This invention relates to aircraft rudder controls.

It has been found in actual practice that it is a great relief to the pilot or operator of an aircraft to provide means for locking the rudder bar against movement after it has been adjusted by foot pressure to hold said rudder or other control surface of the craft at the proper flying angle, to maintain the craft on a substantially straight course.

The object of the present invention is to provide in conjunction with such rudder bar, means operable by either one or both feet of the operator to release the rudder bar.

Under the arrangement herein shown and described, the operator may release or unlock the rudder bar with either foot and either by a pushing or pulling action. It is a further object to provide a lock which is immediately operative after the rudder bar has been moved in one direction, so as to prevent reverse movement by the pressure of the air on the rudder. Another object is to provide a lock of this character so that the rudder bar is released for movement in the desired direction only when one foot is used to operate the bar. A further advantage of the construction is that in a training machine where the pilot and student are seated side by side, either or both of such persons may operate the rudder bar with the aid of one foot only.

Another object of the invention is to provide means whereby in case of the locking and unlocking mechanism getting out of order, the operator may instantly throw all of such mechanism out of operation, leaving the rudder bar absolutely free to be operated in the usual manner.

To the above ends the invention consists in the novel construction, combination and arrangement herein fully described, shown and claimed.

In the accompanying drawings:

Fig. 1 is a plan view of the rudder bar showing the locking and unlocking means therefor.

Fig. 2 is a rear elevation of the same.

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1.

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 1.

Fig. 5 is a plan view of a rudder bar showing a modified form of locking and unlocking means.

The rudder bar 10 is centrally mounted upon a substantially vertical pin or pivot 11 and is supported upon a suitable stationary base 12 ordinarily secured to the floor of the fuselage of an airplane. At the opposite extremities of the rudder bar 10 are fittings 13 having holes 14 therein for the attachment of the control cables (not shown) which extend to the rudder to be controlled by the rudder bar.

The means for locking the rudder bar in a fixed position comprises a normally stationary clutch member 15 shown in the form of a disk having in one embodiment of the invention teeth 16 around the periphery thereof. Arranged at opposite sides of the stationary clutch member 15 are movable clutch members 17 having teeth 18 to engage and disengage the teeth 16 of the clutch member 15. The movable clutch members 17 are pivotally mounted on pins or bolts 19 projecting from and secured to the rudder bar 10. The movable clutch members 17 are normally held in clutching position as shown in Fig. 1 by means of a contractile spring 20 terminating in a web 21 of said clutch members.

The means for unlocking the rudder bar comprises a pair of foot levers 22 which are fulcrumed upon and adapted to turn about a common axis formed by the center pin 11. Each lever 22 is connected by a pivot 24 to one of the movable clutch members 17 and for that purpose each of said levers is provided with an extended portion 25 which projects beyond or to the opposite side of the center pin 11 in order that each foot lever 22 may have pivotal connection with the movable clutch member 17 adjacent the end 25 of the same. This is done in order that when foot pressure is brought to bear against either one of the levers 22, the opposite movable clutch member 17 is disengaged from the stationary clutch member 15, the adjacent clutch member not being moved. The rudder bar 10 is then free to be turned about the center pin 11 for the purpose of adjusting the angle of the rudder.

The foot levers 22 have attached to their inner ends pedal plates 26 which are formed as shown in Fig. 4 to bear slidely upon the rudder bar 10. Each pedal also comprises a bottom plate 27 which extends under the rudder bar and is formed with a guide slot 28 in which is a guide roller 29 secured to the rudder bar 10 by suitable fastening means 30.
In addition to the means above described for releasing the clutch means by foot pressure, I also provide means for releasing the clutch mechanism by a pulling action exerted by the operator’s foot or feet. In carrying out this part of the invention I employ stirrups 31 connected to brackets 32 on the rudder bar by means of pivots 33. Each stirrup has a downwardly extending arm 34 which is adapted to press against a motion transmitting lever 35 mounted under the rudder bar on the lower end of the pivot bolt 19. The other end of the lever 35 is connected to the adjacent pin 24 which couples the respective movable clutch member 17 to the foot lever 22 at that side of the center of movement of the rudder bar. Each lever 35 is also pivotally mounted on the fixed pivot 19. The lever 35 is in effect an integral extension of the adjacent movable clutch member 17 since both are pivoted on fixed pivot 19 and connected to the pin 24 of the foot lever 22. When the operator exerts a pulling action on one stirrup 31, by a rearward movement of the foot, motion is transmitted through the lever 35 to the adjacent movable clutch member 17 so as to permit the rudder bar to be operated in the one direction it is pulled in the one direction, the spring 26 yielding to permit this action but maintaining the clutch member in engagement or ready for instant engagement to prevent reverse movements.

If the left foot lever for example in Fig. 1 is pressed by the foot of the operator the right clutch member 17 is released and rotation in a clockwise direction of the rudder bar is permitted. Reverse rotation is prevented by the left clutch member 17. Exactly the same action takes place when the right stirrup 31 is operated by pulling upon the right foot. If both feet are pressed or pulled at the same time, both clutch members 17 are released and free movement in either direction permitted until the feet are removed. If the stirrup left 31 and the left pedal plate are simultaneously pulled and pushed respectively, both clutch members 17 are released and movement permitted in either direction.

It will now be clear that the operator may use one or both of his feet in moving the rudder bar about its pivotal axis and also for unclutching said rudder bar, since by pulling upon stirrup 31 and simultaneously pushing upon the adjacent pedal plate 26 with one foot, both clutch members 17 are released. Upon removing his foot or feet from the rudder bar, the latter is automatically locked and maintained in that position by the operation of the clutch mechanism described. It will further be seen that he may operate the rudder bar with the aid of one foot only and either by a pushing or pulling action, leaving his other foot free for other purposes. Furthermore, the mechanism is admirably adapted for dual control where two persons are seated side by side, as either of said persons may have full control of the rudder bar. This is a valuable feature for training purposes.

In an emergency, where, for example, any part of the clutch mechanism or controlling means therefor should get out of order or bind and interfere with the operation of the rudder bar, the entire clutch mechanism may be thrown out of gear by the operation of an emergency foot lever 36 which controls a locking pin 37 slidable through a guide 38 in the top of the base 12 as shown in Fig. 3, and normally engaging a hole 39 in the stationary clutch member 15. It will be seen that by withdrawing the locking pin 37, the normally stationary clutch member 15 is rendered free and loose and therefore the rudder bar may be freely turned by the operator without being interfered with by the clutch mechanism and operating means therefor herein-above described.

Instead of providing the stationary and movable clutch members with teeth, the arrangement shown in Fig. 5 may be utilized. Instead of Fig. 5, 40 designates the stationary clutch member having a smooth periphery 41 forming the clutch face of the stationary member. Likewise the movable clutch members 42 are provided with smooth clutch faces 43 which cooperate with the clutch face 41 of the stationary clutch member 40. I claim:—

1. In combination with a pivotally mounted rudder bar, a locking and releasing means embodying a stationary clutch member, a movable clutch member on each side thereof to cooperate therewith mounted on the rudder bar, and a foot lever on each side of the rudder bar, each of which has a pivotal connection with the opposite movable clutch member.

2. In combination with a pivotally mounted rudder bar, locking and releasing means embodying a stationary clutch member, movable clutch members to cooperate therewith mounted on the rudder bar, and foot levers movable about a single fixed axis and each of which is adapted to release a movable clutch member.

3. In combination with a pivotally mounted rudder bar, locking and releasing means embodying a stationary clutch member, movable clutch members to cooperate therewith, foot-operated push levers each of
which is connected to release one of said movable clutch members and foot-operated pull stirrups each of which is adapted to release one of the movable clutch members.

4. In combination with a pivotally mounted rudder bar, locking and releasing means embodying a stationary clutch member, movable clutch members to cooperate therewith, foot-operated push levers each of which is adapted to release one of said movable clutch members, foot-operated pull stirrups pivoted on said bar and each adapted to release one of said movable clutch members, said push levers and said pull stirrups being arranged in pairs so that a pulling effort on said stirrups causes a pushing effort on the push levers.

5. In combination with a pivotally mounted rubber bar, locking and releasing means embodying a stationary clutch member, movable clutch members to cooperate therewith mounted one on each side of the rudder bar, a pedal member on each side of the rudder bar, a foot lever for each pedal member, each of said pedal members being connected to the opposite movable clutch member by one of said foot levers.

6. In combination with a pivotally mounted rudder bar, locking and releasing means embodying a stationary clutch member, movable clutch members to cooperate therewith mounted one on each side of the rudder bar, a pedal member on each side of the rudder bar, a foot lever for each pedal member mounted on the pivotal axis of said rudder bar, each of said pedal member being connected to the opposite movable clutch member by one of said foot levers and yielding means inter-connecting said movable clutch members.

7. In combination with a pivotally mounted rudder bar, locking and releasing means embodying a normally stationary clutch member, means for locking and unlocking said normally stationary clutch member, a movable clutch member to cooperate therewith mounted on the rudder bar, and a foot lever which is adapted to release said normally stationary clutch member.

8. In combination with a pivotally mounted rudder bar, locking and releasing means therefor, embodying a stationary clutch member, a movable clutch member to cooperate therewith mounted on said rudder bar, a stirrup adapted to be pulled by the operator's foot to operate the rudder bar and a device operably connected to said stirrup to be moved thereby to release said movable clutch member.

9. In combination with a pivotally mounted rudder bar, locking and releasing means therefor embodying a stationary clutch member, a plurality of movable clutch members to cooperate therewith mounted on said rudder bar, a stirrup for each movable clutch member movably mounted on said rudder bar and adapted to be pulled by the operator's feet to operate the rudder bar and a device operably connected to each said stirrup to be moved thereby to release its respective movable clutch member.

In testimony whereof I affix my signature.

ERNEST G. McCAULEY.