Abstract Title: Pulley arrangement with an adjustably-mounted line guide

A pulley arrangement, particularly for use on a racing dinghy, has a carrier 12 within which is a sheave 13. The carrier has an arcuate track 19 disposed radially beyond the periphery of the sheave and a line guide, which may include a self-jamming cleat 31 and a fairlead 33, is adjustably mounted on the track. The line guide may be clamped in position by a bolt 29.
PULLEY ARRANGEMENT

This invention relates to a pulley arrangement and in particular to a pulley arrangement including a rotatable sheave and a line guide for a line passing around the sheave.

Though a pulley arrangement of the kind with which this invention is concerned may be used in a variety of circumstances, it has a particular application in relation to racing dinghies, catamarans and the like. As such, the invention will be described exclusively with reference to pulley arrangements for those uses, even though the invention is not to be regarded as limited thereto.

Pulley blocks are used extensively on the running rigging of racing dinghies (which term is used herein to include other racing boats such as catamarans), to assist in the hoisting and trimming of the sails, as well as for other lines used on dinghies. Such pulley blocks are required to have very low friction in order to minimise losses and also to have relatively low weights. Further, pulley blocks used on racing dinghies are frequently highly stressed and so must display great strength in order not to fail at inconvenient times.

Many pulley blocks include a line guide for the free end of the line passing round the sheave, that line guide including a self-jamming cleat in order that the free end of the line may be restrained against running freely, back through the block, once the line has been set as required. The line guide typically may include a fairlead such that the line may be released from the cleat but still is guided by the fairlead, so that when the line is to be restrained once more against running back, it may easily be re-engaged with the self-jamming cleat.
A pulley block including a line guide and self-jamming cleat as described above typically is mounted to a part of a dinghy for free articulation, so that the block may align itself with a sailor when tension is applied to the free end of the line passing round the sheave. Despite this alignment, friction may arise from taking the line from the guide at an angle to the linear direction between the sheave and guide, such that the line passes through a significant angle at the fairlead or cleat. To minimise the angle through which the line passes in such circumstances, it is known to mount a line guide on a pulley block in such a way that there are a few pre-set positions for the guide with respect to the mounting arrangement for the block. As only relatively few pre-set positions are usually available, in use it is not possible to set the line guide so that friction between the line and fairlead is largely eliminated.

An additional problem arises when the sailor helming a racing dinghy is hiked-out on a trapeze while still holding the tail of the mainsheet, to effect adjustments to the trim of the mainsail. The sailor’s hand may be a significant distance from the block (perhaps 2.5 to 3.0 m) and so the distance through which he must move the gripped part of the tail to free the mainsheet from the self-jamming cleat or to re-engage it can be quite large. There is thus a considerable benefit in being able to set the angle of the cleat with respect to the sailor so that the cleating and releasing angles fall within a range which can be used easily by the sailor. Particularly with racing dinghies where the sailor may be some distance from the block, it is found that the pre-set adjustments provided by known blocks are too coarse to allow adjustment exactly as required.
It is a principal aim of the present invention to provide a pulley arrangement including a line guide which may be adjusted as required for a particular intended use, to minimise friction between the line and the line guide. According to this invention, there is provided a pulley arrangement comprising a carrier rotatably mounting a sheave, the carrier defining an arcuate track disposed radially beyond the periphery of the sheave, and a line guide for a line passing around the sheave, the line guide being adjustably mounted on the arcuate track of the carrier.

It will be appreciated that by providing an arcuate track in effect externally (in the radial direction) of the sheave, the line guide may be adjusted as required around the sheave, to minimise the line angle at the fairlead, taken by the free end of a line passing around the sheave and then through the fairlead to the sailor. Most preferably, the line guide is infinitely adjustable on the track without there being any pre-set positions for the line guide. In this way, friction at the line guide may be minimised, but more importantly for a block having a line guide associated with a self-jamming cleat, it becomes possible to set accurately the cleating and releasing angle with respect to a sailor in a given position, such that he may easily perform the required movement of a line to perform cleating and releasing thereof.

In one embodiment of this invention, the pulley arrangement is configured as a pulley block. In this case, the carrier will have a pair of spaced side cheeks between which the sheave is rotatably mounted. For a multiple block, more than one sheave may be rotatably mounted side-by-side between the side cheeks. For a single or multiple block, the arcuate track may comprise
a pair of corresponding track portions formed one on each of the two cheeks respectively, radially beyond the or each sheave.

In an alternative pulley arrangement, the track of the carrier may include an arcuate rail provided with a swivel mount at each of its ends which swivel mounts have a common rotational axis, whereby the mounts may be affixed to a surface such as the rear face or side face of a mast, the underside of a boom, a deck surface or a bulkhead, whereafter the rail may perform pivoting motion with respect to that surface, about the common axis of the swivel mounts. For such an alternative arrangement, the track of the carrier preferably comprises a pair of arcuate rails between which is rotatably mounted the sheave. For example, each rail may carry a respective side plate between which the sheave is rotationally supported so as to be disposed substantially wholly within the area defined by the side rails. At least one of the swivel mounts may be hollow thereby to serve as a guide for the standing part of a line passing around the sheave, on the other side of the sheave from said line guide. Depending upon the configuration, the rotational axis of the sheave may be substantially centred on the curvature of the arcuate rails, or may be displaced therefrom.

Though the line guide could comprise a simple fairlead through which the line passes, as mentioned above it is preferred that the line guide includes a self-jamming cleat for restraining the free end of a line passing around the sheave, from running back in the direction from the line guide to the sheave. Such a self-jamming cleat preferably comprises a pair of cams between which the line may pass, along with a fairlead overlying the self-jamming cleat and
arranged to guide the line when freed from the cleat to permit easy re-cleating of the line.

The line guide may include an arm slidably mounted on the arcuate track and serving as a mount for a fairlead and a self-jamming cleat, at the end of the arm remote from the track. Lock means may be associated with the arm, to permit the arm to be secured at a chosen position on the track, such lock means comprising for example a screw-threaded clamp which may be tightened at a chosen position.

In addition to the line guide mounted on the arcuate track, a becket may also be mounted on the track in an adjustable manner, to permit the securing of an end of a line to the block. Such a becket may include a clamp arrangement to permit the becket to be secured at a chosen position on the track.

By way of example only, two specific embodiments of pulley arrangement of this invention will now be described in detail, reference being made to the accompanying drawings in which:-

Figure 1 is a general perspective view of the first embodiment of pulley arrangement including an adjustable line guide;

Figure 2 is a side view of the block of Figure 1;

Figure 3 is a further perspective view of the block of Figure 1 but with part of the line guide cut away to show the lock arrangement for the line guide;

Figure 4 is a scrap view on the arcuate track and lock arrangement for the line guide;

Figure 5 is a perspective view of a second embodiment of pulley arrangement of this invention; and
Figure 6 is a side view on the arrangement of Figure 5.

Referring initially to Figures 1 to 4, it can be seen that the first embodiment of pulley arrangement of this invention is in the form of a pulley block including a casing 10 having a pair of side cheeks 11,12 between which is rotatably mounted an annular sheave 13. A U-shaped mounting strap 14 is secured to the side cheeks 11,12 and passes over a bridging part 15 of the casing 10, to extend between the side cheeks 11,12, the mounting strap restraining a rotatable mounting pin 16 to the block. The pair of side cheeks 11,12 are clamped together by means of screws 17,18 passing through the mounting strap and screw 18 extending within the bore of the sheave.

An arcuate peripheral region of each side cheek remote from the bridging part 15 is formed as an arcuate track portion 19, centred on the rotational axis of the sheave 13 and disposed radially beyond the periphery of the sheave. As best seen in Figures 2 and 4, each track portion is defined by an arcuate rebate 20 around the external periphery of the respective side cheek 11,12 and an arcuate groove 21 formed on the inwardly directed face of the respective side cheek, radially beyond the sheave 13. A rectangular nut 22 is slidably disposed in the grooves 21 and may be located at any required position within the arcuate extent of those grooves.

A line guide 25 comprising a support plate 26 with a pair of lips 27 is slidably engaged with the rebates 20 and has a hole 28 through which a bolt 29 passes, that bolt being threadingly engaged with the nut 22. In this way, the line guide 25 may be slid around the track portions 19 to a required position and then clamped in that position by tightening the bolt 29.
A platform 30 is formed integrally with the support plate 26 and is braced by a pair of arms 26A. A self-jamming cleat 31 is mounted on platform 30, the cleat 31 having a pair of pivoting cams 32 spring-urged to the position shown in Figure 1 and a fairlead 33 extending over the cams. In this way, the tail of a line passing around the sheave 13 and between the cams 32 may be pulled away from the sheave so shortening the standing part of the line, the cams 32 pivoting as required to allow the line to run therethrough, but on releasing the tension applied to the tail, the cams will pivot together and grip the line to restrain the running back thereof. When the line is to be allowed to run in that sense, or if the line is to be free for rapid minor adjustments, either lengthening or shortening the standing part, it may be lifted out of the cams 32 but still be guided by the fairlead 33 by lifting the tail. Re-engaging the line with the cleat requires the tail to be pulled downward though possibly with a small movement away from the block. Releasing and re-engaging thus requires the tail to be moved through at least a pre-defined angle. Such an assembly of a self-jamming cleat and fairlead and its use is well known in the dinghy and boating art and will not be described in more detail here.

When used in a racing dinghy, the pulley block is mounted to a fixture usually by means of a shackle passing through the bore in the mounting pin 16 and a line (for example, the main sheet of a dinghy) is passed around the sheave and through the line guide 25. The bolt 29 is loosened to free the line guide and then a sailor takes up an expected position (such as hiked-out on a trapeze) and applies tension to the tail of the line, when it runs through the cleat. The line guide 25 will self-adjust to minimise the angle which the line
makes at the cleat on passing therethrough, and then the bolt 29 is tightened to clamp the line guide at that position. As will be appreciated, the line guide may be set to any required position within the range of movement permitted by the length of the arcuate track portions 19, whereby friction between the line and the fairlead when the line runs freely may be minimised, and the angle through which the tail must be moved to achieve cleating and releasing is within the range easily achievable by the sailor.

Referring now to Figures 5 and 6, there is shown a second embodiment of pulley arrangement intended for direct attachment to a surface such as the rear or side face of a mast, a boom, a deck surface or a bulkhead. This pulley arrangement comprises a pair of arcuate track rails 35 each of substantially 180° extent, each end of the rails having a respective swivel mount 36,37, defining a common pivotal axis. Each swivel mount is provided with holes 38 to permit the mount to be attached to a surface, whereby the track rails may thereafter pivot about that common axis.

Attached to each rail 35 is a side plate 39 between which is rotatably mounted a sheave 40, lying wholly within the area defined by the rails. A U-shaped line guide 41 is also secured to the track rails 35 and side plates 39, as shown in Figure 5.

An external line guide 43 is mounted on the rails 35 and is adjustably arranged thereon. This further line guide 43 comprises a plate 44 profiled to define a pair of lips 45 profiled to engage the periphery of the rails 35. A clamp nut 46 is disposed internally of the rails 35, a bolt 47 extending through plate 44 and into a threaded bore in nut 46 whereby tightening of the bolt secures the
line guide 43 at a chosen position. As shown in part in Figure 5, the plate 44 defines a platform 48 on which is mounted a self-jamming cleat 49 and fairlead 50 corresponding to cleat 31 and fairlead 33 of the first embodiment; as such, these components will not be described in further detail here. Shown in broken lines in Figure 6 is an alternative position for the line guide. It will be appreciated that the guide may be positioned where required anywhere around the rails 35.

Each swivel mount 36,37 has a respective through-bore 51 along the pivoting axis thereof, whereby the standing part of a line may pass through the bore of one of those mounts, around the sheave 40 but constrained by the U-shaped line guide 41, and then through the further line guide 43, either between the cams of the self-jamming cleat 49 or within the fairlead 50.

Once installed, the pulley arrangement of the second embodiment is adjusted and used in much the same manner as has been described above with reference to the first embodiment. Those aspects will therefore not be described again, here.
CLAIMS

1. A pulley arrangement comprising a carrier rotatably mounting a sheave, the carrier defining an arcuate track disposed radially beyond the periphery of the sheave, and a line guide for a line passing around the sheave, the line guide being adjustably mounted on the arcuate track of the carrier.

2. A pulley arrangement as claimed in claim 1 and configured as a pulley block, wherein the carrier has a pair of spaced side cheeks between which the sheave is rotatably mounted.

3. A pulley arrangement as claimed in claim 2, wherein the arcuate track comprises corresponding track portions formed on each of the two cheeks.

4. A pulley arrangement as claimed in claim 3, wherein each track portion is of a greater radius than the radius of the sheave.

5. A pulley arrangement as claimed in claim 4, wherein each track portion is formed around the peripheral region of a part of each cheek, respectively.

6. A pulley arrangement as claimed in claim 1, wherein the track of the carrier includes an arcuate rail provided with a swivel mount at each of its ends which swivel mounts have a common rotational axis whereby the mounts may be affixed to a surface whereafter the rail may perform pivoting motion with respect thereto.

7. A pulley arrangement as claimed in claim 6, wherein the track of the carrier comprises a pair of parallel arcuate rails between which is rotationally mounted the sheave.
8. A pulley arrangement as claimed in claim 7, wherein each rail carries a respective side plate between which the sheave is rotationally supported so as to be disposed substantially wholly within the area defined by the side rails.

9. A pulley arrangement as claimed in any of claims 6 to 8, wherein at least one of the swivel mounts is hollow thereby to serve as a guide for a line passing around the sheave.

10. A pulley arrangement as claimed in any of the preceding claims, wherein the line guide includes a self-jamming cleat for a line passing around the sheave.

11. A pulley arrangement as claimed in claim 10, wherein the self-jamming cleat comprises a pair of cams between which the line passes.

12. A pulley arrangement as claimed in any of the preceding claims, wherein the line guide comprises an arm slidably mounted on the arcuate track, the arm including a fairlead for the line.

13. A pulley arrangement as claimed in any of the preceding claims, wherein lock means are associated with the line guide mounted on the track.

14. A pulley arrangement as claimed in claim 13, wherein the lock means comprises a screw-threaded clamp arranged to permit the line guide to be clamped at a chosen position on the track.

15. A pulley arrangement as claimed in any of the preceding claims, wherein the centre of curvature of the arcuate track is substantially co-incident with the rotational axis of the sheave.

16. A pulley arrangement as claimed in any of the preceding claims, wherein a becket is adjustably mounted on the track.
17. A pulley arrangement as claimed in claim 16, wherein further lock means are associated with the becket mounted on the track.

18. A pulley arrangement as claimed in claim 17, wherein the further lock means comprises a screw-threaded clamp arranged to permit the becket to be clamped at a chosen position on the track.

19. A pulley arrangement substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
Application No: GB0519034.3
Claims searched: 1 - 18
Examiner: Tom Sutherland
Date of search: 18 January 2007

Patents Act 1977: Search Report under Section 17

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Field of Search:

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- B8B

Worldwide search of patent documents classified in the following areas of the IPC:

- B63B; B65H; B66D

The following online and other databases have been used in the preparation of this search report:

- WPI, EPDOC