June 24, 1941. W. S. DIEHL 2,246,510

RETRACTABLE PITOT STATIC TUBE

Filed July 6, 1939 2 Sheets-Sheet 1

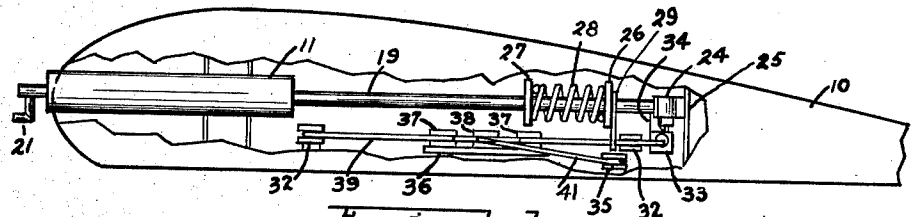


FIG. 1

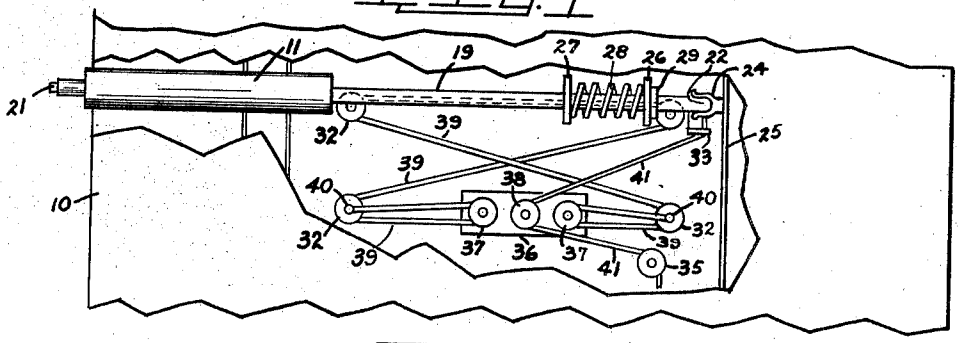


FIG. 2

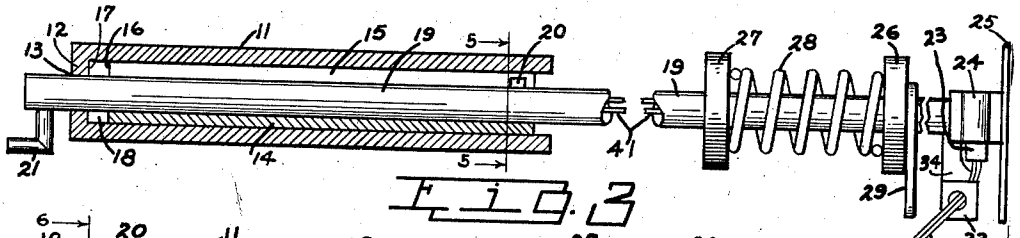


FIG. 3

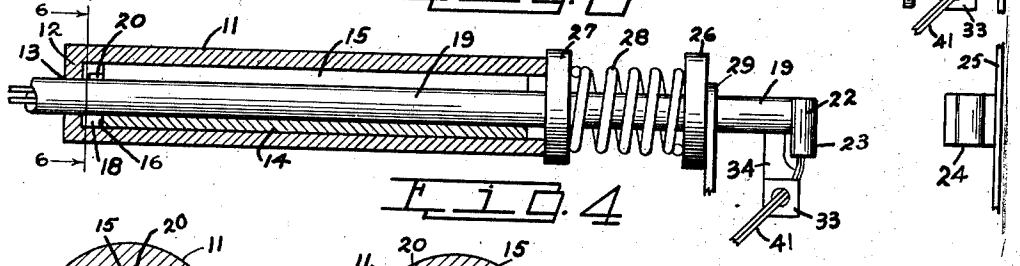


FIG. 4

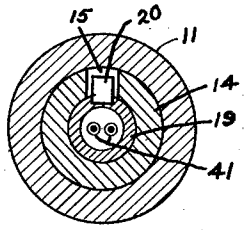


FIG. 5

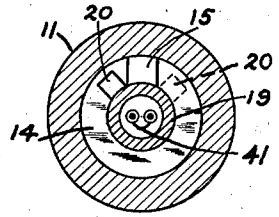


FIG. 6

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RETRACTABLE PITOT STATIC TUBE

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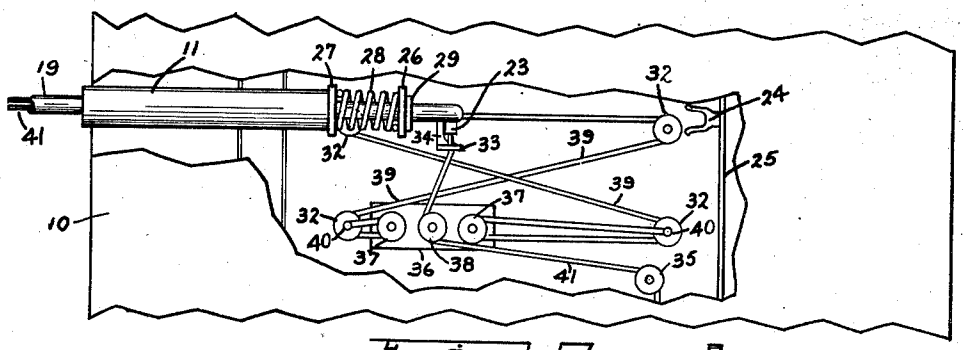


Fig. 7

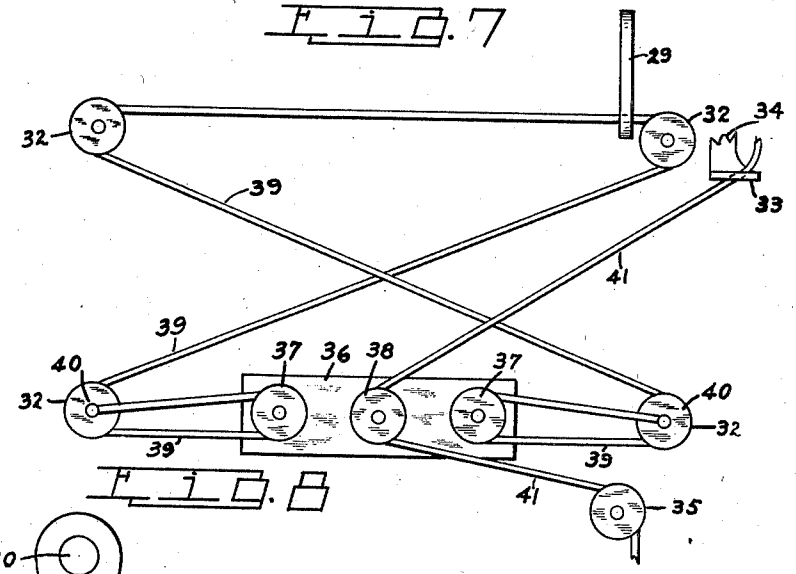


Fig. 8

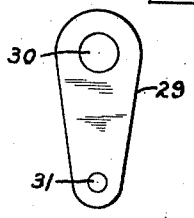


Fig. 9

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RETRACTABLE PITOT STATIC TUBE

Walter S. Diehl, United States Navy

Application July 6, 1939, Serial No. 283,030

4 Claims. (Cl. 244—1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The present invention relates to Pitot static tubes and particularly to that class of tubes for static and impact pressure readings.

In the present day method of securing a high degree of accuracy in static and impact pressure readings, the Pitot static tube is mounted on a boom extending approximately one-half chord length ahead of an aeroplane wing. From experience it has been found that the above arrangement is only advantageous where there is abundant space and where the aeroplane is handled on the ground under favorable conditions. The boom method of mounting the Pitot tube is disadvantageous for the reason that it is subject to fouling and damage from various other causes.

It is therefore an object of the present invention to provide a Pitot static support tube that may be adjustable between extended and retracted positions and one that will insure satisfactory readings in an extended position.

Another object of the present invention is the provision of a device that is manually or mechanically operated, and one that is positive and firm.

A further object of the present invention is the provision of a retractable Pitot static tube that may be properly handled on the ground in a retracted position under unfavorable conditions.

A still further object of the present invention is the provision of locking means for securely locking the Pitot static tube in either an extended or retracted position.

A still further object of the present invention is the novel arrangement of means for imparting impact and static pressure to the Pitot tube at all times and for preventing fouling and kinking of the pressure tubes during extended or retracted movement of the Pitot tube.

With these and other objects in view the invention consists in the combination and arrangement of parts to be hereinafter described and claimed, reference being had to the accompanying drawings in which the numerals of reference designate similar parts in the several views and wherein:

Fig. 1 is a side elevational, fragmentary view of an aeroplane wing, illustrating my novel tube mounting and operating means;

Fig. 2 is a fragmentary plan view of an aeroplane wing illustrating the Pitot static tube in retracted position and the arrangement of the operating means for said tube;

Fig. 3 is an enlarged detail view of the Pitot static tube in retracted and locked position and illustrating the spring and pin means for holding the Pitot tube in extended position, the guide tube housing and slotted guide tube being shown in section, portions being shown broken;

Fig. 4 is an enlarged detail view, similar to Fig. 3, and illustrating the Pitot static tube in extended position, portions being in section;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3 illustrating the assembly of the tubes and the guide pin in the guide slot;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 4 and illustrating the slidable tube in locked position;

Fig. 7 is a fragmentary plan view illustrating the Pitot static tube and its associated mechanism in extended, locked position;

Fig. 8 is an enlarged detail view of the arrangement of pulleys, cable, cable finger, guide ring tubes and pulley block; and

Fig. 9 is an enlarged view of the cable finger.

Referring to the drawings, I have illustrated my device as manually operated and I would have it distinctly understood that the device may be mechanically operated if desired. In the drawings, the numeral 10 represents an aeroplane wing in which is mounted in any suitable manner a cylinder 11, one end of which is provided with a wall 12 having a reduced bore 13. Within the cylinder 12 is mounted a tube 14 that is provided with a slot 15 and it is to be noted that the end 16 of the tube 14 is spaced from the inner wall of cylinder 12 providing a circular opening 18 for a purpose to be later described. Within the tube 14 is mounted for slidable movement a Pitot static tube 19 carrying a pin 20 (Fig. 3) that is freely slidable in slot 15. One end of the Pitot static tube 19 has a depending L-shaped head portion 21, the opposite end 22 having a depending portion 23, and it is to be noted that the end portion 22 is adapted for locking engagement with a spring clip 24 that is secured to a longitudinal brace 25 of the wing in any suitable manner. Fixedly mounted on the Pitot static tube 19 adjacent the end 22 of the tube is a disk 26. A floating disk 27 is also mounted on the tube 19, and interposed between the disks 26 and 27 is a compression spring 28. A finger 29 provided with apertures 30 and 31 (Fig. 9) is fixed to the disk 26, the tube passing through the aperture 30, the diameter of which is in excess of the diameter of the tube 19 so as to permit the turning of the tube 19 either to the right or left for a purpose presently to be described.

Within the aeroplane wing 10 is mounted in

any suitable manner a plurality of pulleys 32 and a ring 33 that is carried by a plate 34, one end of which is rigidly fixed in any suitable manner to the tube 19, guide pulley 35 and a floating pulley block 36 that is provided with cable pulleys 37 and a guide wheel 38. Trained around the pulleys 32 and 37 is a cable 39, the ends of the cable respectively being securely fixed to axles 40 of the pulleys 32. The aperture 31 of the finger 29 is fixedly positioned on the cable 39 as illustrated in Fig. 8. Within the tube 19 and trained through the ring 33 and around the guide wheels 38 and 35 are pressure tubes 41 and it is to be noted that the pressure tubes appear to be one tube, this being accomplished by binding the tubes together in order that they may pass over guide wheels 38 and 35 smoothly.

In the operation of my novel device, the operator grasps the Pitot tube at 21 and pulls the tube 19, which due to the pull is released from the clip 24 out to its full extended position, when it is given a slight turn to the right or left, wherein the pin 21 engages the face 16 of tube 14. Near the end of the outward travel of the tube 19, the collar 27 engages the inner end of the cylinder 11 so that the final movement of the tube slightly compresses the spring 28. The tube 19 is thus held against backward rotation by the force exerted by the compression spring 28. During the movement of the tube to extended position, motion is imparted to the cable 39 through the medium of the fixed finger 29, moving the pulley block 36 and the guide ring 33. As the movement continues, the pulley block 36 moves to the left and the pressure tubes, during movement are prevented from kinking by the guide ring 33 and guide wheels 35 and 38. To return the Pitot tube to retracted position, the tube is turned until the pin 20 registers with the slot 15, and inward force is exerted to the tube until the end 22 engages the clip 24. During the retracting movement the cable 39, pulley block 36 and guide ring 33 and pressure tubes 41 move as the tube 19 moves, the pulley block 36 assuming its central position as illustrated in Figs. 2 and 8.

It will be understood that the above description and accompanying drawings comprehend only the general and preferred embodiment of my invention and that various changes in construction, proportion and arrangement of parts may be made within the scope of the appended claims without sacrificing any of the advantages of my invention.

The invention described herein may be manufactured and/or used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In combination with an aircraft structure a Pitot tube slidably mounted for movement from an extended operative position to a retracted position, a part of said tube at all times being housed within the aircraft structure, a member mounted on the Pitot tube within the aircraft structure, a pulley, means for mounting the pulley within the aircraft structure for movement in a path generally parallel to the path of movement of the Pitot tube, means connecting said pulley to said member including means for moving the pulley one-half the movement of said member and in the same direction, pressure and impact tubes secured to the aircraft structure in the general neighborhood of the position of the rear end of the Pitot tube when in retracted position, then passing over said pulley and then connected to the rear end of the Pitot tube whereby slack is taken up in said tubes as the Pitot tube is extended and retracted.

2. In combination with an aircraft structure a Pitot tube slidably mounted for movement thereon from an extended operative position to a retracted position, a part of said tube at all times being housed within the aircraft structure, a member mounted on the Pitot tube within the aircraft structure, a helical spring encircling said Pitot tube to the rear of said member and secured at one end to said member, a finger slidably mounted on said Pitot tube and secured to the other end of said spring, a pulley means for mounting the pulley within the aircraft structure for movement in a path generally parallel to the path of movement of the Pitot tube, means connecting said pulley to said finger including means for moving the pulley one-half the movement of said member and in the same direction, pressure and impact tubes secured to the aircraft structure in the general neighborhood of the position of the rear end of the Pitot tube when in retracted position, then passing over said pulley and then connected to the rear end of the Pitot tube whereby slack is taken up in said tubes as the Pitot tube is extended and retracted.

3. In combination with an aircraft structure, a Pitot tube slidably mounted for movement thereon from an extended operative position to a retracted position, a part of said tube at all times being housed within the aircraft structure, a finger mounted on the Pitot tube and movable with said Pitot tube within said structure, a pulley mounted within the structure and adjacent the rearward position of said finger, a second pulley adjacent the forward position of said finger when the Pitot tube is in extended position, a floating member, means for mounting said member for movement in a path generally parallel to a line passing through said pulleys, at least three pulleys mounted on said member, a securing means mounted on the airplane structure adjacent the first mentioned pulley, cables secured to said means and passing around one of the pulleys on the floating member, thence around the first named pulley, then around the second named pulley, then around another pulley on the floating member, then secured to the aircraft structure adjacent said second named pulley, means securing the finger to said cable between the first and second pulleys, means for reversing the direction of motion of said cable between the first two pulleys and the floating member, a static pressure tube and an impact tube both secured to the airplane structure adjacent the first mentioned pulley, then trained around a pulley on said floating member, then secured to the sliding Pitot tube device whereby when the Pitot tube is moved to an extended or retracted position the floating member is displaced, thereby taking up slack in said tubes.

4. In combination with an aircraft structure, a Pitot tube slidably mounted for movement thereon from an extended operative position to a retracted position, a part of said tube at all times being housed within the aircraft structure, a member secured to said Pitot tube within the aircraft structure, a helical spring encircling said Pitot tube to the rear of said member and secured at one end to said member, a finger slidably mounted on said Pitot tube and secured to the other end of said spring, a pulley mounted within the structure and adjacent in rearward

position of said finger, a second pulley adjacent the forward position of said finger when the Pitot tube is in extended position, a floating member in said aircraft structure, means for mounting said member for movement in the path generally parallel to a line passing through said pulleys, at least three pulleys mounted on said member, a securing means mounted on the airplane structure adjacent the first mentioned pulley, cables secured to said means and passing around one of the pulleys on the floating member, thence around the first named pulley, then around the second named pulley, then around another pulley on the floating member, then secured to the aircraft structure adjacent said second named pulley, means securing the finger to said cable between the first and second pulleys, the means for reversing the direction of motion of said cable between the first two pulleys and the floating member, a static pressure tube and an impact tube both secured to the airplane structure adjacent the first mentioned pulley, then trained around a pulley on said floating member, then secured to the sliding Pitot tube device whereby when the Pitot tube is moved to extended or retracted position the floating member is displaced, thereby taking up slack in said tubes.

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