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STAY ADJUSTER

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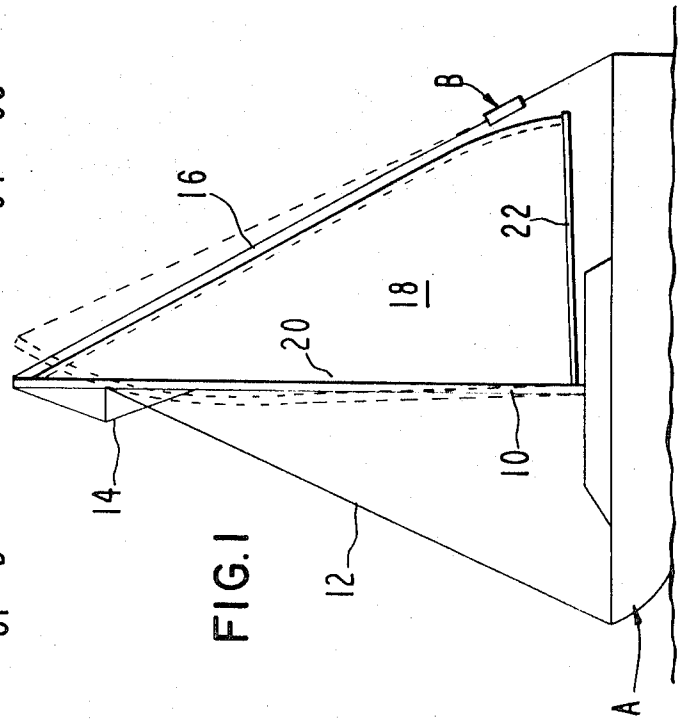


FIG. 1

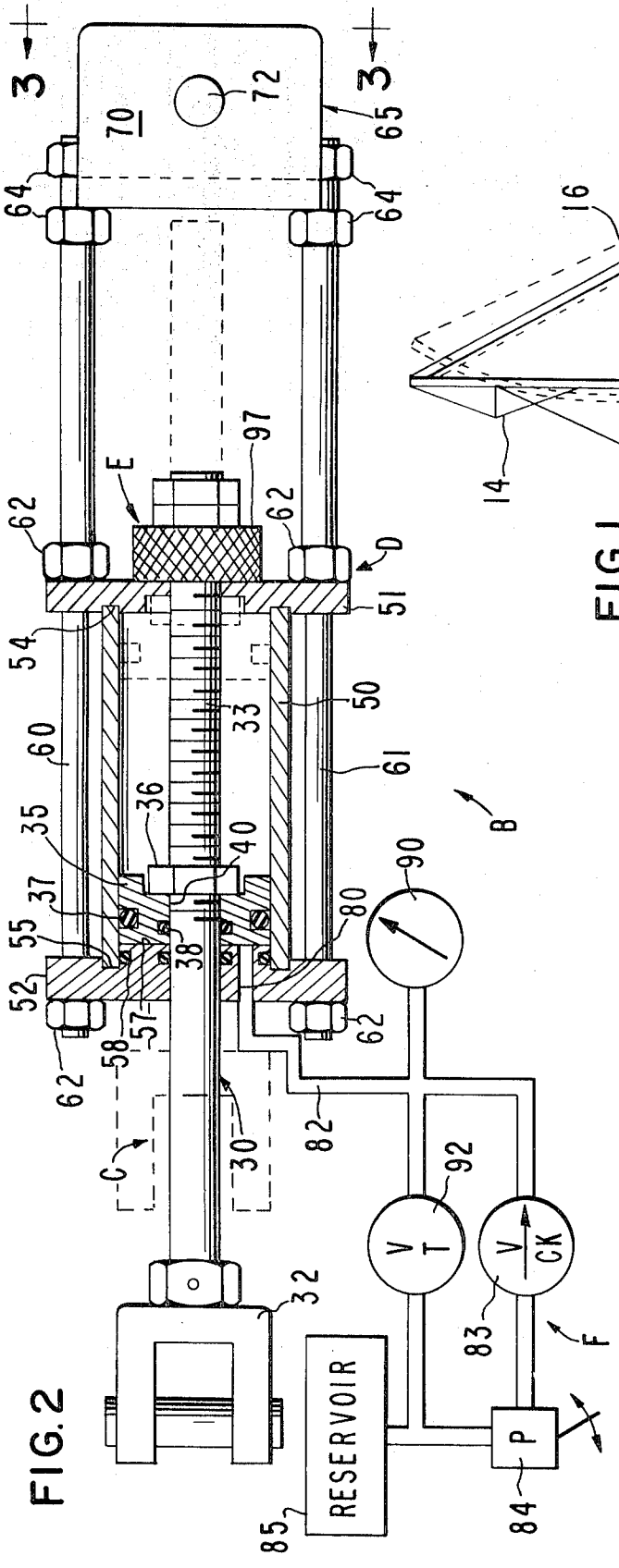


FIG. 2

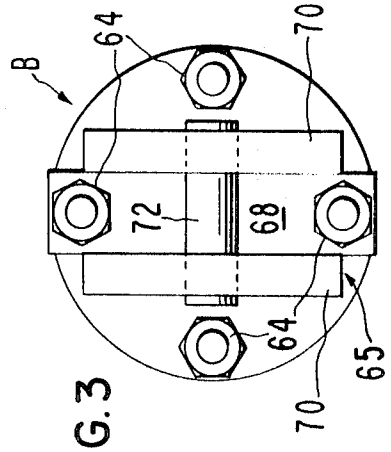


FIG. 3

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STAY ADJUSTER

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ABSTRACT OF THE DISCLOSURE

A stay adjuster is provided with a hydraulic cylinder and piston for changing the length of a tensively loaded stay on a sailboat. Once adjustment has occurred, a mechanical lock on the stay mechanism maintains the stay adjuster in a positively locked position. A pressure gauge communicated to the interior of the hydraulic cylinder and piston provides an indication of backstay loading during stay adjustment.

This invention relates to stay adjusters for use on sailing craft having adjustable stays including in their standing rigging and, more particularly, to a hydraulically actuated stay adjuster.

Hydraulically actuated stay adjusters are known. Typically, such stay adjusters are inserted in a segment of a stay. A hydraulic cylinder is connected through appropriate linkages to one segment of the stay and a piston fitted interior of the cylinder connected to another segment of the stay. By forcing hydraulic fluid interior of the hydraulic piston and cylinder, the length of such stay adjusters can be changed to provide various stay loadings and lengths necessary for appropriate tuning of sailboat rigging.

Heretofore, such hydraulic actuated stay adjusters have suffered from two serious disadvantages. First, in order to maintain their adjustment, hydraulic fluid within the cylinder and piston has to be maintained under pressure at all times. As hydraulic systems under pressure are subject to some leakage, such stay adjusters have to be constantly checked and reset to maintain the desired stay length and tension.

Secondly, such stay adjusters are commonly mounted in a position overlying either the tack or clew of a sail. The inevitable fluid leakage occurring from a cylinder and piston having hydraulic fluid therein under pressure for long intervals of time causes oil to fall on the sails resulting in unsightly stains which destroy sail appearance.

An object of this invention is to provide a hydraulic backstay adjuster which can be moved by hydraulics into a desired setting of length and tension and thereafter can be mechanically locked in its adjusted position.

An advantage of this invention is that the hydraulic cylinder and piston only have the hydraulic fluid therein under pressure during adjustment of the stay; when adjustment is completed and the mechanical lock set, pressure on the hydraulic fluid interior of the cylinder and piston is reduced, arresting the tendency for oil leakage.

A further advantage of this invention is that the mechanical lock of this invention prevents inadvertent parting of the stay; while neglect to the tuning of the stay may cause loss in sail efficiency, no inadvertent catastrophic release of the stay can occur in the use of this adjuster.

A further feature of this invention is that the mechanical advantage provided by hydraulics is readily suited to the adjustment of larger sailboat riggings having correspondingly greater tensions therein.

A further object of this invention is to provide in a hydraulic stay adjuster a pressure gauge for determining fluid pressure interior of the cylinder and piston.

An advantage of the pressure guage is that it will afford

an indication of stay tension during tuning or adjustment of the rigging.

A further advantage of the pressure guage disclosed in this invention is that it eleminates the need for more complex tension sensing devices such as tuning forks, strain guages and the like, which devices often interfere with the fittings to which stays are fastened.

Other objects, features and advantages of this invention will become more apparent after referring to the following specification and attached drawing in which:

FIG. 1 is a side elevation schematic of a Marconi rig sloop incorporating in its backstay, the stay adjuster of this invention and illustrating in broken lines the tuned position of a sail when the stay adjuster is in a contracted position;

FIG. 2 is an enlarged side elevation in partial section illustrating the expanded disposition of the stay adjuster of this invention and showing in broken lines a contracted position of the stay adjuster of this invention; and,

FIG. 3 is an end elevation section along lines 3—3 of FIG. 2.

With reference to FIG. 1, Marconi rigged sloop A is illustrated having mast **10** held in position by head stay **12**, jumpers **14** and backstay **16**. As is illustrated, stay adjuster B of this invention is illustrated inserted in and occupying a segment of backstay **16**.

Adjustment of adjuster B to shorten the effective length of the backstay causes changing of the mast orientation to a configuration shown in broken lines in FIG. 1. Typically, the lower two-thirds of mast **10** is thrust forwardly. The upper third of the mast flexes arcuately rearwardly. The position of the mast and stay illustrated in broken lines causes flattening of the triangular sail **18** fastened to the mast at its luff **20** and to boom **22** at its foot. As is well known in the art, such flattening of sail **18** is desirable when conditions of heavy wind exist.

Referring to FIGS. 2 and 3, stay adjusters B of this invention is illustrated. Stay adjuster B includes piston portion C, cylinder portion D, locking mechanism E, and hydraulic system F.

Piston portion C of the stay adjuster includes rod **30** having clevis **32** attached to one end, threaded shank **33** configured in rod **30** at the other end, and piston **35** fastened therebetween. Typically, piston **35** is provided with concentric aperture **40** through which rod **30** extends. The piston is secured by bolt **36** to rod **30**. As is conventional in hydraulic construction, the periphery of piston **35** is provided with O-ring seal **37** to prevent hydraulic leakage between the sidewalls of the piston and the sidewalls of the cylinder. Likewise, second O-ring seal **38** is provided in piston **35** at aperture **40** to prevent hydraulic leakage along rod **30**. A similar O-ring seal between rod **30** and end plate **52** of the hydraulic cylinder is shown in coaxial alignment to O-ring **38**.

Cylinder section D of the backstay adjuster includes cylindrical sleeve **50** capped at its end removed from clevis **32** by first end plate **51** and capped at its opposite end adjacent clevis **32** by second end plate **52**. End plate **51** is secured to the end of cylinder **50** at first annular groove **54**. Likewise, end plate **52** is secured to the opposite end of cylinder **50** at second annular groove **55**. Unlike end plate **51**, end plate **52** is provided with a raised cylindrical plug **57**, which plug incorporates in the cylindrical sidewalls thereof O-ring seal **58** to prevent hydraulic leakage between the sidewalls of cylinder **50** and plug **57**.

End plates **51** and **52** are urged one towards another by rods **60** and **61**, and bolts **62** threadedly secured to the rods. Typically, rods **60** and **61** are located at diametrically opposite portions of the section of cylinder **50** and extend through aligned apertures **51** and **52** in end plates.

These plates **51** and **52** are firmly compressed towards one another by the threaded engagement between bolts **62** threadedly secured to respective rods **60** and **61**.

Attachment of the cylinder portion D to the backstay is accomplished by virtue of second clevis **65**. Typically, rods **60** and **61** extend away from cylinder portion D a distance exceeding the stroke of piston mounted rod **30**. At their respective ends, two bolts **64** secure a rectangular plate **68** to each rod **60** and **61**. Plate **68** has in turn fastened to the sides thereof between rods **60** and **61** two parallel plates **70**. Plates **70** when provided with aligned apertures through which pin **72** extends provide the clevis structure **65** attaching cylinder section D to the other section of the stay. As is apparent, rods **60** and **61** as extending outwardly and away from the cylinder define a spatial interval therebetween, which interval permits threaded portion **33** of rod **30** to reciprocally move when hydraulic movement of the piston relative to the cylinder occurs.

Hydraulic pump mechanism F is schematically illustrated. Typically, end plate **52** defines hydraulic fluid aperture **80** extending therethrough to the interface between piston **35** and cylinder end plate **52**. Hydraulic piping **82** connected through check valve **83** to lever actuated hydraulic pump **84** and reservoir **85** permits one-way entry of hydraulic fluid into the cylinder. Upon actuation of pump **84**, hydraulic fluid is withdrawn from reservoir **85**, passed through check valve **83** and then through piping **82** into cylinder **50** between end plate **52** and piston **35**.

A pressure gauge **90** is illustrated connected to hydraulic conduit **82** between check valve **83** and the interior of the hydraulic cylinder and piston. When hydraulic movement of the piston relative to the cylinder occurs, gauge **90** will serve to measure the fluid pressure necessary to effect such movement. As such pressure will be a direct function of the tension between clevis **32** attached piston portion C and clevis **65** attached to cylinder portion D, gauge **90** can be calibrated directly to the tension being transmitted through stay adjuster B.

To provide for the release of hydraulic pressure, throttle valve **92** is here shown connected across hydraulic conduit **82** to reservoir **85**. When release of the pressure interior of the cylinder and piston is desired to relax the adjusted stay, throttle valve **92** can be opened to permit fluid to exit from the cylinder and piston through throttle valve **92** and then into reservoir **85**.

A mechanical lock of the stay is provided in its adjusted position by locking mechanism E, here illustrated as knurled bolt **97** threadedly secured to threaded portion **33** or rod **30**. Typically, when movement of piston **35** interior of cylinder **50** has occurred, bolt **97** will be threadedly moved on rod **30** to a position of abutment with end plate **51**. As is apparent, once knurled bolt **97** is in contact with end plate **51**, pressure of the hydraulic fluid interior of the cylinder and piston can be relaxed.

Operation of the adjustable back stay of this invention can be readily understood with reference to FIG. 2. Assuming that the back stay adjuster B is in the relaxed position illustrated in solid lines in FIG. 2, lever actuated hydraulic pump **84** is operated. Fluid from reservoir **85** passes through pump **84**, check valve **83**, conduit **82** and then through inlet aperture **80** into the interface between hydraulic cylinder **35** and end plate **52** interior of cylinder **50**. Typically, hydraulic fluid forced into this interval will cause movement of piston **35** away from end plate **52**. Such movement of the piston **35** away from the end plate **52** can occur and continue until piston **35** occupies the position shown in broken lines abutting end plate **51** at the opposite end of cylinder **50**.

When the desired adjustment of the back stay has occurred, knurled bolt **97** will be moved on the threaded segment **33** of shaft **30** until it lies against end plate **51**. In this position, hydraulic pressure interior of the cylindar can be relaxed and a mechanical interlock of piston portion C of the backstay adjuster relative to cylinder portion D of the backstay adjuster will occur.

Relaxing of the backstay adjuster is analogous. Typically, lever actuated pump **84** will be actuated to remove the force of compression of locking mechanism E onto end plate **51**. Thereafter, knurled bolt **97** will be threadedly moved away from end plate **51** to the new position of backstay adjustment. When such movement of knurled bolt **97** has been made, throttling valve **92** will be opened. This valve will permit fluid interior of the cylinder and piston to be discharged through the throttle valve **92** directly to the reservoir **85**. Fluid discharge will occur until locking mechanism E again seats directly on end plate **51**.

It should be apparent to the reader that numerous configurations of a cylinder, piston and mechanical lock therebetween could be used to practice this invention. Likewise, while one embodiment of this invention has been shown and described, it will be apparent that other adaptations and modifications of this device can be made without departing from the true spirit and scope of the invention.

I claim:

1. In a sailboat having a mast, a sail and adjustable tensively loaded rigging extending between a point on said mast and a point on said boat for deflecting said mast and trimming said sail, a segment of said adjustable tensively loaded rigging comprising: a hydraulic cylinder having means for attachment to said standing rigging at one end and defining a bore for receiving a piston at the other end; a hydraulic piston for being received interior of said bore of said cylinder; a rod attached to said piston at one end extending outwardly of the bore of said hydraulic cylinder and having means for attachment to said standing rigging at the other end for completing said segment of said tensively loaded rigging; said hydraulic cylinder and said rod being substantially coaxial with said rigging; means for introducing fluid within said cylinder to urge said piston to move in opposition to the tensive loading of said standing rigging between said hydraulic cylinder and piston; and means for preventing movement of said piston rod with respect to said cylinder responsive to tension in said rigging when cylinder movement has caused adjustment of said rigging.

2. The invention of claim **1** and wherein said fluid introducing means includes a pressure gauge communicated to said fluid introduced interior of said cylinder for detecting tensive loading of said rigging segment during rigging adjustment.

3. The invention of claim **1** and wherein said movement preventing means includes: a plate connected to said cylinder and defining an aperture therethrough for permitting reciprocating movement of said cylinder rod therethrough; a locking nut threadedly movable on said cylinder rod towards and away from said plate for locking said rod with respect to said plate after adjustment of said rigging by said cylinder.

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