Nov. 21, 1944. J. W. CADE 2,363,229

CABLE TENSION REGULATOR

Filed March 17, 1944

Fig. 1.

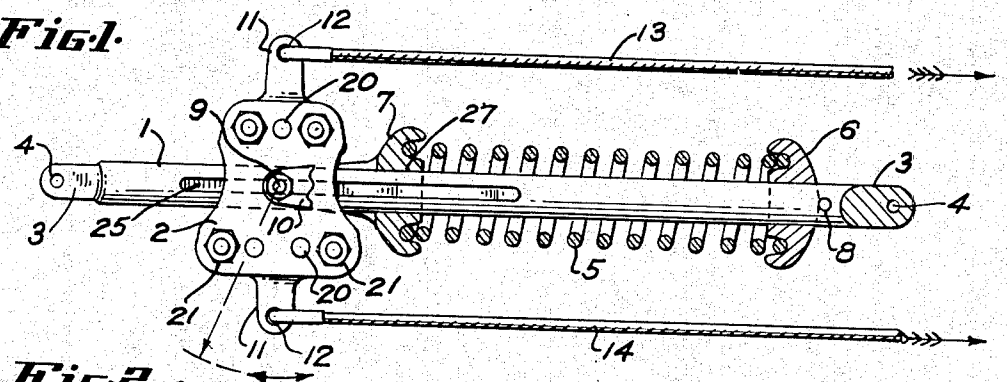


Fig. 2.

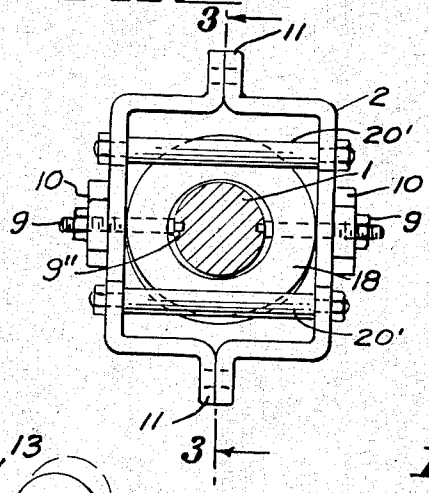


Fig. 3.

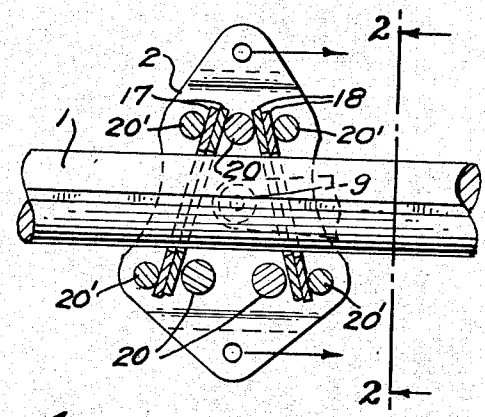
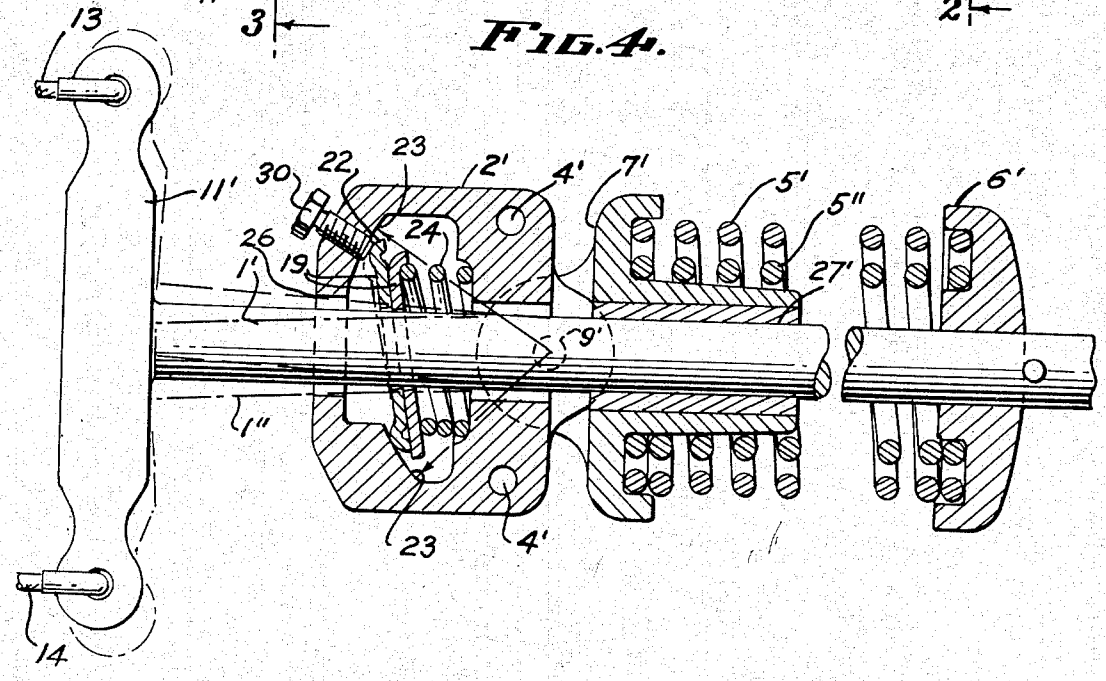


Fig. 4.



INVENTOR
JOHN W. CADE
BY J. A. Bried
ATTORNEY

Patented Nov. 21, 1944

2,363,229

UNITED STATES PATENT OFFICE

2,363,229

CABLE TENSION REGULATOR

John W. Cade, La Canada, Calif., assignor to Sturgess, Inc., Glendale, Calif., a corporation of California

Application March 17, 1944, Serial No. 526,863

12 Claims. (Cl. 74—501)

This invention relates to devices for maintaining the working tension in a pair of control cables, ropes, wires, chains, or other tension members used in transmitting motion to or operating back and forth some distant device or part, particularly a movable vane, rudder, elevator aileron of air craft.

The principal object of the invention is to provide a simple device of the kind referred to, which will produce an unusually quick and firm locking out of the tensioning means upon the pull of a pair of tensioned control cables (or their equivalent) becoming unbalanced, as when the controls are being operated.

The present invention pertains to the general type of cable tension regulator disclosed in my copending patent application filed under Serial Number 521,389 on date of February 7, 1944, and has to do with the locking out arrangement.

In the drawing accompanying this application

Fig. 1 is a side view of one form of my invention.

Fig. 2 is an enlarged cross section of Fig. 1 as seen from the line 2—2 thereof.

Fig. 3 is a cross section of Fig. 2 as seen from the line 3—3.

Fig. 4 is a central longitudinal section showing a modified arrangement of the bar locking plates.

Before describing the drawing in detail it may be stated that in the type of cable tension regulator here under consideration the device comprises two main members, one of which is urged by spring means (or its equivalent) to move along the other member. One of the members is a bar-like member and the other is a block-like member slidably embracing the first member. One of the members is arranged to be anchored to the structure on which the installation is to be made, and the other has a cross arm or rock lever on it, (or its equivalent) to the opposite ends of which lever the two control cables are respectively secured or connected, and which cables are first adjusted by turnbuckles (not shown) so as to set the driving end of the system in phase with the driven end under the tension of the spring tending to slide the cable attached member along the fixed or anchored member, and in such a basic structure special means is provided for immediately locking the two members mentioned against relative sliding movement when an extra pull or tension is applied to either control cable to rock the aforesaid lever to tilt the members relatively (as when operating a rudder or its equivalent) and maintaining the two members so locked until the pull or tension on both cables is again substantially equalized.

In the construction outlined either of the two relatively slidable members may carry the cable attaching cross arm or lever, and the other be fixed, as it is the rocking or tilting of one of the main members relative to the other by unequal pull on the two cables which causes the device to lock, and in Figs. 1 and 3 it is the block-like member which carries or comprises the lever or cross arm to which the cables attach or connect, while the bar-like member is anchored, while in Fig. 4 it is vice versa.

In the two constructions shown in the drawing one of the main members is herein termed the "bar," and the other main member which slides longitudinally of the bar is termed the "block." In Figs. 1 and 3 the bar is designated 1 while in Fig. 4 it is 1', and the block is similarly designated 2 and 2' respectively.

In both constructions the bar is shown as a solid round bar, tho it may be of any cross sectional form, solid or hollow.

In Fig. 1 the bar is indicated as provided with flattened ends 3 with holes 4 or otherwise formed to adapt the bar for bolting or anchoring to the structure on which it is to be used, whereas in Fig. 4 it is the block 2' which is provided with anchoring holes 4'.

The block 2, 2' is arranged to be relatively slidable along the bar 1, 1' and is resiliently urged therealong as by a coiled compression spring 5, 5' embracing the bar and reacting against end saddles 6, 7 (6', 7' for Fig. 4). Saddle 6 is fixed on the bar by any suitable means or stopped from being pushed off by the spring as by a stop pin 8 projecting from the bar, while the other saddle 7 is preferably pivotally connected to the block as at 9 by pivot means passing from the block through two ears 10 extending from the saddle against opposite sides of the block. The pivot means 9 is preferably in the center of the block from which the block is tiltable with relation to the bar so that the spring will not be forced out of alignment on the bar when the two members are tilted or rocked relatively.

In Figs. 1 to 3 the block 2 is provided with outwardly extending lever arms 11 apertured at their ends as at 12 to which the control cables 13 and 14 respectively attach or are connected, and these lever arms form in effect a straight lever extending at right angles across the block and bar when the parts are in normal position as shown in Fig. 1 and permit tilting of the block out of its right

angled position upon either cable being tensioned more or less than the other.

In Fig. 4 the lever or cross arm is positioned on the bar as at 11' and is rigidly secured thereto by any desired means, and the cables 13, 14 similarly connected to its outer ends so that an unequal pull upon the cables will tilt or cant the bar 1' either way as denoted by the dotted positions depending on which cable is under the greatest tension, and when the tension is equal the bar will be in the central full line position.

In Fig. 4 the spring 5' is shown double, that is, two springs 5' and 5'' are used—one inside the other and which construction is optional on either design.

In both designs angularly disposed locking plates or washers are carried within the block member and arranged in such a manner that the bar normally slides freely through them, but upon slight tilting of the block or bar relatively, the edges of the washers holes grip the bar from opposite sides to look the members against sliding movement.

In the construction of Figs. 1 to 3 two sets of these locking plates are used as shown best in Fig. 3 at 17, 18, and in Fig. 4 but one set of the plates is used as shown at 19.

In Fig. 3 the plates (preferably of steel or hard metal) are formed with central apertures somewhat larger than the bar (preferably sharp cornered) and the plates are tilted until their edges almost engage the bar and they are held loosely in this position as by pins or bolts 20 projecting inwardly from or passing through the side walls 2 of the block.

In Fig. 3 each set of locking plates is shown as comprising two plates, but there may be from one to any number. Also the two sets are positioned or tilted at oppositely disposed angles so that one set will lock the two main members against sliding under the extra pull of one cable on the cross arm, and the other set will lock the parts when the extra pull is on the other cable. In each case one set of plates will be tilted into bar engaging position while the other set will be tilted toward further disengaged position. If desired one edge only of the holes in the plates may be sharp and the other rounded (as indicated in Fig. 3) so that the spring 5 will always be able to exert its force in maintaining the minimum working tension in the cables even though the pull on the cables is unequal.

Some of the plate positioning pins (20') may constitute spacing bolts for the side or body walls 2 of the block and be provided with nuts 21 on their outer ends as indicated in Fig. 1.

In Fig. 4 but one set of locking plates is shown within the hollow block. This is the alternative showing where the block is indicated as being the anchored member. In this figure only one set consisting of two of the locking plates is shown at 19. The plates are free to move on each other and are slidably supported by the specially curved inner wall 23 of the block so as to be normally free of gripping contact with the bar 1' when it is in full line central position, yet upon tilting the bar either way by an unbalanced pull on the cables 13, 14 attached to the cross arm 11' the angle of the plates with respect to the bar will be reduced to cause engagement of the edges of the plate openings with the bar and at once lock it against sliding action relative to the block.

To permit establishing the free or critical angle of the plates as close as practicable to the gripping angle (so that the members will lock without requiring too much tilting of the bar about the axis 9') an adjusting screw 30 may be provided for initially determining the angle of the plates. This screw may operate against a rounded portion 22' of one of the plates and will constitute a cam from which the plates will fall to the dotted position when the bar is tilted (downwardly in the drawing) to the dotted position 1'', and over which it will slide when the bar is tilted in the opposite direction, to thus in either case reduce the angle of the plates from "just free" to gripping relation with the bar.

The plates are kept in the proper position by a light coiled compression spring 24.

As it is desirable to provide means to maintain the lever arms of both designs in a plane at right angles to axis 9' of Fig. 4 or 9 of Fig. 3, any suitable means may be employed for this purpose. One such means comprises forming a keyway along the bar as indicated at 25 and letting an extension 9'' of axis pin 9' or 9 of the block project into it. If the bar is not round but is rectangular or oblong in cross section it suffices to make the opening 26 in the block through which the bar passes, of a width to prevent the bar from turning, or the interior of the bore 27 or 27' of the saddle 7 or 7' through which the bar slides, of the same shape as the bar.

Having thus described my improved cable tension regulator and the manner of its functioning it will be evident that while it will generally be used for maintaining the working tension in control operating cables, it will operate equally well with control systems employing ropes, wires, chains, or rods, as well as in installations where part of the tension members are rods or wires and part are cables, chains, or other flexible members, and accordingly my use of the word cable or cables herein and in the claims is intended to include any such equivalent control members in which the tensioning and locking out features of my special construction above described is or its equivalent applicable.

I therefore claim:

1. In a cable tension regulator of the character described, comprising a bar-like member with a block-like member relatively slidable along the bar-like member, spring means urging the members to slide relatively, means for anchoring one of said members, and means adapted for connecting a pair of control cables to the other one of said members respectively at points spaced outward at opposite sides of the longitudinal center line of said bar-like member whereby an unequal pull on said cables will tend to tilt the members relatively, means for locking the member to which the cables are secured against sliding in direction of pull on the cables comprising a locking plate carried by the block-like member presenting an edge against the bar-like member in a manner to engage and lock with the same when the block-like member and the bar-like member are tilted relatively, said plate being normally disposed at a tilted angle relative to the bar-like member but insufficient to lock therewith when the members are not tilted relatively.

2. In a structure as set out in claim 1, there being a plurality of such locking plates arranged in mutually slidable relation.

3. In a structure as set out in claim 1, there being another similar locking plate but tilted at an opposite angle to the first plate.

4. In a structure as set out in claim 1, spring means tending to urge said plate into tilted position.

5. In a structure as set out in claim 1, means for adjusting the normal angle of said locking plate.

6. In a structure as set out in claim 1, there being a plurality of such locking plates arranged in mutually slidable relation, and a second set of such plates but tilted at an opposite angle to the first set.

7. In a cable tension regulator of the character described, comprising a bar-like member with a block-like member relatively slidable along the bar-like member, spring means urging the members to slide relatively, means for anchoring one of said members, and means adapted for connecting a pair of control cables to the other one of said members respectively at points spaced outward at opposite sides of the longitudinal center line of said bar-like member whereby an unequal pull on said cables will tend to tilt the members relatively, and a locking plate carried by said block-like member, said plate being apertured and in freely embracing relation to said bar-like member and adapted to engage and lock with said bar-like member at the edges of its aperture when sufficiently tilted with respect thereto, and means normally holding said plate at a tilted angle just insufficient to lock with said bar-like member when said members are not tilted.

8. In a cable tension regulator of the character described, comprising a bar-like member with a block-like member relatively slidable along the bar-like member, spring means urging the members to slide relatively, means for anchoring one of said members, and means adapted for connecting a pair of control cables to the other one of said members respectively at points spaced outward at opposite sides of the longitudinal center line of said bar-like member whereby an unequal pull on said cables will tend to tilt the members relatively, and a plurality of relatively loose locking plates carried by said block-like member, said plates being apertured and in freely embracing relation to said bar-like member and adapted to engage and lock with said bar-like member at the edges of their apertures when sufficiently tilted with respect thereto, and means normally holding said plates at a tilted angle just insufficient to lock with said bar-like member when said members are not tilted.

9. In a structure as set out in claim 8, there being two sets of said plates, and with one set tilted at an opposite angle to the first set.

10. In a structure as set out in claim 7, means for adjusting the normal angle of said plate.

11. In a structure as set out in claim 7, means supporting said plate and over which said plate is adapted to slide insuring a gripping angle of the plate with the bar-like member being effected upon tilting of the members relatively by an overbalancing pull upon either of said pair of cables.

12. In a structure as set out in claim 8, means supporting said plates and over which said plates are adapted to slide insuring a gripping angle of the plates with the bar-like member being effected upon tilting of the members relatively by an overbalancing pull upon either of said pair of cables.

JOHN W. CADE.