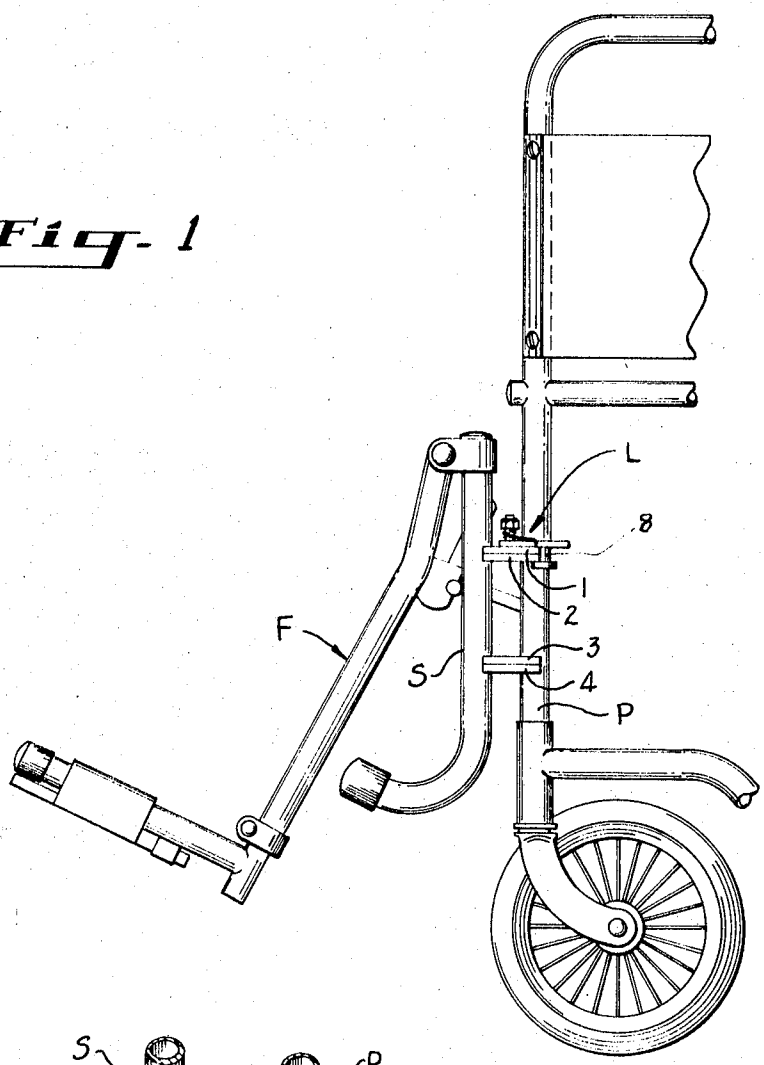
July 1, 1969 W. J. PIVACEK 3,453,027

LATCH FOR SWINGING FOOTREST

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Fig. 1



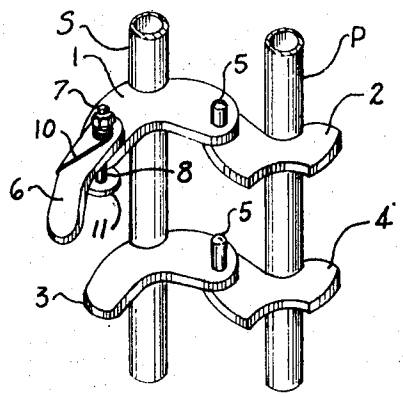


Fig. 2

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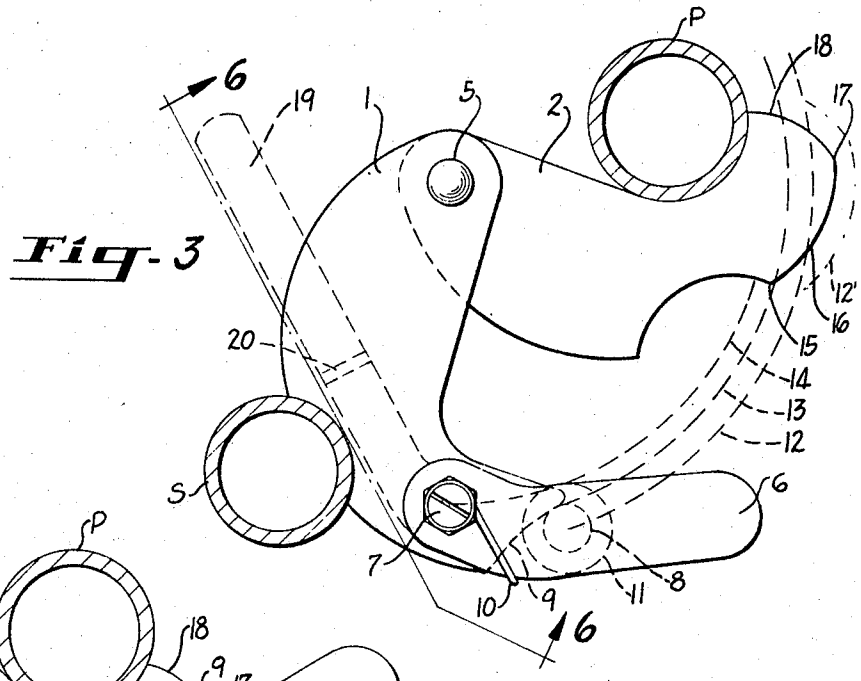


Fig. 3

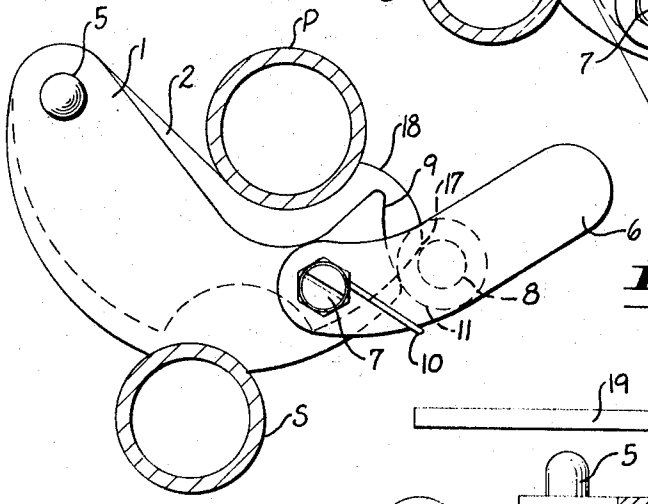


Fig. 4

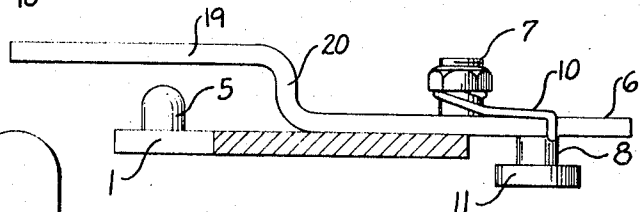


Fig. 6

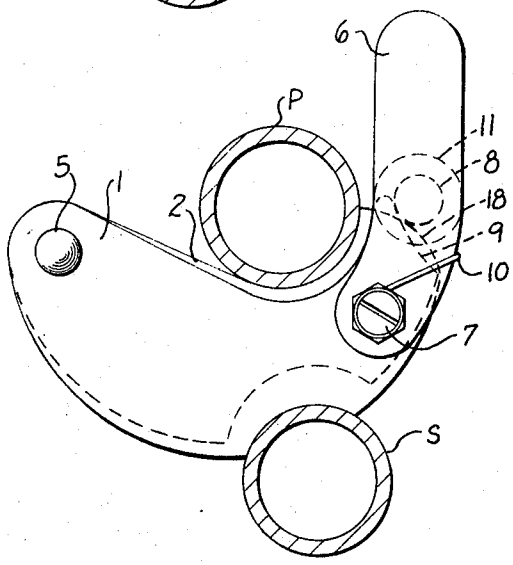


Fig. 5

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LATCH FOR SWINGING FOOTREST

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Int. Cl. A47c 7/50
U.S. Cl. 297—429 13 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to removable and swingable footrests for wheel chairs, and more particularly to improved latching mechanism to facilitate securing the footrest in its working position and releasing it for swinging and detachment from the chair.

Swingable and removable footrests are known in the art. For example, in United States Patent No. 2,592,449, to Miller, the footrest is equipped with pintle hinges for ease of swinging, attachment and detachment, but in the Miller Patent, locking the footrest in working, foot-supporting position requires that the invalid, occupant or attendant must find a locking pin, which is supposed to be attached to the front post of the chair by a chain, and aim and align the pin with apertured knuckles that must be aligned to hold the footrest in working position. To so manipulate the footrest and locking pin is inconvenient and difficult, and the loss of the pin, which is not difficult, renders locking impossible.

These disadvantages were in part sought to be cured in my United States Patent No. 3,185,527, where the footrest carries a spindle which is received in a vertically mounted and slotted socket on the front post of the chair. Locking requires swinging a lever about a horizontal axis into a slotted head of the spindle to secure the footrest in foot-supporting position. This constitutes a separate operation with different motion from the actual mounting and swinging of said footrest into working position. While this improved upon Miller, considerable awkardness remained for the occupant or attendant incident to locking or latching and unlatching the footrest for swinging and/or removal.

An object of my present invention is to overcome the objections and deficiencies associated with latching and locking prior art removable and swingable footrests for wheelchairs. Another object of my present invention is to provide a better and more useful footrest latch with improved facility of swinging attachment to and detachment of the footrest about and from a wheelchair. Another object of my present invention is to provide an improved latch to secure a removable and swingable footrest in the working position, the latching and unlatching of which is integrated into a single-step motion or operation with the swinging of the footrest into and out of the working position.

Other objects are to provide a swingable and detachable mounting for a footrest on a front post of a wheelchair that is strong and secure, and can be positively latched against detachment in the working position, that is freely swingable, but not inadvertently removable, and may be attached, positioned and latched easily by a person in the chair using touch or sight as a guide.

Other objects and advantages of my invention will appear from the following description of a preferred form thereof, reference being had to the accompanying drawings in which:

FIGURE 1 shows a footrest with my improved latch holding the footrest in its foot-supporting or working position mounted on the front post of a conventional wheel chair.

FIGURE 2 is a fragmentary perspective view of the pivotal supporting means for the footrest, with the footrest swung away to the side of the wheel chair and the latch in its open position.

FIGURE 3 is a top plan view of a latch in its open position.

FIGURE 4 is a top plan view similar to FIGURE 3, with the latch approaching its closed position and being cocked for its latching action.

FIGURE 5 is a top plan view similar to FIGURES 3 and 4, except that latch L is closed and latched and the footrest is secured in its working position as in FIGURE 1.

FIGURE 6 is a vertical sectional view of a portion of latch taken along the angled line 6—6 of FIGURE 3, showing however the part of the latching lever in full lines that were shown in phantom in FIGURE 3.

In FIGURE 1, I have shown a preferred form of my invention with the footrest F in its forwardly extending, foot supporting position attached to the front post P of the associated wheelchair, and locked in this normal working position by latch L. A modest force exerted on the latching lever **6**, or the extension **19** thereof suggested in broken lines in FIGURE 3, will release footrest F from its locked working position and swing it away to the side of the wheel chair, see FIGURES 2 and 3. Similarly, a modest force exerted on any convenient portion of footrest F will swing it forwardly from the side of the wheel chair to its forward working position, and lock it there, FIGURES 1 and 5. In addition to locking footrest F in its foot-supporting, working position, Latch L also prevents detachment of footrest F from the wheel chair while in that position. An advantage of latch L resides in the manner in which it will position footrest F in its foot-supporting position, latch it there, and prevent its inadvertent detachment, all in a single motion and operation, then, when desired, release the footrest from its foot-supporting position and swing it away to the side of the wheel chair, again in and by a single easy motion and operation.

Footrest F comprises a vertical tube S proximate the front post P of the wheel chair and is connected therewith by means of a pair of plates **1** and **3** brazed or welded to the tube S, and hinged to and supported in relation to a coacting pair of plates **2** and **4** brazed or welded to the front post P of the wheelchair.

Referring to FIGURE 2, plates **2** and **4** are preferably identical, are horizontally disposed, vertically aligned, spaced apart vertically and affixed to front post P of the wheelchair normal to the axis of the post. Each plate has, preferably, the general shape of a half moon. Plates **1** and **3** are similarly shaped, and similarly spaced apart, and are similarly attached normal to the axis of the tube S. Plates **2** and **4** are pivotally and detachably engaged at their outer ends, i.e., toward the outside of the wheelchair with the corresponding portions of plates **1** and **3**, preferably by means of pintles **5**, which extend upwardly from plates **2** and **4** through holes in plates **1** and **3** which are aligned with pintles **5** and have a free sliding and pivotal fit therewith. Pintles **5** conveniently may be made of unequal length for added ease of attachment, as is known in the art.

Latch L may be associated with either the upper or lower pivotally connected pair of plates, FIGURE 2. However, locating the latch on the top pair **1** and **2** of such plates will ordinarily facilitate oepration by an occupant of the wheelchair whose reach or convenience may be limited. Therefore, the device will be described as so located. Referring to FIGURES 2 and 3, latch L comprises a latching lever **6**, which is pivotally mounted about pin **7**. Pin **7** extends upwardly from plate **1**, preferably near the

inner end thereof, some distance from pintle **5**. Extending downwardly from lever **6** is cam-riding latch pin **8**, see FIGURE 1, which in rest position, FIGURE 3, is held against rest surface **9** on the "inner" end of plate **1** by helical spring **10**, which is wound around pin **7** and comprises an arm-like terminal which is curved around and engages the edge of level **6**, and yieldingly urges the lever **6** to counterclockwise pivotal movement about the pin **7** as viewed in FIGURES 2–5. The contour of surface **9** of plate **1** is preferably slightly concave, FIGURE 3, so that cam-riding latch pin **8** will rest securely against it, without slipping beyond about the position shown in FIGURE 3 under the bias of the spring **10**. The lower end of cam-riding pin **8** comprises a flanged disc **11**, which is preferably positioned a distance below the lower surface of plate **1** equal to the thickness of plate **2** whereby to slideably underlie the lower surface of the plate **2** as the plate **1** comes to overlap the plate **2**, FIGURES 4 and 5. Flange **11** may be of any convenient shape, subject to the functional limitations described below.

In operation, the footrest F is attached to the wheelchair by aligning the pintles **5** of plates **2** and **4**, with the corresponding holes in plates **1** and **3**, and dropping the latter down on the former while the parts are in about the relation shown in FIGURES 2 and 3, cf. FIGURES 4 and 5, so that the footrest F is hingedly and removably attached to and freely swingable relative to, the associated wheelchair, particularly the post P thereof. The half-moon configuration of the plates **1**, **2**, **3** and **4**, and the location of pintles **5** near and to the "outside" leftward as viewed in FIGURES 2–5, of front post P of the wheelchair, permits swinging the footrest outwardly and rearwardly of the chair as is old in the art.

The single step operation and continuous individual motion of swinging footrest F from its outward and/or rearward position to its straight-ahead, foot-supporting position, and locking it there against swinging movement and vertical detachment, is depicted in successive stages in FIGURES 2, 3, 4 and 5. FIGURE 3 shows latch L in open position, with footrest F away and free from front post P of the chair. Latching lever **6** is in rest opsition, with latch pin **8** yieldably held against rest surface **9** of plate **1**, by spring **10**. The dotted line of an arc **12** struck from pintle **5** indicates the projected path of the center of latch pin **8**, as the footrest is swung counterclockwise as viewed in FIGURE 3 through the position of FIGURE 4 and to locked and latched position in FIGURE 5. The dot-dash line **12'** indicates the departure of the actual path of the pin **8** from arc **12** caused by the engagement of the pin **8** with edge **15**, **16** and **17** of plate **2**. Similarly dotted arc **13** indicates the path of that part of latch pin **8** closest to pintle **5**, which is similarly interrupted by the edge of plate **2**. Lastly, dotted arc **14** indicates the projected and actual path of pin **7**, as latch L swings with footrest F to its forward foot-supporting, working and locked and latch position, FIGURE 5.

As footrest F swings toward working position, cam-riding pin **8** is held against surface **9** of plate **1** by spring **10**, as described above, until cam-riding pin **8** strikes the edge of plate **2** at about point **15**. At this point, cam-riding pin is disengaged from surface **9** of plate **1**, and begins its journey along a first cam surface **16** on the edge of plate **2**. During this journey, spring **10** is loaded by the clockwise motion of pin **8** about the axis of pin **7**, as its actual path **12'** departs between points **15** and **17** to a greater and greater extent from its projected arc **12**.

This motion continues until the pin **8** reaches point **17**, the terminal point of first cam surface **16**, and plates **1** and **2** are in an intermediate position relative to each other, shown in FIGURE 4. At this point, maximum load has been built in helical spring **10**, the latch is cocked and the cam surface **16** has performed its latch cocking function.

As latch pin **8** passes point **17**, the energy built up in spring **10** during the passage of the pin **8** along cocking cam surface **16** is released since the actual path **12'** of pin **8** rapidly approaches its projected arc **12** after point **17** is passed. Footrest F thus comes abruptly into forwardly extending, foot-supporting position, as latch pin **8** snaps onto and along the locking cam surface **18** of plate **2**, and comes to rest thereon, short of the intersection of arc **13** with cam **18**, see FIGURES 3 and 5. Locking cam surface **18** is steeply angled relative to the arcs **12** and **13** so that a tangent to the cam **18** at the point of locked engagement with the pin **8** is almost normal to the direction of the component of force resulting from clockwise effort, as viewed in FIGURE 5, upon the footrest exerted to swing it outwardly away from its latched and locked position. Contact between the plate **1** and the post P, FIGURE 5, prevents counterclockwise motion of the footrest "inwardly" of the chair.

The footrest F therefore cannot be moved out of foot-supporting position, FIGURES 1 and 5, unless and until a clockwise force, as viewed in FIGURES 3–5, is applied to latching lever **6**. A force applied anywhere else will result in cam-riding pin **8** being forced immovably against, rather than along, locking cam surface **18**. Thus footrest F is swung into foot-supporting position and locked against swinging motion, in a simple, one-step operation with smooth uninterrupted motion.

Further, it will be appreciated that the only force which the occupant of the chair need apply in unlocking footrest F in foot-supporting position, is that necessary to overcome spring **10** to the extent suggested in FIGURE 4. From that point on, the work is done by the energy built up in the spring during that phase, and no effort is required by the operator.

To unlatch footrest F, the occupant of the chair applies a small clockwise force to latching lever **6** sufficient to move pin **8** over cam surface **18**, to about point **17**. At that point footrest F is capable of free swinging motion, without the restraint from latch L, see FIGURE 3.

Locking of footrest F against vertical detachment is accomplished in the same one-step operation which swings it into foot-supporting position and locks it there against swinging motion. At some point in time during the journey of cam-riding pin **8** along the clocking cam **16**, see FIGURES 3 and 4, flange **11**, attached to the bottom thereof, passes underneath plate **2**, thus preventing vertical detachment of plate **1** from plate **2**, and stays under plate **2** in the snug sliding engagement in the locked position, FIGURES 1 and 5.

It may be desirable under some circumstances to provide the occupant of the chair with an extension of lever **6** which will enable him to operate latch L from a position outside the front post P of the wheel chair. For this purpose the lever **6** may also comprise the extension **19** as indicated in dashed lines on FIGURE 3. When the lever **6–19** is made long enough to extend beyond the outside of plate **1**, it is preferably offset upwardly as at **20**, FIGURE 6, to clear the pintle **5**.

While I have described a preferred form of my invention, changes and improvements will occur to those skilled in the art who come to understand it, without departing from the precepts and examples herein described. Therefore, I do not wish to be confined to the form of my invention herein specifically disclosed, nor in any other way inconsistent with the progress by which my invention has promoted the art.

I claim:

1. A latch for releasably locking a swinging footrest in relation to an adjacent part of a wheelchair upon which the footrest is pivotally supported to swing about a vertical axis, comprising, pivotally connected elements connected to said part and said footrest respectively and disposed in adjacent horizontal planes to swing relatively about said axis, one of said elements having cocking and locking cams remote from said axis and the other element carrying a latching lever pivotally mounted about a lever axis fixed on said element, said lever having a cam engaging pin

moveable about said lever axis and disposed to engage said cams successively as said footrest is swung to its locked position, and a spring urging said pin to yieldably engage said cams and hold said pin on said locking cam against force exerted on said footrest to move it about said vertical axis relative to said chair.

2. The latch of claim 1 wherein a tangent to said locking cam at a point where said pin is held lies approximately normal to a line joining said point and said lever axis.

3. The latch of claim 1 wherein said locking cam is disposed on the side of said part remote from said vertical axis and extends substantially radially away from said vertical axis.

4. The latch of claim 1 wherein said lever axis is remote from said vertical axis and is swingable to and from proximity with said part.

5. The latch of claim 1 wherein said cocking cam is disposed with increasing remoteness from said primary axis in the direction of motion of said footrest toward its locked position.

6. The latch of claim 5 wherein said cocking cam biases said lever in a sense opposite the swinging motion of said footrest when said footrest is swinging toward its locked position.

7. The latch of claim 1 wherein said cocking cam joins said locking cam abruptly and at an angle permitting acceleration of said pin over the end of said locking cam proximate said cocking cam.

8. The latch of claim 1 wherein each line tangent to said locking cam departs from normalcy to a line joining the point of tangency with said lever axis by a small acute angle which limits locking motion of said pin over said locking cam in the direction away from said cocking cam.

9. The latch of claim 1 wherein the element which carries the lever has a portion which is engageable by said pin to restrain biased motion of said lever when said pin is not engaging either of said cams.

10. The latch of claim 1 in which said lever has a free end extending beyond said elements for convenient manual access.

11. The latch according to claim 1 wherein movement of said lever about said lever axis in a sense to remove said pin off said locking cam is in the same sense as the swinging motion of said footrest away from its locked position.

12. The latch of claim 1 wherein said vertical axis is disposed outwardly of said chair and away from said part and an end of said lever extends outwardly adjacent said axis.

13. The latch of claim 1 with means carried by said pin restraining removal of said footrest from said chair when the same are locked against relative swinging motion.

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U.S. Cl. X.R.

297—433