrical post having an outwardly-turned flange for mounting the post to a supporting structure,

(b) a drum rotatably mounted on the post and concentric therewith having a lower reel portion with a flange at the bottom bearing on the outwardly-turned flange on the post, an upper flange, an upwardly-directed hub continuous with the upper flange and of larger diameter than the reel portion, an annular series of teeth on the inner wall of the hub,

(c) a ratchet mechanism housed within the hub cooperating with the teeth for rotating the drum,

(d) said hub having a plurality of spokes extending outwardly therefrom, a hand-wheel around the hub and supported by the spokes for manually turning the drum on the post, and

(e) a fairlead on the drum for securing the end of a line to be wound on the drum.

6. A ratchet device of the class described comprising:

(a) a rotatably mounted drum having ratchet teeth around its inner wall,

(b) a support structure mounted within the drum about which the drum rotates,

(c) driving means comprising a member mounted on the support for oscillation about an axis parallel with and eccentric to the axis of rotation of the drum, said member having an operating handle extending above the drum for effecting oscillation thereof,

(d) a dog and pawl on said member at opposite sides of its axis of rotation, the dog and pawl having terminal portions for engagement with the ratchet teeth, oscillation of said member about its axis of rotation serving to alternately move the dog and pawl in opposite directions relative to the ratchet teeth, and

(e) means for selectively conditioning the operation of the dog and pawl for

(1) rotating the drum against the resistance of a load imposed on the drum when a cable is wound about the drum,

(2) an escapement position to effect a step-by-step reverse rotation of the drum under tension when a cable is wrapped about the drum under tension, and

(3) a position where the pawl and dog are entirely clear of the ratchet teeth and the drum is free-running.

7. A ratchet device as defined in claim 6 comprising a brake shoe mounted on the support structure within the drum, the brake shoe being operatively connected to the conditioning means and the driving means for movement of the brake shoe into and out of braking contact with the inner wall of the drum on actuation of the operating handle only when the dog and pawl are in a position clear of the ratchet teeth.

8. A ratchet device as defined in claim 6 wherein biasing springs are provided for urging the dog and pawl yieldably into engagement with the ratchet teeth, said conditioning means comprising a link attached to the dog through a lost motion connection and a link attached to the pawl through a lost motion connection and a common member for changing the effective attitude of said links relative to the dog and pawl respectively, and means for selectively effecting a change in the position of said common member.

9. A ratchet device comprising:

(a) a post,

(b) a drum rotatably mounted on the post and having teeth around its inner wall,

(c) a shaft pivotally mounted on the post,

(d) means for oscillating the shaft about a pivot axis,

(e) a dog and pawl pivotally mounted on the shaft on opposite sides of the shaft pivot axis,

(f) biasing means for urging the dog and pawl toward and away from the teeth,

(g) control means for selectively conditioning the biasing means to establish a plurality of operating modes including a forward driving mode wherein the dog and pawl alternately engage the teeth for incremental unidirectional rotation of the drum in a first direction on oscillation of the shaft, a reverse mode wherein the dog and pawl alternately engage the teeth wherein the pawl and dog function as an incremental escapement when the drum is urged in a second direction by an external force and the shaft is oscillated, and a free-running mode wherein the dog and pawl are held out of engagement with the teeth,

(g) a brake member pivotally mounted on the post for movement into and out of braking contact with the inner wall of the drum, and

(h) means for urging the brake member against the drum wall.

10. A ratchet device of the class described comprising:

(a) a rigid support,

(b) a rotary drum assembly mounted for axial rotation on the support,

(c) an annular series of internal ratchet teeth on the drum assembly,

(d) an operating member on the support interposed between the axis of rotation of the drum and the internal ratchet teeth and mounted on the support for oscillation about an axis parallel with the axis of rotation of the drum,

(e) a pair of pawls pivotally mounted on the operating member, one pawl of the pair being at one side of the axis of rotation of said operating member and the other at the opposite side whereby oscillation of the operating member alternately advances one and retracts the other, each of said pawls having a ratchet-engaging free terminal,

(f) a selector cam movable into any one of three positions, and

(g) means controlled by the position of said cam for changing the operation of said pawls to alternately engage the ratchet teeth for rotating the drum in increments to effect a cable-winding rotation when the operating means is oscillated, or where the pawls alternately engage the ratchet teeth upon oscillation of the operating means to provide an incremental escapement when an unwinding torque is exerted on the drum, or where both pawls are simultaneously clear of engagement with the ratchet teeth.

11. A ratchet device of the class described as defined in claim 10 wherein there is an internal braking surface on said drum, a brake shoe on the support within the drum assembly movable into and out of braking engagement with said surface, and means including one of said pawls to effect motion of the brake shoe through the oscillation of said operating member when the pawls are in the last-named position clear of engagement with the ratchet teeth.

12. A ratchet device of the class described as defined in claim 10 wherein the means controlled by the position of the cam comprises

(a) a hook-like extension projecting laterally from each pawl in the plane in which it moves,

(b) a separate link attached to each pawl near its free end through a lost motion connection,

(c) a bell crank member pivotally mounted on the support having an arm to which both of said links are pivotally connected,

(d) springs operating against said links and yieldably urging the ends of the pawls into engagement with the ratchet teeth, movement of the bell crank serving to change the attitude of said links with respect to the pawls for selecting the direction in which the drum is rotated by the pawls, said cam serving to restrain the oscillation of the bell crank in one position and permit free oscillation thereof in another, and

(e) other means controlled by the cam for cooperation with said hook extensions on the pawls for holding the pawls out of engagement with the ratchet teeth.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,232,127 February 1, 196(

Elmer W. Easter

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 9, for "positions. The arm 71 is in biasing engagement with" read -- to the post. The arm 71 is i frictional sliding, cam-fol- --; line 36, for "dejending" read -- depending --.

Signed and sealed this 7th day of February 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents