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[54] ACTUATABLE STOP

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[58] Field of Search 212/39, 66-69;
104/35, 47; 174/526, 527

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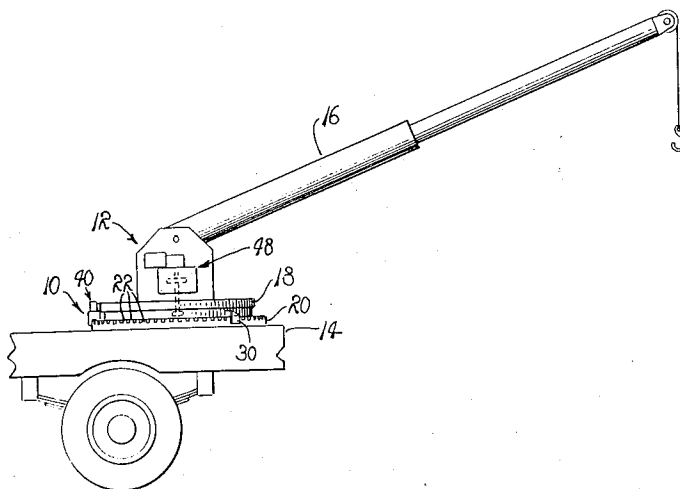
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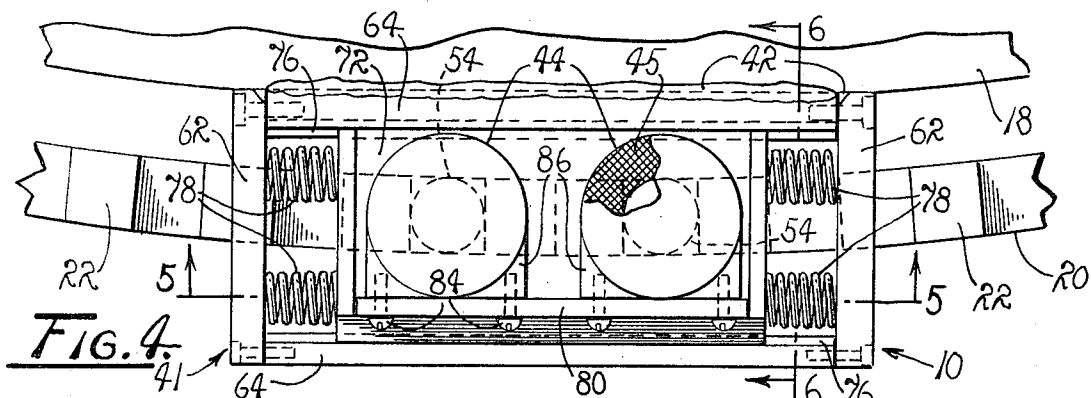
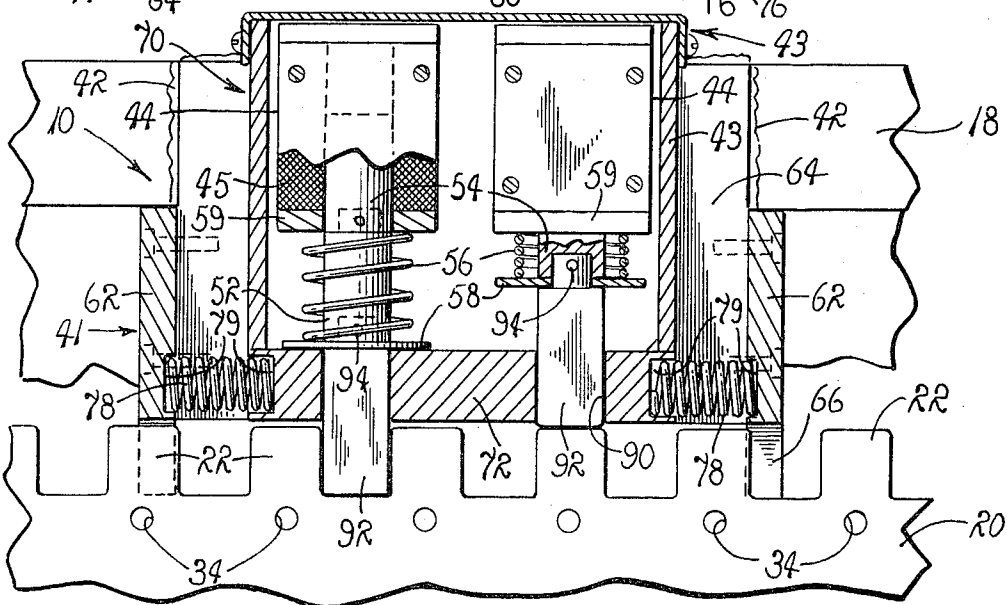
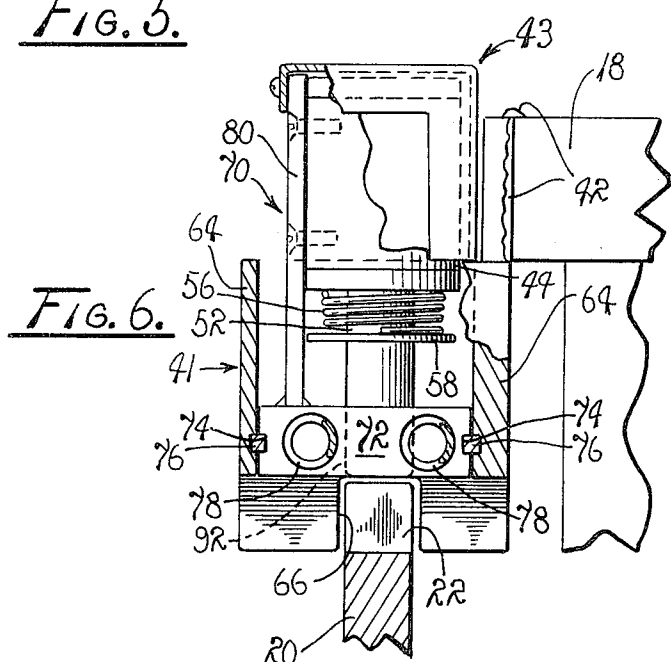
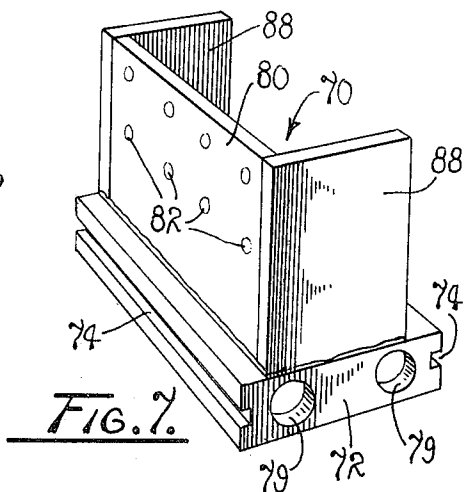
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ABSTRACT

An actuatable stop particularly suited for use as a "dead man" stop in arresting "drift" for cranes and the like, characterized by a rigid stop ring circumscribing an associated crane's pedestal and an actuatable locking mechanism including a reciprocating shaft adapted to extend from the pedestal into locking engagement with the ring in response to an actuation of an associated control, a feature of the stop being the inclusion of means for extending the shaft in response to a detected power-off condition for the crane, whereby rotation of the pedestal automatically is arrested as the crane's power train is de-activated.

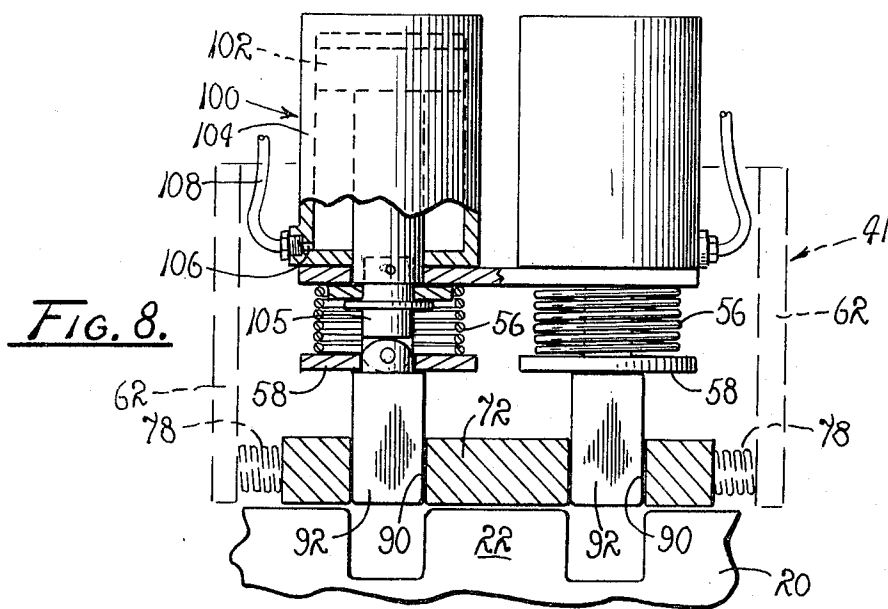
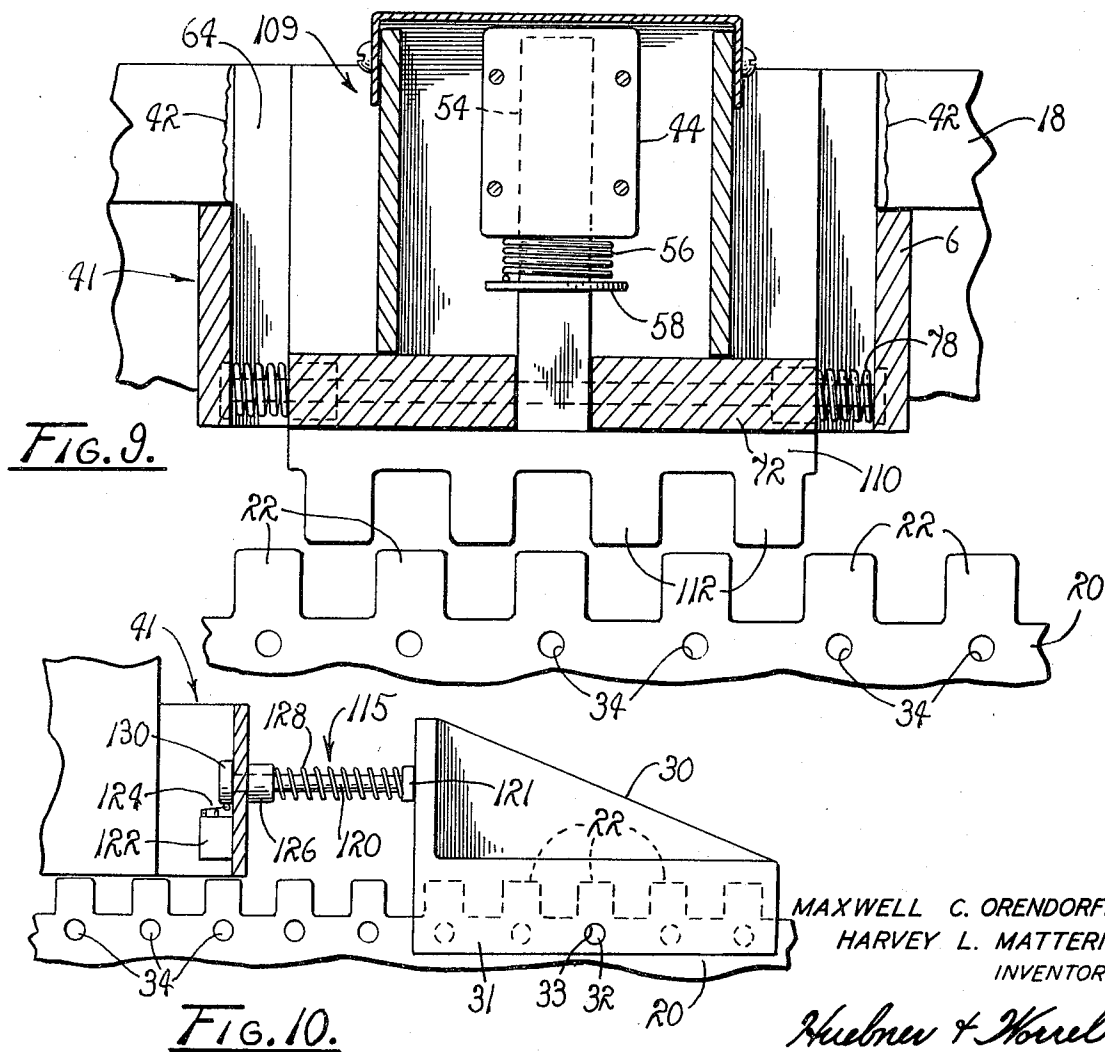
1 Claim, 10 Drawing Figures





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ACTUATABLE STOP

BACKGROUND OF THE INVENTION

The invention relates to "dead man" stops and more particularly to a "dead man" stop particularly suited for employment with a boom-supporting pedestal of a crane and adapted to respond to a de-energization of the crane's drive train for effecting a locking of the pedestal against rotation.

The prior art is replete with braking mechanisms employed in arresting the translatory displacement of pivotally supported booms such as those employed by cranes and the like. Among the mechanisms presently utilized are mechanically actuated brake shoes, bands, dash-pots, and similar responsive devices which serve to dissipate the kinetic energy of a rotating boom. Another type of stop often employed is a rigid stop mounted adjacent to a crane's pedestal so that displacement of the pedestal is arrested as its displacement through a selected angle is completed for causing selected portions of the pedestal to engage the stops.

One of the problems which continues to confront those involved in the design and use of cranes, particularly cranes of the type which are supported on flatbed vehicles and the like, is the likelihood that the boom, when loaded, will "tip" or capsize the supporting vehicle. This particularly is true in those instances where the boom is displaced to a position extending laterally from the sides of the supporting vehicle. As is readily apparent to those familiar with the use of such cranes, the greater the length of the boom the greater is the tendency to capsize, due to the length of the resulting moment arm.

However, it also is highly desirable to provide any given boom with a working span or length sufficient to extend the distal end of the boom to selected points located at practical distances from the pedestal under optimum load conditions. Where a boom is supported on a vehicle, such as a flatbed truck, the working radius is greater in fore-and-aft directions, relative to the longitudinal axis of the supporting vehicle, than in lateral directions. This is due to the increased effective radius of the supporting structure in fore-and-aft directions. Consequently, precise control of the pedestal's rotation must at all times be exercised in order to avoid drift and over-extension. Additionally, since the distal end of a boom normally is brought into close proximity with various types of structures such as buildings, power lines and the like, limits of displacement must be accurately determined and fixed. In practice, drift and over-extension may result from power failure at the braking mechanism and from other factors of a similar nature which create conditions wherein a boom is not positively driven but is "free-wheeling" and its rotation is unarrested.

OBJECTS AND SUMMARY OF THE INVENTION

This invention overcomes the aforementioned difficulties by providing an actuatable stop, particularly suited for use with the boom-supporting pedestal of a power-driven crane, including a stop ring rigidly fixed to a supporting base and circumscribing an actuatable locking mechanism adapted to respond to a power-off condition for the crane's power train to achieve a positive coupling between the mechanism and the ring for thus coupling the pedestal with the base whereby displacement therebetween is arrested and boom drift is avoided.

Accordingly, an object of the invention is to provide an improved selectively operable stop for use with a rotatable pedestal.

Another object is to provide a stop for arresting boom overtravel for a vehicle supported crane.

Another object is to provide a stop particularly suited for use in arresting the rotation imposed on a vertically disposed boom-supporting pedestal in the presence of a power-off condition for the pedestal's power train.

Another object is to provide a stop for arresting the undesired displacement of the boom of a crane supported by an automotive vehicle.

Another object is to provide a "dead man" stop for detecting the existence of a power-off condition within the power

train of a rotatably driven crane and responsively activating the stop to achieve a positive coupling between a base-supported stop ring and a crane-supported locking mechanism for thus limiting azimuthal rotation of the crane's boom in the presence of a detected power-off condition.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary view of a power-driven crane, mounted on a flatbed vehicle, provided with an actuatable stop embodying the principles of the present invention.

FIG. 2 is a perspective view, on an enlarged scale, of the stop shown in FIG. 1, particularly illustrating the operative relationship of the stop ring and its associated actuatable locking mechanism.

FIG. 3 is a schematic view of a simplified electrical circuit as provided for controlling the operation of the actuatable stop shown in FIGS. 1 and 2.

FIG. 4 is a top plan view of the locking mechanism, as shown in FIG. 2 but with its cover plate having been removed.

FIG. 5 is a side elevation of the stop, taken generally along line 5-5 in FIG. 4.

FIG. 6 is a partially sectioned end view of the stop illustrated in FIGS. 4 and 5.

FIG. 7 is a perspective view illustrating supporting structure employed in supporting the locking mechanism shown in FIGS. 4 through 6.

FIG. 8 is a partially sectioned side elevation of a modified form of the stop illustrated in FIGS. 4 through 6.

FIG. 9 is a partially sectioned side elevation of still another modified form of the invention.

FIG. 10 is a detailed view of a circuit interrupter which may be employed with the stop illustrated in FIGS. 1-9.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Form

Referring to FIG. 1, a stop 10, which embodies the principles of the present invention, is illustrated in an operative environment relative to a boom-supporting pedestal 12. As illustrated, the pedestal 12 may be supported on a bed 14 provided for a flatbed truck, not designated. The pedestal 12 is supported for azimuthal rotation and serves operatively to support one end of a boom 16. The particular configuration and type of the boom 16 with which the stop 10 is employed is a matter of choice or convenience. However, it is to be understood that the boom 16 normally is an extendible boom which, in operation, is extended to predetermined lengths whereby the boom's distal end may be displaced to describe preselected arcs about the pedestal 12.

As a practical matter, the pedestal 12 selectively is driven in rotation by hydraulically or electrically activated power trains, including suitable gear trains 17 which impart selected rates of rotation to the pedestal. While not shown, it is to be understood that the pedestal 12 also includes suitable bearing structure upon which is supported a laterally extended base plate 18 adapted to be driven in rotation with the pedestal.

About the pedestal 12, in circumscribing relation to its base plate 18, there is disposed a stop ring 20, of a generally annular configuration, having a plurality of vertically extended teeth-like protrusions 22. These protrusions are spaced equidistantly about the uppermost surface of the ring 20 in a manner such as to define an annular row of vertically extended teeth circumscribing the base plate 18.

In order to expedite the mounting of the ring 20 on the bed 14, the ring is divided into arcuate segments, designated 24 and 26, and is provided with a plurality of radially extended mounting plates 28 having openings 29 formed therein for accommodating a bolting of the independent segments to the bed. Of course, as can readily be appreciated, the ring 20 can

be secured to the bed 14 in any suitable manner including welding, bolting, clamping or by any other suitable means which rigidly couples the ring 20 with the bed 14, whereby the ring 20 is disposed in close proximity with the peripheral surface of the base plate 18.

On the ring 20 there is mounted a pair of releasably coupled stops 30. Each of the stops 30 includes a pair of depending ears 31 disposed in mutual parallelism and adapted to receive therebetween the ring 20 in order that the stop 30 may be seated on the upper surface of the protrusions 22. The stops separately are secured in place through the use of pins 32 extending through coaxially aligned openings 33, formed in the ears 31, and openings 34 extended radially through the ring 20 in coaxial alignment with the openings 33. Therefore, the stops 30 may be selectively positioned about the circumference of the ring 20 and secured in place by inserting the pins 32 through the coaxially aligned openings 33 and 34.

As illustrated in FIG. 2, the ring 20 is associated with an actuable locking mechanism, generally designated 40. The locking mechanism 40 is supported by a bracket 41 secured to depend from the peripheral surface of the base plate 18 by any suitable means, including welds 42. Within the bracket 41 there is a housing 43, which contains the mechanism 40, adapted to be displaced relative to the ring 20 as the boom 16 azimuthally is displaced and the plate 18 is rotated for thus displacing the bracket.

Within the housing 43, there is supported a plurality of actuators 44. In the first form of the invention, as illustrated in FIG. 3, the actuators 44 are electrically energizable solenoids, including electrically energizable coils 45. The coils are connected, through suitable leads 46, within a power train control circuit 47 and establish a magnetic field thereabout as a current flow is established in the circuit. The circuit 47 serves to connect a suitable voltage source V with the crane's power train and brake assembly 48 for driving the pedestal 12 in azimuthal rotation.

As depicted in the simplified diagram, the circuit 47 further includes a master control switch 50 which is actuated to energize the power train and brake assembly 48 in accordance with selected modes of operation. As illustrated, the switch 50 is a simple on-off switch, however, as should readily be apparent, the switch 50 is compatible with the specific circuit employed and, where desired, may constitute a two-way switch for reversing the direction of current flow through the leads 46 of the control should the source V include a DC source of electrical current.

Since the specific control switch 50 is in practice varied as found desirable under given operative conditions, a detailed description is omitted. However, it is to be understood that the switch 50 serves to interrupt the flow of current through the coils 45 as the switch is actuated to de-energize the power train 48 when termination of azimuthal rotation for the boom 16 is desired. Furthermore, it is to be understood that the specific circuitry employed in connecting the actuators 44 with the power train control circuit 47 may be varied as desired, so long as the flow of current through the coils 45 of the actuators 44 is dictated through an actuation of switch 50 in order that the actuators 44 be activated in response to changes initiated in the current flowing through the circuit 47.

As presently employed, each of the actuators 44 is provided with an output shaft 52 coaxially aligned and coupled with an armature 54 which, in turn, is magnetically coupled with the coils 45 in order that the shaft 52 may be reciprocated. Of course, the armature 54 and shaft 52 may, if desired, be fabricated as a single shaft. Concentrically seated about the shaft 52 there is provided a compression spring 56 which is disposed between a collar 58, rigidly fixed to the shaft 52, and a concentric abutment plate 59.

Consequently, the shaft 52 is retracted toward the associated coil 45, in response to an electrical energization thereof, and is extended from the coils under the influence of the recovery forces of the spring 56, acting against the collar 58, when the coils 45 are electrically de-energized. Therefore,

as currently employed, the shaft 52 is reciprocated by opposing forces applied thereto by the coils 45 and the compression spring 56.

Since the coils 45 are connected in circuit series with the power train and brake assembly 48, it can readily be appreciated that the shaft 52 of each of the actuators is extended in the event the circuit between the assembly 48 and the voltage source V is interrupted, without regard to the specific manner in which the circuit is interrupted. Furthermore, it also should be apparent that the shafts 52 of the actuators 44 are retracted upon a completion of an electrical path through the circuit 47 for thus electrically energizing the coils 45. Therefore, the position of the output shafts 52 for the actuators 44, at any given instant, is dictated by the state of energization of the circuit 47 as it is employed to control the power train and brake assembly 48.

As best shown in FIGS. 4 and 5, the bracket 41, which supports the mechanism 40, is of a generally rectangular configuration and includes a pair of parallel, vertically disposed end plates 62 coupled together through a parallel pair of side plates 64. Each of the end plates 62 is provided with a downwardly directed opening 66, FIGS. 2 and 6, which receives the teeth-like protrusions 22 of the ring 20, whereby relative displacement therebetween is achieved as the base plate 18 is rotated relative to the ring 20.

The actuators 44 operatively are supported within the bracket 41 by a reciprocably mounted support 70, FIG. 7, which forms a base for the housing 43. The support 70 includes a laterally extended, rectangular base plate 72, of rugged construction, having coplanar and parallel channular tracks 74 extended along the parallel side edges of the plate. The tracks 74, as best shown in FIG. 6, are employed in coupling the base plate 72 to the opposite side walls 64 of the bracket 41. It is intended that the support 70 be reciprocated relative to the bracket 41, therefore, the channular tracks 74 are coupled with the side plates 64 of the bracket 41 through a pair of laterally extended coplanar rails 76, which extend laterally from the opposite side walls of the lower portion of the bracket 41. The rails 76, in practice, are inserted within the channels 74 in order that the plate 72 of the support 70 may be displaced relative to the bracket 41.

The base plate 72, and the side plates 64 of the bracket 41 are so dimensioned as to permit the plate 72 to be reciprocated through pre-selected distances relative to the end plates 62. However, in order that reciprocation imparted shock for the support 70 be dissipated, the base plate 72 is provided with a pair of force dissipating compression springs 78 at each of its opposite ends. These springs are mounted in coaxially aligned openings 79, formed in the opposing surfaces of the end plates 62 and the ends of the base plate 72 and position the housing 43 at an intermediate position between the plates 62. Therefore, it is to be understood that any reciprocation of the base plate 72 is achieved in opposition to the recovery forces of the compression springs 78 whereby a shock absorbing function is performed by the springs as the housing's displacement is initiated.

In order that displacement of the actuators 44 may be supported within the bracket 41, the base plate 72 is provided with an upstanding wall 80 which is welded in a vertical relationship with the upper surface of the base plate 72. The wall 80 includes a plurality of openings 82 through which suitable mounting screws 84 are extended for coupling thereto a retainer bracket 86. The bracket 86 is of any suitable design and circumscribes the actuators 44 for maintaining them in a fixed relationship relative to the plate 72. The plate 80 is further supported, at its opposite ends, by a pair of support walls 88 welded or otherwise fixed to the end portions of the plate 80 and to the base plate 72 for thus imparting rigidity to the support 70.

The base plate 72 further is provided with a pair of vertically extended openings 90 arranged in coaxial alignment with the output shafts 52 of the actuators 44. Through each of the openings 90 there is extended a locking pin 92 coupled to the

output shaft 52 through a convenient knuckle-pin coupling 94. As illustrated in FIGS. 5 and 6, a distal end of each of the pins 92 is received in spaces formed between the teeth-like protrusions 22 and acts as a locking pawl. The knuckle-pin couplings 94 permit the distal ends of the pins 92 to be deflected from coaxial alignment with the shafts 52 in order that they may be inserted into a locking engagement with the ring 20, without prior alignment being accurately achieved between the protrusions and the pins.

Consequently, when the power train and brake assembly 48 are activated, through a selected closing of the switch 50, the coils 45 of the actuators 44 serve to retract the shafts 52 upwardly and out of engagement with the protrusions 22. Consequently, as the pedestal 12 is driven in rotation through a selective activation of the power train and brake assembly 48, the pins 92 are displaced relative to the ring 20. However, when the switch 50 is actuated for interrupting the electrical circuit to the power train and brake assembly 48, for thus de-energizing the drive train and actuating the brake assembly, the compression springs 56, acting against the collars 58, drive the locking pins 92 downwardly causing the distal ends to act as locking pawls to become mated with the protrusion 22 for establishing a fixed coupling therebetween. Since the distal ends of the pins 92 are fixed relative to the ring 20 and the bracket 41 is fixed to the base plate 18 of the pedestal 12, a displacement between the base plate 18 and the ring 20 is limited through the "snubbing" effect of the springs 78. In the event the brake of the brake assembly malfunctions, or otherwise fails to arrest rotation of the pedestal 12, the rigidly coupled locking mechanism 40 and the stop ring 20 serve to arrest rotation of the pedestal 12, and consequently limit the travel of the boom 16. When the master control switch 50 is again actuated, so that current flow from the voltage source V to the power train and brake assembly 48 is initiated, the coils 45 again are actuated for retracting the distal ends of the pins 92 from between the protrusions 22 of the ring 20, whereby displacement between the locking mechanism 40 and the stop ring 20 again is accommodated.

As best illustrated in FIG. 5, it will be noted that the actuators are paired and so spaced that when the end portion of one of the pins 92 is seated between a pair of the protrusions 22, the locking pin 92 of the other actuator of the pair is engaged by the uppermost surface of one of the protrusions 22. Consequently, the pins 92 are spaced within the bracket 41, relative to the teeth-like protrusions 22, so that once the circuit through the coils 45 is interrupted the maximum displacement which can occur between the ring 20 and the bracket 41, before seating of the distal end of one of the pins 92 occurs, is limited to the diameter of one of the pins. Therefore, for all practical purposes, the coupling achieved between the locking mechanism 40 and the stop ring 20 is simultaneous with an interruption of the power circuit.

Second Form

Turning to FIG. 8, therein is illustrated another form of the invention. As depicted, the actuators 44 comprise hydraulic or, alternatively, pneumatic actuators 100 coupled to a suitable source of pressurized fluid, not shown, for axially driving the pins 92 against the applied force of the springs 56 in order to retract the distal ends of the pins 92 from the spaces arranged between the teeth-like protrusions 22 of the ring 20.

As a practical matter, the actuators 100 are quite similar in design and function to the actuators 44, previously described. However, in lieu of electrically energizable coils 45, each of the actuators 100 is provided with a piston including a pressure driven piston head 102 received within a pressure cylinder 104 and mounted on an extended shaft 105 to which is coupled a pin 92. The cylinder is pressurized as pressure is delivered thereto through an inlet port 106 coupled to the source of fluid through a suitable fluid conduit 108, while the conduit 108 acts as a pressure line for delivering fluid under pressure to the cylinder 104, it also serves as a relief line for relieving the pressure within the cylinder.

When it is found desirable, because of the weight and strength requirements imposed by the kinetic energy imparted to the boom 16 and its pedestal 12, the pins 92 simultaneously are extended and coupled with the ring 20. To achieve this, the actuators 100 laterally are spaced at distances such that the depending pins 92 are spaced in a center-to-center relationship with the openings formed between the protrusions 22 in order that the pins 92 of the actuators 100 may be seated in a coupled relationship with the ring 20 as the springs 56 act to extend the shafts 105 as the cylinders 104 are de-pressurized.

Pressurization control for the cylinders 104 is achieved through a pressure system of a suitable design. Since such systems are readily available, a detailed description thereof is omitted in the interest of brevity. However, it is to be understood that the system includes a suitable selector valve, also not shown, associated with the switch 50 and operatively is driven in a manner such that as the switch is closed, for energizing the circuit 47, the selector valve is actuated for pressurizing the cylinder 104, through the line 108, whereupon the piston head 102 within each actuator is displaced for retracting the associated pin 92 in a manner consistent with that hereinbefore described with regard to the actuators 44. Likewise, de-pressurization of the cylinder 104 occurs as the circuit 47 is interrupted, whereupon the pins 92 are displaced into a coupled relationship with the ring 20 by the applied force of springs 56.

Third Form

A further embodiment 40 of the instant invention is illustrated in FIG. 9 which is quite similar in design and function to that hereinbefore described. However, the distal end of a single pin 92 is connected with a plate 110 from which depends a plurality of aligned and equally spaced teeth or pawls 112. The pawls 112 are on a center-to-center spacing with the protrusions 22 of the ring 20. The pawls 112 may be connected with actuators 44 or 100, as desired. Consequently, when the actuator-associated locking pin 92 is extended, through an actuation of the actuator or control, the plurality of pawls 112 are seated between the plurality of protrusions 22 of the ring 20 for thus achieving a desired locking relationship therebetween. This seating of the pawls 112 serves to effect an interlocking of the locking mechanism 40 and the ring 20.

Circuit Interrupter

As illustrated in FIG. 10, the locking mechanism 40 may be provided with a circuit interrupter 115. The interrupter includes a spring-loaded, axially reciprocable rod 120 having a laterally extended foot 121 so disposed as to engage the vertical face of a stop 30 as the locking mechanism is displaced about the circumference of the ring 20.

Within the bracket 41 of the locking mechanism 40 there is mounted a microswitch 122 which is biased to an open condition, but which normally is closed through a spring-loaded actuator arm 124 depressed for purposes of closing the microswitch. As a practical matter, switch 122 is coupled within the circuit 47 in circuit series with the voltage source V and the locking mechanism 40 in a manner such that the circuit 47, between the voltage source V and the locking mechanism 40 is interrupted through a circuit-opening actuation of the microswitch.

In order to maintain a closed current path through the microswitch 122, the rod 120 is mounted for reciprocation within a concentric sleeve 126 and is spring-biased to an extended disposition by a concentric compression spring 128. At the innermost end of the rod 120 there is provided a switch-actuating cam 130 which engages the arm 124, when the rod 120 is fully extended, to maintain the switch 122 in a closed position. However, when the locking mechanism 40 is displaced toward the stop 30 sufficiently for causing the foot 121 to engage the face of the stop 30, the rod 120 is retracted against the applied force of the spring 128 sufficiently for unseating the cam 130, with respect to the actuator 124, whereupon the circuit 47 is opened between the voltage source V and

the locking mechanism 40 whereby the stop 10 is rendered effective for arresting displacement of the pedestal 12 in the manner hereinbefore described.

In those instances wherein the microswitch 122 is employed, it is important to note that the circuit 47 must be provided with a by-pass switch 132, FIG. 3, which preferably is a normally open switch, adapted to be actuated to a closed condition in order that a circuit path may be completed through the switch 50 so that the power train and brake assembly 48 may again be actuated and the pedestal 12 driven in a reverse direction for causing the boom 16 to reverse its direction of travel a distance sufficient to permit the arm 124 to again be extended. The specific configuration of the by-pass switch 132 is a matter of convenience and may be varied as found practical.

OPERATION OF THE PREFERRED EMBODIMENTS

The operation of the described embodiments of the subject invention is believed to be readily apparent but is briefly summarized at this point. As the operation of the locking mechanism 40 is similar for the various forms of the invention hereinbefore described, it is believed that a single description of the operation of the "dead man" stop 10 will suffice to provide a complete understanding of the present invention.

As best illustrated in FIG. 1, the boom 16 is driven in azimuthal rotation in response to a selective energization of the power train and brake assembly 48. In the event it is desirable to arrest rotation of the boom 16, the power train and brake assembly 48 selectively is de-energized through a switching of the switch 50, FIG. 3. As this switching occurs, the circuit through the coils 45 of the actuators 44 simultaneously are de-energized, whereupon the output shafts 52 of the actuators are caused to descend, under the influence of the springs 56, for thereby causing the distal ends of the pins 92 to act as pawls and seat between the vertically disposed protrusions 22.

In instances where the actuators 100 are employed and activated through delivery of fluid under pressure to the actuator, as illustrated in FIG. 8, the circuit shown in FIG. 3, also activates a solenoid, not shown, which serves to actuate a selector valve, also not shown, so that as pressure within actuator 100 is relieved the springs 56 are rendered effective for seating the distal ends of the shafts relative to the ring 20 for thus establishing a coupling therebetween.

In the same manner, the depending teeth 112 of the plate 110 are seated relative to the stop ring 20 in response to an actuation of an associated actuator.

In any event, once the variously employed actuators 44 and 100 are caused to be actuated, the locking mechanism 40 is coupled with the ring 20 through an extension of the pins 92, or 112, as the case may be, with the teeth-like protrusions 22. However, additional travel for the boom 16 is accommodated through the springs 78 for achieving a shock-absorbing or snubbing effect for the locking mechanism 40 as the plate 72 is displaced along the rails 76 against the applied forces of the springs 78.

When the pedestal 12 is to be rotated in a reverse direction, the switch 50 again is actuated so that a current flow again is established between the voltage source V and the power train and brake assembly 48, whereupon the distal ends of the pins 92, or pawls 112, are extracted from between the teeth-like protrusions 22 of the ring 20 in order that displacement between the locking mechanism 40 and the stop ring 20 again is accommodated.

Where the stop 40 is provided with the circuit interrupter 115 for purposes of assuring that over-travel and drift will not occur, regardless of the state of energization of the power

train and brake assembly 48, the foot 121 will engage the face of the stop 30 as the pedestal 12 is rotated for thereby causing the rod 120 to be retracted as the boom 16 is rotated. Retraction of the rod 120 serves to displace the cam 130, whereupon the spring-biased arm 124 is permitted to be elevated for thereby opening the switch 122 and achieving an interruption of the circuit 47. As the circuit 47 is interrupted, the associated actuators are rendered effective for causing the locking mechanism 40 to arrest rotation of the pedestal 12. The circuit may again be closed, at the interrupter 115, by closing the switch 122 or the switch 132, as found practical.

It should be apparent that the various actuators, type of locking pin or pawl employed, as well as the spacing of the protrusions for the stop ring may be interchanged as found desirable and that the interrupter may be employed with the variously described locking mechanisms.

In view of the foregoing, it is to be understood that the present invention provides a highly reliable, actuable switch which serves as a "dead man" stop to arrest undesired rotation of a crane-associated pedestal, whereby drift of the crane's boom is avoided.

Although the invention has been herein shown and described in what are conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A stop for use with a crane having a rotatable pedestal mounted on a rigid base and driven in rotation by electrically powered means comprising:

A. a stop ring circumscribing the pedestal and rigidly mounted on said base,

1. said ring being disposed concentrically of the rotatable pedestal and having upwardly disposed teeth of predetermined width measured circumferentially of the ring separated by interstices of substantially the same width; a pair of stops selectively positionable about the circumference of said ring

B. locking means including,

1. a bracket mounted on said pedestal in spaced relation to the stop ring,

2. a pair of pins mounted in the bracket above the stop ring and in juxtaposition thereto for reciprocal elevational movement to and from ring engagement,

a. the pins being adapted to be received by the interstices and

b. having centers spaced a distance equal to an odd numbered multiple of the tooth width whereby when one pin is aligned with a tooth the other registers with an interstice,

3. resilient means urging the pins downwardly into ring engagement, and

4. electromagnetic means individual to the pins adapted when energized to retract their respective pins upwardly from the ring in opposition to the resilient means; and

C. an electric circuit for supplying electrical energy to the electrically powered means and simultaneously to the electromagnetic means whereby the pins are retracted whenever the powered means is energized,

1. said circuit including a switch having actuating means engageable with said stops when said pedestal has been rotated through a predetermined rotation for simultaneously interrupting energization of the powered means and the electromagnetic means for release of the pins for receipt of one thereof into an interstice upon de-energization of the powered means.

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