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TEMPERATURE CHANGE COMPENSATING MEANS

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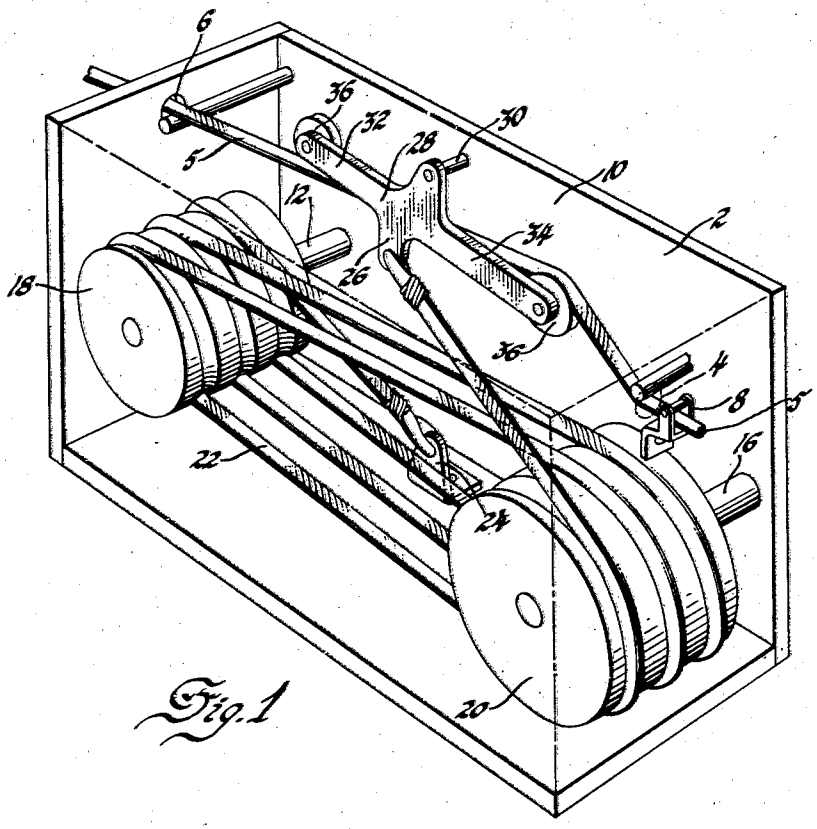


Fig. 1

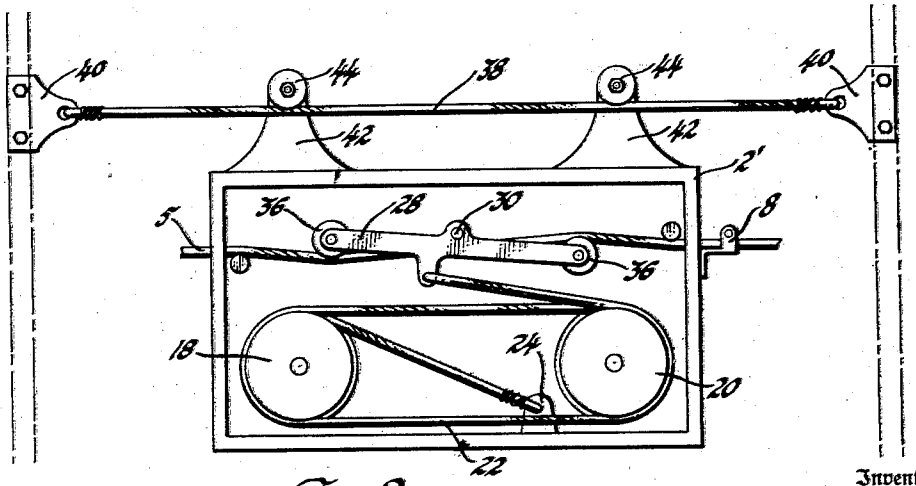


Fig. 2

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TEMPERATURE CHANGE COMPENSATING MEANS

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This invention relates to control means and more specifically to means for maintaining substantially constant tension in control cables such as those utilized in aircraft. In the relatively large present-day planes, the control cables operated by the pilot assume some length between the control point and that part of the plane being moved, such as the ailerons, rudders, etc. These control cables are usually made of steel for strength and the body of the plane and wings are usually of aluminum for lightness in weight. These two materials, therefore, have considerably different coefficients of expansion and when the plane is subjected to severe temperature changes, the tension in the cable is decidedly changed. It is a rather common occurrence for the temperature to change from sixty to seventy degrees Fahrenheit on the ground to sixty degrees below at 25,000 feet altitude and large bombers are subjected to these changes daily. The control cables, therefore, in one of these large ships tend to become slack as the plane gains altitude and cools off inasmuch as the aluminum contracts more than the steel cables.

It is therefore an object of my invention to provide compensating means to maintain substantially constant tension in the cables regardless of temperature.

It is a still further object of my invention to provide cable temperature compensating means easily applicable to control cables.

With these and other objects in view which will become apparent as the specification proceeds, my invention will be best understood by reference to the following specification and claims and the illustrations in the accompanying drawing, in which:

Figure 1 is a perspective view of my cable compensating means with parts of the housing being broken away and being shown diagrammatically.

Figure 2 is a side elevation of a modified form of cable temperature compensating means.

The control cables in large aircraft do not move through too large a distance, for example, those in the B–24 type move a maximum distance of about a foot and a half, while those in some of the larger planes travel less than three feet. However, the slack which would normally be found in these cables if no compensating means was provided is sufficient to make the operation of the plane considerably different at different altitudes and it is desirous to apply as equal a force as possible in order to make the operation easier for the pilot.

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Referring now more particularly to Figure 1, there is shown therein a roughly rectangular housing box 2 in the end walls of which are provided two aligned openings 4 and 6 through which the control cable 5 from the pilot to the part being moved is led. This control cable passes freely through the opening 6 but is clamped to the housing 2 by clamping means 8 adjacent the opening 4 in the end panel. Thus as the cable moves back and forth dependent upon the operator, the housing 2 will be carried by and move therewith.

Mounted in spaced relation on the back wall 10 of the housing 2 are two short shafts 12 and 16 which carry helically grooved pulley drums 18 and 20 respectively. A cable 22, formed of aluminum wire, has one end anchored to bracket 24 and then proceeds through several turns alternately around the pulleys 18 and 20. The opposite end of the cable 22 is connected to one arm 26 of a pivoted lever 28 mounted upon a small pin 30. This lever 28 has two oppositely extending arms 32 and 34 carrying small grooved wheels 36 in which the control cable engages, passing under one wheel and over the other. It will be evident from the disclosure of this figure that any pull exerted upon the lever 28 by the cable 22 will tend to take up slack by shortening the effective length and maintain the control cable 5 taut.

Therefore, since this cable 22 is made of aluminum, the same material as that used in the body of the plane, it will be subject to the same coefficient of expansion as the body and therefore as the temperature to which the plane is subjected decreases and the steel cable 5 tends to sag since the aluminum body will contract faster than the steel cable, the cable 22 will likewise contract pulling the lever 28 around its pivot 30 and cause the resultant slack to be taken by and the cable 5 to remain in substantially the same tension. This whole assembly is carried on the control cable and only weighs a slight amount and in no wise affects the general operation thereof. It has the further advantage that if anything should happen to the cable 22 or to any other portion of the compensating apparatus, the steel cable 5 could still operate the part to which it is attached as it is continuous and would be in no worse condition than as if no compensator were supplied.

Figure 2 shows a similar arrangement, but in this instance where it might not be desirous to carry the compensator entirely supported by the control cable, I have provided a separate supporting cable 38 which is anchored as at 40 to two of the structural portions of the plane and

need not be very long for, as before mentioned, the longest travel in the present largest planes is less than three feet. In this case the housing 2' is supported by two vertically extending members 42 having pulleys 44 riding on the supporting cable 38.

The remainder of the compensating structure is the same as that shown in Figure 1, the housing being clamped to the cable by clamping means 8 and having therein an aluminum cable 22 of considerable length wound alternately over drums 18 and 20 and operating the tensioning lever 28 as before. The only difference between the two structures is that the weight in this instance is carried by separate means.

It will thus be evident that I have provided simple, safe means for maintaining substantially constant tension in the mechanical controlling cables of bodies subjected to severe temperature changes in which the various parts are made from different materials having different coefficients of expansion.

I claim:

1. In tensioning means for a cable, a casing supported on said cable, a lever pivotally mounted on said casing and having arms extending along the cable length in opposite directions and on opposite sides and means carried by said casing and connected to the lever for rotating the same about its pivot, said means being formed of material having a different coefficient of expansion than that of the cable so that upon temperature changes the lever will assume different relative positions and tension the cable.

2. In tensioning means for a cable formed of a given material, means supported on the cable capable of changing the contour thereof and means also supported on said cable formed of material having a different coefficient of expansion than that of the cable connected to the contour changing means to control the cable tension.

3. In tensioning means for a cable formed of a given material, a casing through which the cable extends, a lever medially pivoted and engaging opposite sides of the cable to vary the effective length thereof, a pair of rotatable drums on the casing, a second cable anchored to the casing and wound around the drums and connected to the lever formed of a material having a different coefficient of expansion than the first cable to turn the lever upon a temperature change and alter the effective length of the first cable.

4. A cable tensioning unit comprising supporting means rigidly clamped to said cable to move therewith, movable means engaging said cable to change its contour mounted on said supporting means and means having a different coefficient of expansion than that of the cable carried by the supporting means and connected thereto at one extremity, the opposite end being connected to the movable means to alter the cable contour as the temperature changes.

5. A cable tensioning unit comprising a casing supported by and clamped to the cable to move therewith, a lever pivoted to the casing and extending on opposite sides thereof to engage the same and change its path and a second length of cable having a coefficient of expansion different from that of the first named cable connected to the pivotal means and to the casing to determine the position of the pivotal means and therefore the main cable tension.

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