MOUNTING FOR INTERCHANGEABLE STICKS AND WHEELS

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This invention relates to airplanes, and has reference more particularly to mountings as used in airplanes for the mounting of the "joy stick" whereby the stabilizers and ailerons are manually controlled and operated; and it has for its principal object to provide an improved type of mounting designed to permit the interchangeability of the usual joystick or a stick steering wheel-cable assembly to suit the desires of the pilot; the former having an oscillating side to side action and also a front to rear action, while the latter comprises a stick which has manual front to rear action to operate the stabilizers and is equipped with a hand wheel with cable connections for actuating the ailerons by the rotation of the wheel.

Explanatory to the present invention it will be stated that in flight an airplane of ordinary type is controlled, in part, by a hand operated stick or lever. This stick is so mounted and is so operatively connected with ailerons and stabilizers that when pushed directly forward or pulled directly backward from a neutral position, it will manipulate the stabilizers to cause the plane to nose down or nose up accordingly. Furthermore, the stick is so connected with ailerons that when actuated laterally from neutral position to either side, it will adjust the ailerons in a manner whereby to cause the plane to bank for a turn toward that side. In another type of installation, a lateral action of the stick for the control of the ailerons is not provided for, but instead, a hand wheel is mounted on the stick and has a drum with cable connections therefrom to parts which control action of the ailerons whereby on turning the wheel, they may be manipulated for banking the plane.

In no instance, to my knowledge, has provision been made in an airplane for the interchangeability of the ordinary joystick, having forward and aft, also side to side action, and a stick-steering wheel-cable assembly which has front and back action for stabilizer operation and has a wheel connected by cables to parts for the control and operation of the ailerons.

Therefore, it is the object of this invention to provide a mounting that is operatively connected with ailerons and stabilizers for their control and functional operation, and also with which mounting either the universal joy stick, or the wheel equipped stick may be applied as desired by the person who is to pilot the plane.

Other objects of the invention reside in the details of construction and combination of parts, and their mode of operation as will hereinafter be fully described.

In accomplishing the above and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of the present mounting as equipped with the universal type of joy stick.
Fig. 2 is an end elevation of the mounting with the steering wheel equipped stick applied.
Fig. 3 is a cross sectional detail on the line 3-3 in Fig. 2.
Fig. 4 is a top or plan view of the mounting.
Fig. 5 is a longitudinal section on line 5-5 in Fig. 4.
Fig. 6 is a cross section on line 6-6 in Fig. 5.
Fig. 7 is a detail of the toggle link connection.

The present application is a divisional part of an application for patent filed on February 19, 1942, under Serial No. 378,407, which application was abandoned in view of an application filed on November 10, 1941, under Serial No. 418,578 in which this subject matter was disclosed.

Referring more in detail to the drawings—

In Fig. 1, I have illustrated the control stick mounting embodying this invention, and which is adapted for use therewith of the universal type of joystick or a steering wheel equipped stick.

The present mounting, in a preferred construction, comprises supporting bearings 1 and 1a which are aligned longitudinally of the airplane and are fixedly attached to the floor 2 of the cockpit, or compartment in which the pilot of the plane is to be located.

Extended between the bearings 1 and 1a and rotatably supported thereby, is a shaft 3. As here shown, the opposite ends of the shaft extend through and are rotatably contained by the bearings. However, other suitable means and methods of support might be employed. Rotatably fitted about the shaft 3 along the forward portion thereof, is a tubular shaft or sleeve 4, which is equipped near its forward end with a downwardly directed lever arm 5 to which cables 6 and 6' are attached, and which extend laterally in opposite directions for connection with parts which operate in control action of the ailerons of the plane. Fixed to the sleeve at its rear end is a short, upwardly extending post 7, and likewise fixed to the shaft 3 closely adjacent the rear end of the sleeve 4 and registering with the post 7, is a post 8, each of the posts 7 and 8 being formed with a hole through which a bolt
9, as shown in Figs. 4 and 5, may be extended and secured to hold the sleeve against rotation on the shaft 3 when such is desired.  

Fixed to the rearward end portion of the rod 3 are extending equally to opposite sides thereof is a tubular cross head 16, and pivotally mounted by this cross head is the mounting device for the joy stick or the stick and wheel assembly. This device, as best shown in Figs. 1 and 2, comprises a yoke having opposite side straps 14--14' spaced apart along their medial portions, then directed downwardly and toward each other and joined together along their lower end portions. Likewise, the upper end portions of the straps are directed toward each other and are solidly fixed to the opposite sides of an upwardly opening socket member 18 designed to receive the lower end of the joy stock or the stick of the stick and wheel assembly therein. The opposite side straps of the yoke, respectively, pass across the opposite ends of the cross head and a pivot bolt 20 is extended therethrough and through the cross head to pivotally mount the yoke to provide for forward and rearward oscillation of the stick. It is to be observed in Figs. 4 and 5 that the axis of the pivot bolt 20 intersects the axis of shaft 3 at a right angle. Also it will be understood that when the bolt 3 is applied through the posts 7 and 8, lateral oscillations of the yoke will cause the shaft 3 and also sleeve 4 to be oscillated accordingly.

The lower end portion of the socket and stick supporting yoke that is formed by the joining of the lower end portions of the yoke straps 14 and 14', extends downwardly, and is here shown as passing through an opening in the floor 2. Attached pivotally to the lower end of the yoke, by a pivot member 24, is a link 25 which may be extended to any suitable means or devices for the control of the stabilizers of the plane.

It will be mentioned here that insofar as this invention is concerned, the connecting means provided between the stick mounting and the stabilizers and between the mounting and the ailerons for their control, is not important. It is only required, in this instance, that some practical or suitable means be connected with the depending lever arm 5 for the control and actuation of the ailerons by the rotative action of the sleeve 4 and that some suitable means be connected with the lower end of the stick for the control of the stabilizers incident to the forward or rearward action of the stick. These connecting means might be cables, levers, rods or hydraulic devices of any practical kind and arrangement.

Secured to the opposite sides of the sleeve 4 and extending rearwardly and diverging in the rearward direction, are lever arms 30 and 30'. These lever arms normally lie in the horizontal axial plane of shaft 3 and at their rear ends, have out-turned ears 32 with perforations 33. It is to be observed, by reference to Fig. 4, that the ears 32 are aligned with the axis of the cross head 10 on shaft 3 and are equally spaced from the longitudinal axis of the shaft.

Fixed to the floor in alignment with the cross head, and equally spaced from the shaft 3 at opposite sides thereof, are brackets 40 which are used in connection with the mounting of the stick and wheel assembly presently described.

In the use of the present mounting with the universal type of joy stick, the lower end of the stick, designated by reference numeral 45, is applied to the socket. Then it will be apparent that forward and rearward action of the stick actuates the yoke accordingly and thus, through the linkage indicated, effects the actuation of the stabilizers for nosing the plane up or down. Furthermore, lateral action of the stick through the mounting yoke, effects rotative movement of the shaft 3 and sleeve 4, which latter, through the provision of lever arm 5 and cable connections 6 and 8', controls and effects the actuation of the ailerons for banking the plane or for holding it in stable flight.

When it is desired to use the stick and wheel assembly, the joy stick 45 is withdrawn from the socket and the bolt 9 is removed so that the shaft 3 and the sleeve 4 may be rotated on the shaft 3.

Use of the present mounting in connection with stick-steering wheel-cable assembly is illustrated in Figs. 2 and 3 wherein 50 designates the stick equipped at its upper end with a yoke 51 which mounts a steering wheel 52. This wheel is fixed on a horizontal shaft 53 rotatable in the yoke. On the shaft, is a small sprocket wheel 55 over which a short length of sprocket chain 56 is extended; there being short lengths of cables 67 connected with the ends of the chain and extending downwardly therefrom and equipped at their lower ends with hooks 67' which are applied to holes 33 in the outer ends of the arm 32 of the lever arms 30 and 30'. The lower end of this stick 50 is so applied to the socket that the wheel faces the pilot.

Fixed rigidly on the stick, above the socket, is a collar or sleeve 69, and extending laterally and downwardly therefrom, and then turned vertically downwardly to register at their lower ends with the brackets 40, are legs 70; the lower ends of the legs being fixed to the brackets, respectively, by pivot bolts 71 and 11'.

Reference to Figs. 2 and 4 will show that the bolts 71--11' are axially aligned with the cross head 10 which mounts the yoke on the shaft 3. After the stick 50 has thus been applied to the socket, the bolts 71--11' are applied to the legs and brackets, and the cables attached at their lower ends to the rear ends of the legs 30 and 30' by means of the hooks 67'.

It will be understood then that, with the bolt 9 removed from the posts 7 and 8, rotation of the wheel 55 will through the cable connections, effect rotative action of the sleeve 4 and thereby control the aileron action through the lever arm 5 and cable connections 6 and 8'.

The stick 50 in this instance, is held against lateral action by reason of the mounting of the legs 70 in the brackets 40. However, forward and rearward action of the stick is possible the same as in the use of the usual joy stick, and through the linkage connected with the lower end of the yoke, the stabilizers may be similarly controlled.

A feature of the chain and cable connection is shown in Fig. 7, wherein it is indicated that a hinged toggle link 80 is applied in the connection for easy quick release of the cable when it is desired to dismount this particular stick assembly.

With the stick mounting so constructed, it is possible for the pilot to select the type of hand control he desires and to easily and quickly apply it or remove it from the mounting.

This mounting is applicable not only to commercial and combat planes, but may be used in a similar manner in training planes and training equipment of the type shown in the patent applications previously referred to.

Having thus described my invention, what I
claim as new therein and desire to secure by Letters Patent is—

1. In a mounting for interchangeable use of a joystick or stick-steering wheel-cable assembly, a floor, a shaft rotatably supported along the floor in a forward and rearward direction, a cross head fixed on the shaft, a yoke mounted by the cross head to oscillate on an axis at right angles to the shaft axis, and whereby the shaft may be axially rotated in opposite directions, means on the yoke for its operative connection with stabilizer control means, a sleeve rotatably fitted to the shaft having means thereon for its operative connection with aileron control means, arms extended from the sleeve along opposite sides of the shaft into alignment with the yoke axis for the rotatable actuation of the shaft by a steering wheel assembly, brackets fixed to the floor at opposite sides of the shaft and aligned with the crosshead for mounting a steering wheel assembly for forward and rearward oscillation, a socket mounted by the yoke to receive a joystick or the stick of a steering wheel assembly, and means securing the sleeve against turning on the shaft when the joystick is used and releasable to permit turning of the shaft by the stick and steering wheel assembly when the latter is used and its cables connected with said arms.

2. A mounting of the character described, comprising a floor, a shaft rotatably mounted along the floor, a yoke pivoted on the shaft for oscillation on the longitudinal plane of the shaft and equipped for operative connection with stabilizer control means, brackets fixed to the floor at opposite sides of the shaft and aligned with the yoke axis, a sleeve rotatably fitted to the shaft, means on the sleeve for operatively connecting it with aileron control means, a socket mounted on the yoke to interchangeably receive a joystick or a stick and steering wheel assembly, lever arms extended from the sleeve at opposite sides of the shaft into alignment with the yoke axis, a stick applied to the socket, a steering wheel on the stick, cable connections between the wheel and ends of the lever arms for rotating the sleeve, brace legs on the stick extended under opposite sides and having ends in registration with said brackets, removable bolts pivoting the legs to the brackets, and a releasable means for locking the sleeve against rotation on the shaft.

3. In a mounting for interchangeable use of a universal joystick or a stick equipped with steering wheel and cable connections: a rotatably mounted shaft, a sleeve rotatably fitted to the shaft, releasable means locking the sleeve against rotation relative to the shaft, means connected with the sleeve for aileron control, a yoke pivotally mounted on the shaft for rotating it in opposite directions, and providing for oscillation of the yoke in the longitudinal plane of the shaft; said yoke being equipped for connection with stabilizer control means, means on the yoke to receive a joystick for control of ailerons and stabilizers, or to receive a stick equipped with steering wheel and cable connections, and means on the sleeve for the connection thereto of the cable connections of the steering wheel whereby the sleeve, when released from the shaft, may be rotated for aileron control.

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