April 1, 1952 R. N. OWLER 2,591,598

ADJUSTABLE FOOTREST

Filed April 13, 1949 2 SHEETS—SHEET 1

Fig. 1

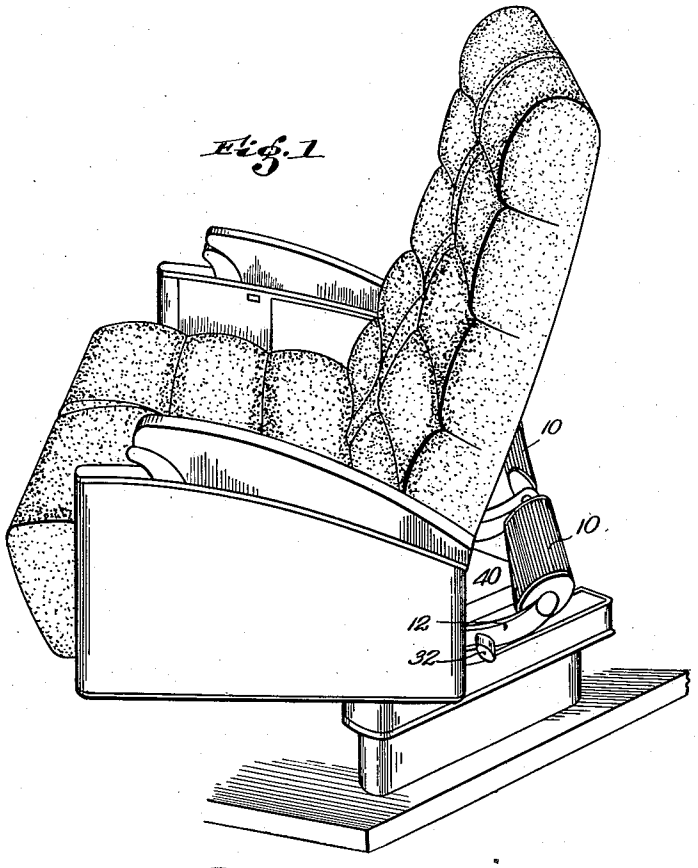



Fig. 2

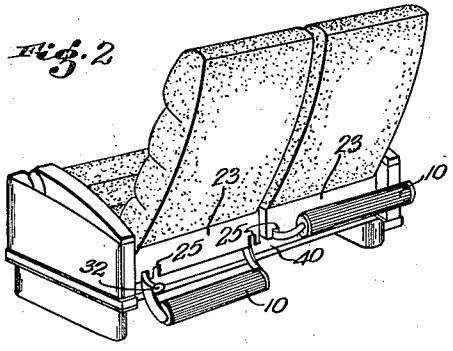
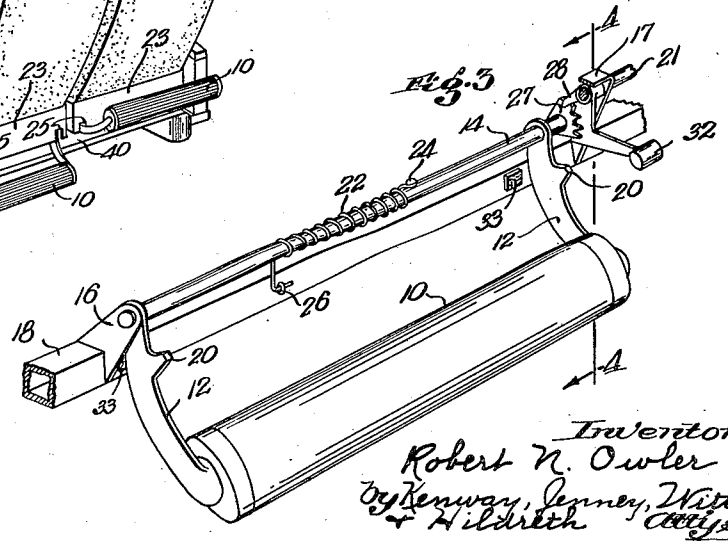



Fig. 3




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Fig. 4

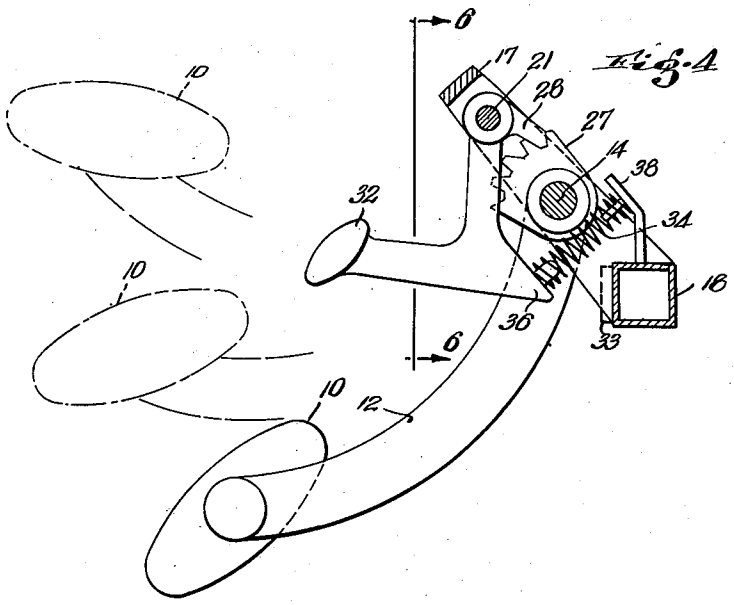



Fig. 5

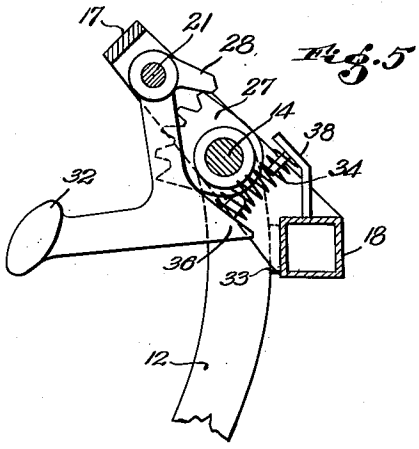
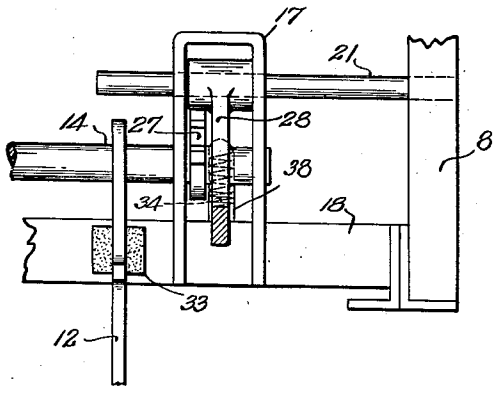



Fig. 6




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2,591,598

# UNITED STATES PATENT OFFICE

2,591,598

## ADJUSTABLE FOOTREST

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4 Claims. (Cl. 155—171)

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This invention relates to foot rests for vehicle chairs and more particularly to novel suspension mechanism for a foot rest which is pivotally mounted and connected to the lower rear of a vehicle chair frame for use by the occupant of the chair next behind. In one aspect this invention relates to novel foot rest suspension mechanism adapted to facilitate vertical adjustment and stowage of the foot rest. In another aspect this invention relates to novel foot rest mechanism for railroad car chairs by means of which the foot rest may be elevated to a position free and clear of the chair frame for purposes of pivoting the chairs for reversal of direction.

Foot rests connected to the lower rear of vehicle chair frames for use by occupants in the chair next behind, fall into four general categories. The first category includes foot rests which are rigidly secured to the chair frame; the second category includes foot rests which are mounted to fold in and out beneath the chair; the third category includes foot rests mounted to slide in and out beneath the chair, and the fourth category includes foot rests mounted to pivot from a depressed position beneath the chair to an elevated position to the rear of the chair. Fixed foot rests in the first category have the obvious disadvantages of failing to accommodate chair occupants having different leg lengths and cannot be moved out of the way by occupants not desiring to use them. Folding foot rests belonging to the second category, while they may be moved out of the way, are generally inconvenient to operate and are not adjustable to accommodate different leg lengths. Sliding foot rests belonging to the third category generally are mounted upon guide ways and slide in and out beneath the chair to acommodate different leg lengths. While they may be adjusted, they usually comprise numerous working parts rendering their construction and installation expensive, and their maintenance difficult. Such sliding foot rests also generally require the occupant to stoop forward to adjust them; and furthermore, due to their location beneath the chair they interfere with pivoting railroad car chairs for reversal of direction. The principal disadvantage pertaining to foot rests in the fourth category is that they are generally difficult to adjust. In the past, attempts have been made to provide convenient adjusting mechanism for fixing the foot rest in various positions, but hitherto none has been entirely successful. One such attempt employed a hand lever linked to the foot rest to elevate or lower it and included a hand operated locking mechanism. While it may be said that such a construction is an

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improvement, still the number of working parts required render it initially expensive, and difficult to maintain. Furthermore, the foot rest is generally bulky rendering it difficult to adjust in the horizontal position, and furthermore, hand operation has the additional disadvantage of requiring the user to stoop forward.

Therefore, it is an object of my invention to provide a conveniently adjustable foot rest connected to the lower rear of a vehicle chair frame for accommodation of occupants of the chair next behind which foot rest will not interfere with pivoting the chair about its base for purposes of changing its direction. Another object of my invention is to provide a simple and convenient suspension mechanism for such a leg rest by means of which the leg rest may be fixed in various positions to accommodate different leg lengths without requiring the user to stoop forward to operate it.

An additional object of my invention is to provide suspension mechanism for a pivotally mounted foot rest having few working parts, being simple in construction, and having means to counteract the bulk weight of the leg rest.

In the accomplishment of these objects I mount a foot rest upon a horizontal shaft and pivotally connect the shaft transversely across the bottom rear support members of the chair frame. At one end of this shaft I secure a toothed gear segment and pivotally mount a pawl arm on the chair frame adjacent to and engaging the gear segment. The gear segment serves as part of a ratchet wheel with the pawl arm engaging its teeth to prevent downward pivotal movement of the foot rest in various positions depending upon which tooth of the gear segment the pawl arm engages. The pawl arm is urged into contact with the gear segment by a compression spring and is also provided with a rearwardly extending foot pedal for the purpose of releasing it from the gear segment. The said compression spring, however, allows the pawl arm to recede and allow upward pivotal movement of the foot rest, when the occupant pulls it upward.

It is a feature of my invention that a torsion spring is mounted upon the foot rest pivot shaft for the purpose of urging the foot rest upwardly to compensate for the weight of the foot rest. The torsion spring, however, is not sufficiently strong to overcome the full weight of the foot rest when the foot rest is pivoted to the horizontal position. Thus, when the pawl arm is released from the gear segment by operation of the foot pedal, the foot rest will drop slowly towards the floor. However, as the foot rest approaches the

depending vertical position the effect of gravity upon the pivotal movement of the foot rest is less and the torsion spring entirely counterbalances the foot rest before it reaches the depending vertical position. Since the foot rest would swing aimlessly in the balanced position, it is an additional feature of my invention that the foot pedal may then be released with the pawl arm then bearing upon the upper edge of the gear segment, holding the foot rest firmly in the fully depressed position.

Further objects and features of my invention will best be understood and appreciated from a detailed description of a preferred embodiment thereof selected for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a view in perspective of the foot rest of my invention secured to a vehicle chair with the vehicle chair partially pivoted for purpose of reversal of direction,

Fig. 2 is a rear view in perspective of a vehicle chair equipped with the foot rest of my invention,

Fig. 3 is a view in perspective of the suspension mechanism of the foot rest,

Fig. 4 is a sectional view in side elevation along the lines 4—4 of Fig. 3, illustrating the foot rest in a partially elevated position,

Fig. 5 is a sectional view in side elevation along the lines 4—4 of Fig. 3, illustrating the foot rest in fully depressed position, and

Fig. 6 is a partially sectioned view in rear elevation of the foot rest bracket.

The preferred embodiment herein shown includes a horizontal foot rest 10, supported at each end by arms 12, which in turn are mounted upon a transverse shaft 14. The shaft 14 is pivotally mounted for rotation in suitable bearings supported at one end by an upstanding strut 16 and at the other end by a bracket 17 both of which are secured to a transverse member 18 of the seat frame (not fully shown).

The arms 12 carry the foot rest in a position below and to the rear of the seat and are provided with stops 20 located to engage a pin 21 when the foot rest is in the fully elevated position as will be further explained below. The foot rest itself is pivotally connected to the arms 12 by suitable bearings (not shown), and rocks freely to accommodate various foot positions.

It will be seen that the foot rest would normally be heavy to pivot upwards; and furthermore, if it were dropped from the elevated position, it would gain considerable momentum in its downward pivotal movement with the possibility of damaging the arms 12 or the strut 16. In order to counteract these forces a torsion spring 22 is mounted upon the shaft 14. One end of the spring 22 is secured to the shaft at 24 and its other end is extended downward and secured to the transverse support member 18 at 26. The torsion spring may be any conventional helical spring, the only limiting feature being that it is not strong enough to actually overcome the weight of the foot rest. Thus the foot rest is free to pivot slowly downward and may be raised by the occupant of the seat next behind by merely lightly pulling it upwards with his foot.

The shaft 14, as above described, is supported at one end by the brackets 17 which is formed in the shape of an inverted U with the shaft 14 passing through its side walls. For the purpose of providing a plurality of fixed positions for the foot rest, a segment of a gear 27 having upstanding gear teeth is secured to the shaft 14 between the side walls of the bracket 17. A pawl arm 28 is pivotally mounted upon a transverse pin 21 which passes through the side walls of the bracket 17 substantially above the shaft 14. The pawl arm 28 is positioned to engage the teeth of the gear segment 27 to prevent downward pivotal movement of the foot rest 10, and is urged into contact with the teeth of one gear segment by a compression spring 34 mounted upon an upstanding arm 38 integral with the transverse support 18 and bearing against a depending extension 36 of the pawl arm 28. Thus, the gear segment 27 serves as part of a ratchet wheel, and holds the foot rest 10 against downward pivotal movement in various positions depending upon which tooth of the gear segment 27 the pawl arm 28 engages. The compression spring 34, however, allows the pawl arm to rise over the successive teeth of the gear segment 27 while the foot rest 10 is being pivoted upward.



The pin 21 extends to each side of the bracket 17, and is secured at one end to the chair side frame 8. The other end of the pin 21 extends transversely to a point directly above the nearest arm 12 in which position it engages the stop 20 of the said arm 12 when the leg rest is fully elevated. A back plate 23 (see Fig. 1) is mounted on the chair to the rear of the suspension mechanism in order to provide a convenient housing for it and is provided with appropriately located notches 25 to receive the arms 12 and foot pedals 32. It will be noted, however, that the arms 12 and foot pedals 32 do not lodge fully into the said notches 25.

In order to lower the foot rest 10, the pawl arm 28 must be disengaged from the gear segment 27, and to this end, a foot pedal 32 is mounted integrally with the pawl arm 28 and extends rearwardly where it may conveniently be operated. Depressing the foot pedal, elevates the pawl arm 28 clear of the teeth of the gear segment 27, and allows free downward pivotal movement of the foot rest 10.

While the torsion spring 22 is not sufficiently strong to overcome the weight of the foot rest 10 when the latter is in an elevated position, it will be seen that the force of gravity is less when the foot rest 10 approaches a depending vertical position. Actually in the preferred embodiment of my invention herein shown, the foot rest never reaches a fully vertical position because the arms 12 abut against rubber shock pads 33 when the foot rest reaches an angle of approximately 75° declivity from horizontal. However, when the foot rest is in such position with the arms 12 engaging the pads 33, the torsion spring 22 is just strong enough to counterbalance the weight of the foot rest 10.

The foot rest is restrained against swaying in the fully depressed position by the compression spring 34 which will at that time urge the pawl arm 28 against the uppermost tooth of the gear segment 27 thereby tending to pivot the foot rest downward. It is to be noted that the pawl arm 28 is then held in a more elevated position by the uppermost tooth than when normally lodged between two teeth, with the result that the compression spring 34 will be more compressed and will exert more pressure in holding the foot rest fully depressed than in initially resisting elevation from one of the intermediate positions. Further in this connection, it is to be noted that the gear segment 27 differs from the conventional ratchet wheel in the sharp angle of the notches

between its teeth. Without such notches in combination with the angle of the pawl arm 28, the steadying effect of the compression spring 34 and pawl arm 28 would be substantially diminished.

The operation of the foot rest of my invention is as follows. In the fully depressed position, the pawl arm bears upon the upper edge of the gear segment 27. From this position, the foot rest may be elevated by the occupant of the chair next behind by pulling upwards upon the foot rest with his foot. During this phase, the teeth of the gear segment 27 cause the pawl arm to rise intermittently and drop between each successive tooth. This operation is accomplished without depressing the foot pedal 32. The foot rest may be left in any position during its upward journey, wherein the pawl arm 28 enters between the teeth of the gear 27. To lower the foot rest, the occupant depresses the foot pedal 32, releasing the pawl arm 28 from the teeth of the gear segment 27. The foot rest will then drop slowly to the fully depressed position.

It will be evident from the apparatus thus described that the foot rest may also be arrested in various positions during its downward path by merely releasing the foot pedal 32 and allowing the pawl arm 28 to enter the teeth of the gear segment 27. If the desired adjustment is not attained by such a method the first time the foot pedal is released, the occupant need merely release the foot pedal again, or elevate the foot rest one or two notches as desired.

Since the foot rest of my invention is mounted upon the rear of the chair frame as distinguished from the chair base or pedestal, the foot rest will be carried by the chair as the latter is pivoted for reversal of direction (see Fig. 5). Thus, the space under the forward part of the chair will be free for use by the occupant or for accommodation of a leg rest. It is not necessary to elevate the foot rest 10 individually prior to pivoting the chair because the pivotal movement brings the arms 12 up against a transverse chair base plate 40 and causes them to elevate the foot rest concurrently with pivoting the chair.

While minor variations will be apparent to those skilled in the art, it is not intended to limit the invention to the precise structure of the preferred embodiment herein shown, but rather to measure it in terms of the appended claims.

Having thus disclosed an illustrative embodiment of my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A rocking foot rest for connection to the lower rear of a vehicle chair and adapted to rock from a position beneath the chair to an elevated position to the rear of the chair; having in combination, a helical torsion spring adapted to urge the foot rest upward, the said torsion spring counterbalancing the foot rest when the latter is in the depressed position but allowing a slow downward movement of the foot rest when the latter is in the horizontal position, and means including a gear segment and spring operated pawl for arresting the downward movement of the foot rest in a plurality of positions of elevation, the pawl constructed and arranged to bear with increased spring compression upon the gear segment when the foot rest is in the depressed position restraining the same from rocking aimlessly.

2. A foot rest for vehicle chairs comprising a shaft rotatably mounted in the lower rear of the vehicle chair, arms secured to the shaft and supporting a foot rail at a distance from the said shaft, a toothed gear segment integral with one end of the shaft, a pawl arm rockably mounted upon the chair adjacent to the gear segment and engaging the said gear segment to prevent downward movement of the foot rail in a plurality of positions, a torsion spring encircling the shaft adapted to counterbalance the weight of the foot rail when the latter is in the depressed position, but allowing slow downward movement of the foot rail when the latter is in the horizontal position, and a compression spring urging the pawl into engaging relation with the gear, the gear segment being adapted to hold the pawl in a partially elevated position when the foot rail is fully depressed whereby the compression spring will exert increased pressure in restraining the foot rail in the said fully depressed position.

3. A pendulous, multi-position foot rest for connection to the lower rear of a vehicle chair for use by the occupant of the chair next behind; having in combination, a spring urging the foot rest upward and counterbalancing the foot rest in a slanting position of declivity; a deep toothed gear segment operatively associated with the foot rest, a pawl rockably connected to the chair adapted to engage the teeth of the gear segment and prevent downward motion of the foot rest in a plurality of positions of elevation; a compression spring urging the pawl into engaging relation with the gear segment whereby prior to lodging fully into the cavity between two teeth the pawl arm urges the foot rest downward with increased pressure, and the fully depressed position of said foot rest positioning said gear segment such that the pawl arm has not lodged fully in the teeth thereof.

4. A pendulous, multi-position foot rest for connection to the lower rear of a vehicle chair having in combination, means arresting the downward motion of the foot rest in a fully lowered slanting position of declivity, a helical torsion spring counterbalancing the foot rest in the said fully lowered position, a toothed gear segment operatively associated with the foot rest, a pawl rockably connected to the chair, adapted to lodge between the teeth of the gear segment to prevent downward motion of the foot rest in a plurality of positions of elevation, the pawl further adapted to engage the upper corner of the end tooth of the gear segment when the foot rest is in the said fully lowered counterbalanced position, and a second spring urging the pawl into engaging relation with the gear segment, whereby, when the foot rest is in the fully lowered counterbalanced position, the pawl arm will be partially elevated, under increased compression, and operative to restrain the foot rest in the fully lowered position.

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