

[54] TACKLE BLOCK

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[57] ABSTRACT

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[58] Field of Search.....254/192, 191, 157, 159, 151-153; 188/188

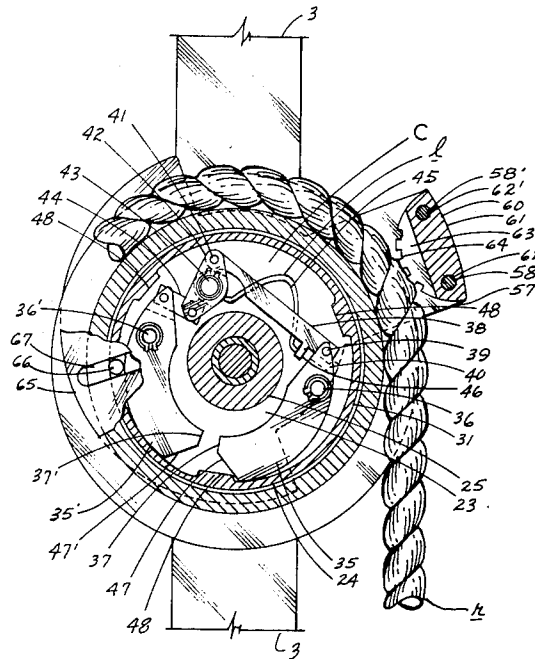
A tackle block incorporating a sheave with a rope or other flexible member extending thereover comprising a movable brake shoe presented radially outwardly of the rope receiving portion of said sheave and being carried upon rocker arms adapted for swingable movement about an axis parallel to, but radially outwardly of, the sheave rotation axis. A clutch mechanism carried within said sheave and operably engageable with said rocker arms; said clutch being actuated responsive to centrifugal force whereby upon excessive sheave speed said rocker arms will be swung to bring the brake shoe into engagement with said rope for clamping same against the sheave.

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11 Claims, 6 Drawing Figures



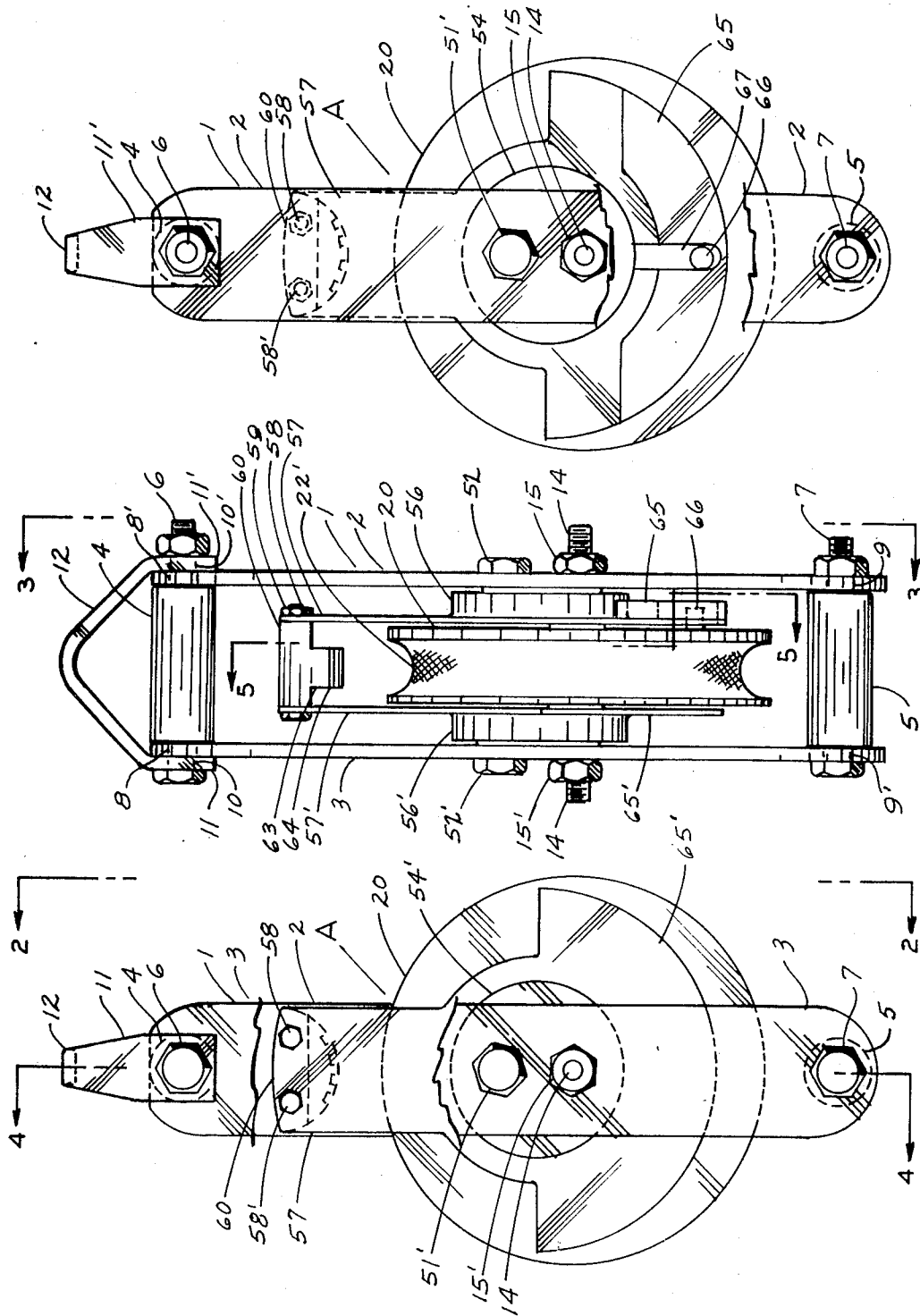


FIG. 3

FIG. 2

FIG. 1

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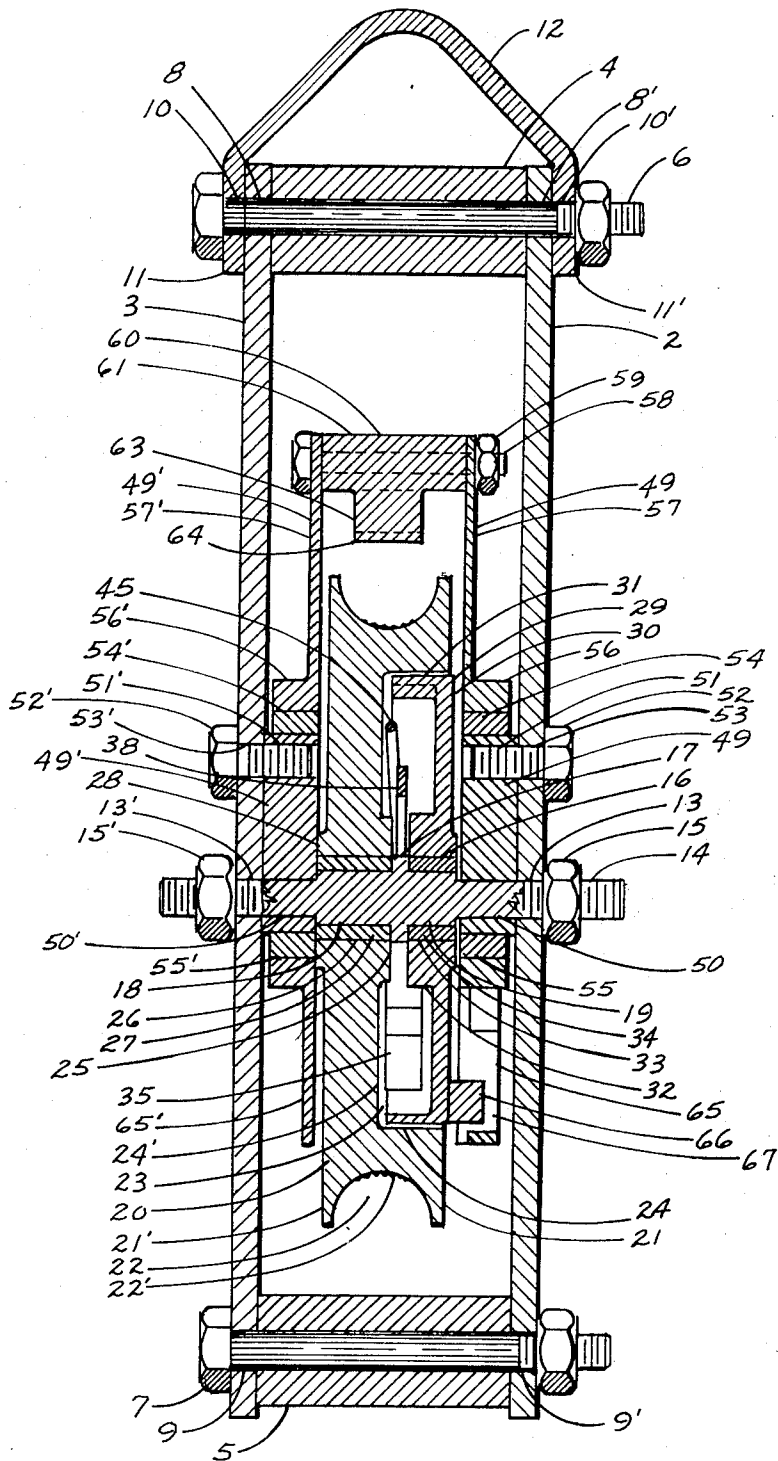


FIG. 4

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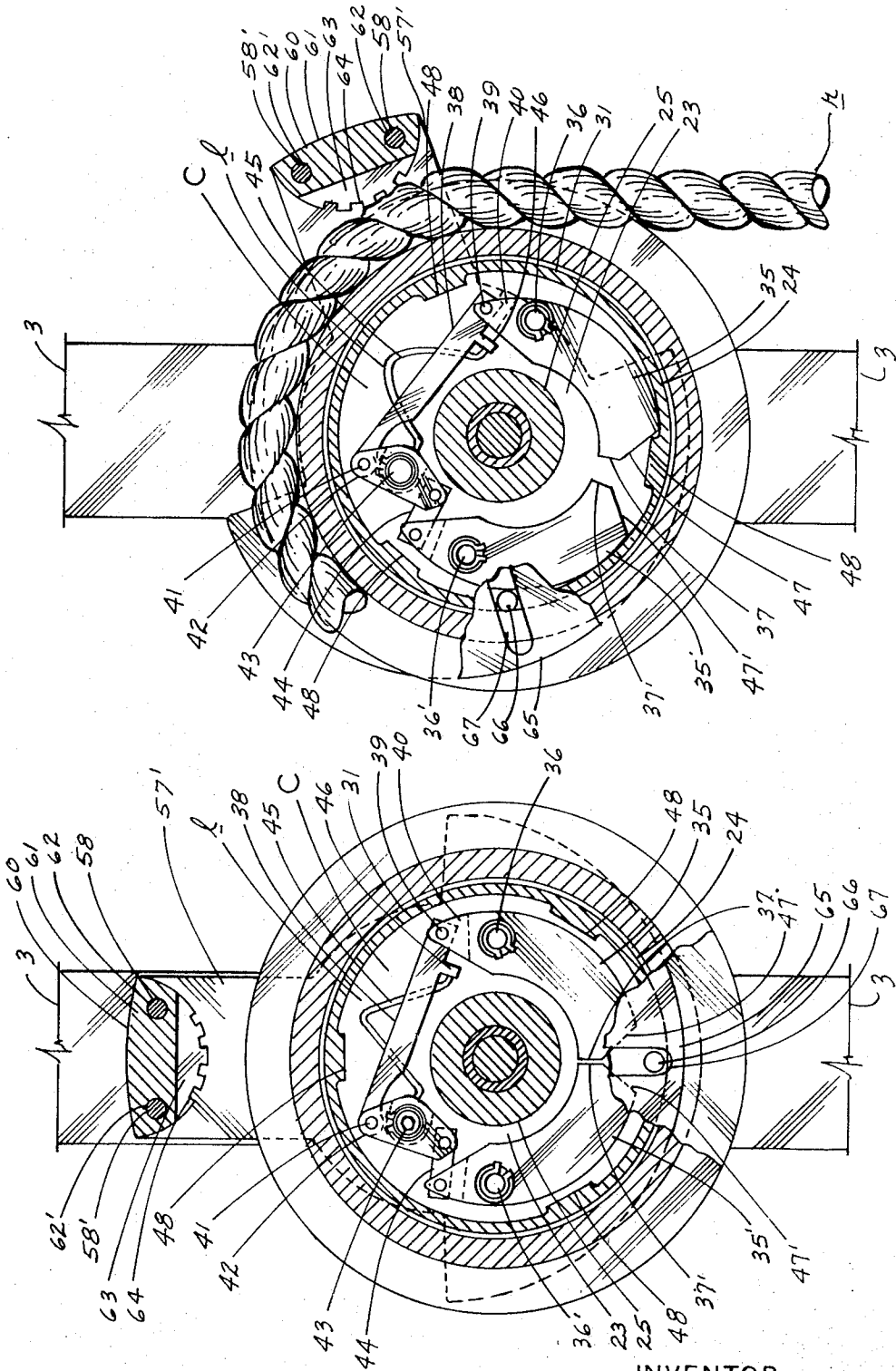


FIG. 6

FIG. 5

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TACKLE BLOCK

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates in general to tackle blocks and, more particularly, to a safety device for incorporation therewith.

It is an object of the present invention to provide a tackle block incorporating a safety brake shoe which is automatically operatively responsive to the centrifugal force developed by excessive sheave speed whereby the rope or other hoisting element running over the sheave is locked against consequent authorized release.

It is another object of the present invention to provide a device of the character stated which is adapted to operate regardless of the direction of rotation of the incorporated sheave.

It is a further object of the present invention to provide a tackle block incorporating a safety device which is reliably effective in operation; which incorporates but a limited number of operating parts so as to be resistant to wear or to breakdown.

It is a further object of the present invention to provide a tackle block which may be manufactured most economically; which is automatic in operation so as to obviate the intervention of human action; and which will maintain the rope when gripped against further movement until the sheave speed has been reduced and hence the termination of the provoking emergency.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a tackle block constructed in accordance with and embodying the present invention, with one of the side plates being cut away.

FIG. 2 is an end elevational view of a tackle block as viewed on the line 2—2 of FIG. 1.

FIG. 3 is a side elevational view of the tackle block as taken on the line 3—3 of FIG. 2 being the side opposite to that shown in FIG. 1.

FIG. 4 is a vertical transverse sectional view taken on the line 4—4 of FIG. 1.

FIG. 5 is a vertical transverse sectional view taken on the line 5—5 of FIG. 2.

FIG. 6 is a vertical transverse sectional view taken substantially on the line 5—5 of FIG. 2 but illustrating the brake shoe in operative position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A generally designates a tackle block having a frame 1 comprising a pair of parallel side plates 2,3 maintained in spaced apart relationship by upper and lower spacers 4,5, respectively, carried upon bolts 6,7, respectively, extending through aligned openings 8,8' and 9,9' in the opposite end portions of said side plates 2,3, respectively. Said bolt 6 also projects through aligned openings 10,10' formed in the depending flanges 11,11', respectively, of a hanger 12 for accepting the customary hook (not shown) or the like for suspending tackle block A for operative purposes.

Side plates 2,3 between their end portions are provided with a pair of aligned openings 13,13' for extension therethrough of the threaded end portions of an axle 14 mounting retaining nuts 15,15' on its opposite ends for securing same against rotation. In its intermediate portion, spacedly from the inner faces of each side plate 2,3, axle 14 is provided with a diametrically increased, smooth surfaced bearing portion designated 16 and embodying an eccentrically located circumferential shoulder 17 which divides bearing portion 16 into a major or larger section and a minor or smaller section 18,19, respectively, for purposes presently appearing.

Mounted upon bearing major portion 18 is a sheave 20 having opposed circular side faces 21,21' in confronting relationship to the inner faces of side plates 2,3, respectively, and a peripheral groove 22 for receiving a rope, cable or like flexible

element as indicated at R which extends thereover for hoisting or like purposes. The base of groove 22 may, if desired, be provided with a raised or roughened pattern as at 22' for conducting to the frictional engagement with rope R. Sheave 20 is provided with a concentric, cylindrical recess or compartment 23 opening through side face 21 and having a circular side wall 24 and an inner or base wall 24' being centrally provided with a circular boss 25 through which the axial bore 26 of sheave 20 extends. Fixed in said bore 26 is a bushing 27 for engaging major bearing portion 18 of axle 14 with the proximate face of shoulder 17 abutting against the inner end of bushing 27 which is surfacewise aligned with the face of boss 25. Sheave 20 is also provided with a slight outwardly extending concentric boss 28 on its side face 21' for receiving the outer end portion of bushing 27 while also serving as a spacer. It will thus be seen that axle bearing major portion 18 is of a like extent as bore 26 and bushing 27 received thereon so as to provide maximum bearing contact.

Provided within recess 23 is a drum 29 having a flat circular main plate 30 of slightly less diameter than recess 23 and a circumferential skirt of flange 31, the outer face of which will be in confronting, but slightly spaced, relationship with side wall 24. Centrally of main plate 30 and on the inner side thereof is a relatively enlarged boss 32 having a bore 33 in alignment with bore 26 of flange 31, there being a bushing 34 fixed within said bore 33. Accepted within bushing 34 is the axle bearing minor portion 19; the inwardly presented end face of bushing 34 abuts against the proximate face of shoulder 17 (FIG. 4). It will thus be seen that boss 32 of drum 29 is maintained spacedly from contact with boss 25 by the thickness of shoulder 17. Drum 29 is of such maximum depth that the outer face of main plate 30 will be in substantial surface alignment with the surrounding portions of side face 21, and with the inner edge of skirt 31 terminating spacedly from inner wall 24' so that drum 29 may rotate about axle bearing surface 19 without obstructive contact with the adjacent portions of sheave 20.

Mounted on inner wall 24' of recess 23 is a clutch indicated generally C comprising a pair of shoes 35,35' being lengthwise arcuate or of crescent shape and being formed on a center substantially concentric with side wall 24. Each of said shoes 35,35' are anchored within recess 23 by pivot pins 36,36' being disposed in aligned relationship along the diameter of recess 23 and on opposite sides of boss 25; being substantially intermediate same and the proximate portion of side wall 24. Shoes 35,35' are of such extent that their ends remote from pivot pins 36,36' as at 37,37' may be in abutting relationship when such shoe ends are swung to the maximum extent toward boss 25.

Said shoes 35,35' are interconnected at their upper ends by a linkage system indicated generally L whereby said shoes may be jointly swung about the axes developed by the respective pivot pins 36,36'; said linkage comprising a relatively long link 38 pivotally engaged to the end of shoe 35 proximate pin 36 as by a pin 39; said link end being receivable within a slot as at 40 formed in said shoe 35. The other end of link 38 is similarly pivotally engaged as at 41 upon a connector 42 swingably mounted upon inner wall 24' by means of a pin 43; said pin 43 being located relatively proximate pivot pin 36'. The other end of connector 42 is swingably interconnected with the end of shoe 35' proximate pin 36' by a short link 44. With reference to FIGS. 5 and 6 it will be seen that when connector 42 is rocked so that its end adjacent shoe 35' is in outward position (FIG. 5) the free ends of brake shoes 35,35' will be in engagement at 37,37'. However, upon swinging of connector 42 so as to cause its end adjacent shoe 35' to be moved inwardly toward boss 25 a pulling will be effected upon the engaged ends of both links 38 and 44 so as to draw the engaged ends of shoes 35,35' inwardly with consequent radially outward swinging of the free ends into the position shown at FIG. 6. Thus, the limit of swing in one direction is caused by abutment of connector 42 against boss 25 and in the other direction by abutment of shoe ends 35,35' thereagainst (FIG. 5).

Provided for urging shoes 35,35' into abutment at their free ends is a spring 45 being formed in the nature of a radially outwardly projecting "V" and having one out-turned end received within connector 42 and the other end accepted within a projection 46 formed on the boss confronting edge of link 38. Thus, shoes 35,35' are urged inwardly at their free ends, removed from engagement with the adjacent side face of skirt 31.

Each of said shoes 35,35' on their free ends are provided with outwardly inclined edge portions as at 47,47', respectively, for engaging detents 48 constituted of boss-like projections extending inwardly from the inner face of skirt 31 at predetermined locations thereon such as, for instance, at 120° intervals. The strength of spring 45 is predetermined so that when the angular velocity of sheave 20 exceeds a predetermined point spring 45 will be overcome by centrifugal force whereupon shoes 35,35' will pivot so that their free ends will be swung toward skirt 31 of drum 29 presenting inclined surfaces 47,47' for engaging the proximate detent 48. (FIG. 6) Thus, regardless of the direction of rotation of sheave 20 one shoe 35,35' or the other will engage the proximate edge of the adjacent detent 48 and thereby bring about a coupling of sheave 20 and drum 29 so that the latter will be driven by the former. When the speed of rotation of sheave 20 decreases to such an extent that the centrifugal force is inadequate to overcome the force of spring 45 the latter will effect restoration of shoes 35,35' to abutting relationship at their free ends thereby discontinuing engagement between one or the other of said shoes and a detent 48 of drum 29 so that the latter is then returned to disengaged relationship with respect to sheave 20.

Disposed between side surface 21,21' of sheave 20 and the proximate side plate 2,3 is a disc 49,49', respectively, each having aligned pairs of bores 50,50' and 51,51', respectively. Axle 14 extends through bores 50, 50' (FIG. 4) while bores 51,51' are tapped to receive the external threads of retaining bolts 52,52' which extend outwardly through aligned openings 53,53' in side plates 2,3, respectively, for securement of said discs thereto. The peripheral surface of each disc 49,49' is smooth for bearing relationship with the inner face of a surrounding bushing 54,54' carried fixedly within the enlarged bore 55,55' of a rocker arm 56,56'. It will thus be seen that by reason of the securement of discs 49,49' to side plates 2,3 rocker arms 56,56' are rotatable about said discs through an axis parallel to, and intermediate between, the axis of axle 14 and the common longitudinal axis of bolts 52,52' so that the axis of rotation of rocker arms 56,56' is offset from, or eccentric with relation to, the axis of rotation of sheave 20 for purposes presently appearing. Each rocker arm incorporates a flat extension 57,57' at its upper end for projection radially beyond sheave 20 and being connected in their outer extreme portions by preferably a pair of bolts 58,58' each being maintained by a nut 59; there being a brake shoe element 60 having an upper body portion 61 serving as a spacer for maintaining said extensions 57,57' in spaced-apart parallel relationship and being provided with openings 62,62' for extension thereto of bolts 58, 58'. Said brake shoe 60 is integrally provided on its face confronting sheave 20 with a convex or outwardly curved projection 63 being of a width less than transverse extent of groove 22 of sheave 20 and its outer face being of serrated or corrugated character as developed by a series of spaced, transversely progressing indentations or notches 64.

Each rocker arm 56,56' is so formed and constructed as to have the larger portion of its weight disposed normally below its pivot axis. This weighting may be easily effected in various manners and for illustration only is shown by a relative area enlargement in their lower portions as at 65,65' such weighting tending to urge said arms 56,56' downwardly so that extensions 57,57' will be normally vertically disposed as shown in FIG. 1. It is to be observed that extensions 56,57' are of such length, when in vertical position, the serrated portion of shoe 60 will be located spacedly from sheave 20 so as to be beyond contact with rope R extending thereover.

Projecting from the outer face of main plate 30 of drum 29 adjacent the edge portion and being integrally formed

therewith is a cam follower 66 which is received with cam slot 67 in the lower central portion of rocker arm 56; said slot progressing along a radial path from a point immediately proximate the lower edge of said rocker arm 56 to a point adjacent bore 55.

In operation, with tackle block A suitably suspended above ground level in a conventional manner and with rope R extending over sheave 20, within the upper portion of groove 22, for hoisting and like conventional purposes sheave 20 will freely rotate as rope R is moved as by pulling on one end portion thereof, such rotation being effected through friction. Accordingly, tackle block A will operate in the usual expected manner of a pulley. However, in the event rope R should become accidentally disconnected at one end and be thereby subjected to the falling of the load at the other end, sheave 20 by its free rotatability will be caused to rotate at increasing angular velocities with the development of a corresponding increase in centrifugal force. When such velocity has reached a point that the related centrifugal force overcomes the bias of spring 45 connector 42 will be rocked for consequent swinging of shoes 35,35' of clutch C so as to cause the appropriate one, depending upon the direction of rotation, to abut the nearest detent 48. Such engagement, as stated above, causes a coupling between sheave 20 and drum 29 whereby cam follower 66 will forcefully abut the appropriate wall of cam slot 67 thereby providing a driving connection between sheave 20 and rocker arms 56,56' causing same to rotate about disc 49,49' through an axis spaced from axle 14 whereby shoe 60 will be moved through an arcuate path intersecting of the circumference of sheave 20 so as to bring its notches 64 into engagement with rope R (FIG. 6) and to effect a clamping of the latter between said shoe and the base of groove 22. As rocker arms 56,56' are urged along such path through the effected driving connection, shoe 60 will be subjected to an increasingly forceful engagement with rope R to thereby assure tight gripping of same, fully resistant to unauthorized or premature disengagement. It is to be recognized that the clutch action above described in effect initiates the movement of brake shoe 60 into gripping engagement with rope R. The increased tightening of this engagement will be brought about through the gravitational pull upon the depending extent of rope R through the expected weight suspended thereby. Consequently, the snug and positive clamping will be further assured through the pull upon rope R. It is to be also observed that in the event the angular velocity of sheave 20 is reduced and shoes 35 returned to radially inward position, the engagement between brake shoe 60 and rope R will be retained. Thus, clutch C initiates the requisite relationship but need not be maintained in engaged condition to preserve such clamping action. Rope R is thus held against accident pending authorized release of brake shoe from operative position consequent to diminution of the angular velocity of sheave 20 to a point below the resisting force of spring 45.

In view of the foregoing it is thus seen that the present invention is a most compact and reliably operative device and which is equally useful without regard to the particular direction of rotation to which sheave 20 may be subjected.

Having thus described my invention what I claim and desire to obtain Letters Patent for is:

1. A tackle block comprising: a frame having a pair of spaced apart side plates, a transverse axle journaled within and extending between said side plates, a sheave carried upon said axle for rotation thereon, said sheave having a peripheral, rope-receiving groove, said sheave axle comprising a diametrically enlarged bearing portion having end portions spacedly from the related side plates of said frame, said axle having a diametrically enlarged bearing portion having end portions spacedly from the related side plates of said frame, a rocker arm mounted on either side of said sheave between same and the adjacent side plate, each of said rocker arms extending radially beyond the peripheral groove of said sheave, a brake shoe provided at the outer ends of said rocker arms for disposition transversely therebetween, radially outwardly of,

and in confronting relationship to, said groove, means for eccentrically mounting said rocker arms disposed on said axle intermediate the frame side plate and the related end portion of said diametrically enlarged bearing portion of said axle, for swinging of said arms about an axis spaced from, and parallel to, said sheave axle, said sheave having an enlarged central recess opening laterally through one face thereof, a clutch provided within said recess and comprising a pair of swingably mounted shoes for radially outwardly swinging through centrifugal action, resilient means restraining said shoes against outward swinging until said sheave has attained a predetermined velocity, a drum provided within said recess comprising a plate disposed substantially in surfacewise planar alignment with said sheave face and a skirt projecting within said central recess within the path of movement of said shoes, means provided on said skirt for engaging said shoes when outwardly swung, means operatively engaging said drum plate to at least one of said rocker arms, and a shoulder formed integral with said diametrically enlarged axle bearing portion, said sheave being received on said bearing portion on one side of said shoulder and said drum plate being received on said bearing portion on the other side of said shoulder.

2. A tackle block comprising: a frame having a pair of spaced apart side plates, a transverse axle journaled within and extending between said side plates, a sheave carried upon said axle for rotation thereon; said sheave having a peripheral, rope-receiving groove, a disc eccentrically mounted on each end portion of said axle between the adjacent side of said sheave and the proximate side plate, means engaging each disc to the proximate side plate along an axis parallel to the axis of said axle and on the opposite side of the normal transverse centerline of said disc, a rocker arm mounted upon each disc for swinging thereabout on an axis between said axle and the means securing said discs, each of said rocker arms extending radially beyond the peripheral groove of said sheave, a brake shoe provided at the outer ends of said rocker arms for disposition transversely therebetween radially outwardly of, and in confronting relationship, to said groove whereby due to the offset axis of rotation of said rocker arms the same upon swinging will cause the brake shoe to move in a path toward said sheave groove to engage the cable between the groove and brake shoe, centrifugally responsive means interengaging said sheave and said rocker arms for effecting swinging of the latter about their respective axes upon attainment of a predetermined angular velocity by said sheave to direct said brake shoe against the rope in said sheave groove for restraining movement of the latter.

3. A tackle block as defined in claim 2 and further characterized by said rocker arms being weighted in their end portions remote from said brake shoe.

4. A tackle block as defined in claim 1 and further characterized by said shoulder being located eccentrically of the transverse axis of said bearing portion.

5. A tackle block as defined in claim 1 and further characterized by said means for eccentrically mounting said rocker arms comprising a pair of cylindrical discs, each disc having a pair of eccentric bores provided therethrough, said sheave axle being passed through one of said bores, means securing each disc to the side frame of said plate being received within the other of said bores, said rocker arms being swingably mounted on said cylindrical discs.

6. A tackle block as defined in claim 5 and further characterized by the transverse axis of said cylindrical disc being spacedly upwardly of the axis of said sheave axle.

7. A tackle block as defined in claim 2 and further characterized by said sheave having an enlarged recess opening laterally through one face thereof, a clutch provided within said recess and comprising a pair of swingably mounted shoes for radially outwardly swinging through centrifugal action, resilient means restraining said shoes against outward swinging until said sheave has attained a predetermined angular velocity, a plate provided coveringly of said recess and having a skirt projecting thereto within the path of movement of said shoes, means provided on said skirt for engaging said shoes when outwardly swung, and means operatively engaging said plate to at least one of said rocker arms.

8. A tackle block as defined in claim 7 and further characterized by said brake shoe being dimensioned for extension into said groove to effect clamping of the rope therein against the base of said groove upon rocking of said rocker arms.

9. A tackle block as defined in claim 2 and further characterized by said centrifugally responsive means comprising a clutch carried in said sheave and cooperating means interconnecting said clutch and one of said rocker arms.

10. A tackle block as defined in claim 9 and further characterized by said clutch having a pair of swingably mounted shoes mounted in said sheave, resilient means urging said shoes toward each other and being adapted to be overcome through centrifugal action, a drum engageable by said shoes, and means operatively connecting said drum and one of said rocker arms for effecting operational engagement between said rocker arms and said sheave upon operation of said clutch.

11. A tackle block as defined in claim 10 and further characterized by said means operatively connecting said drum and one of said rocker arms comprising a projection carried on said disc and projecting outwardly therefrom, and said one of said rocker arms having an aperture through which said projection extends.

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