Jan. 21, 1958 M. K. COSKUN 2,820,532

SLACK ADJUSTER

Filed Aug. 28, 1953 2 Sheets-Sheet 1

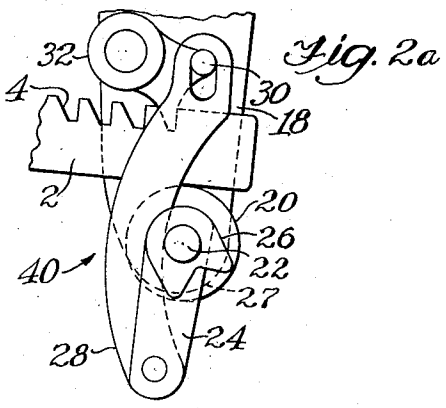


Fig. 2a

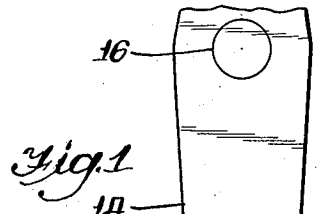
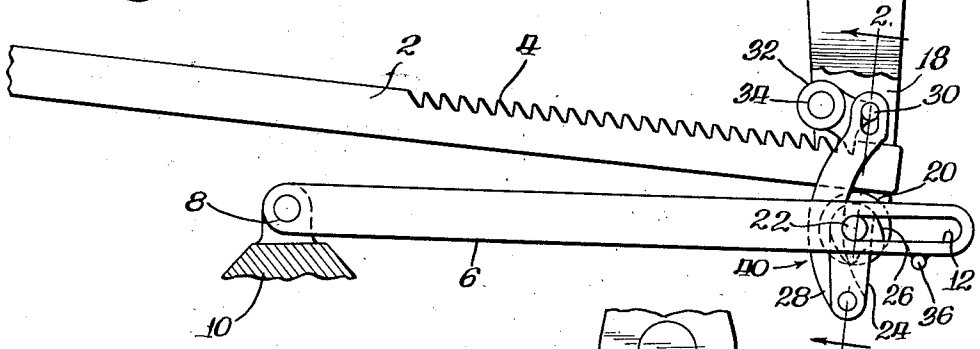


Fig. 1



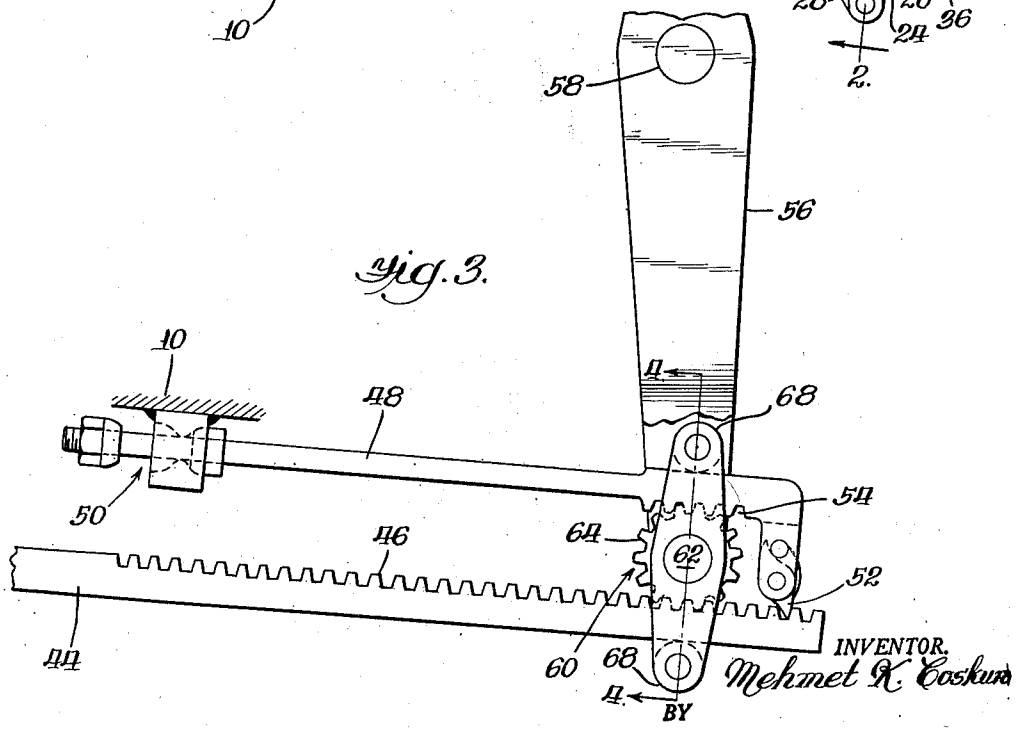


Fig. 3.

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SLACK ADJUSTER

Filed Aug. 28, 1953 2 Sheets-Sheet 2

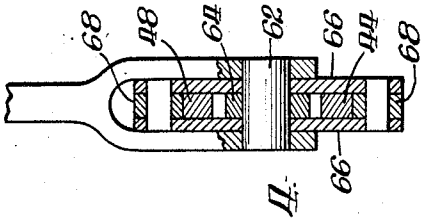


Fig. 4.

Fig. 5.

Fig. 2.

INVENTOR.
Mehmet K. Coskun
BY
O. B. Garner
Atty.

United States Patent Office

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SLACK ADJUSTER

Mehmet K. Coskun, Granite City, Ill., assignor to American Steel Foundries, Chicago, Ill., a corporation of New Jersey

Application August 28, 1953, Serial No. 377,151

8 Claims. (Cl. 188—196)

The invention relates to slack adjusters and particularly to slack adjusters that may be incorporated in the brake actuating linkage of railway equipment.

It is a principal object of the invention to provide novel automatic slack adjusters for use with the brake actuating linkage of a railed vehicle.

It is a specific object of the invention to provide a novel ratchet-pawl arrangement in combination with pawl control linkage to afford the desired automatic adjustment of the mentioned brake linkage in response to wear on the friction surface of a brake mechanism.

It is another specific object of the invention to provide a novel ratchet-pawl arrangement in a linkage of the type described in combination with a differential gear mechanism whereby the mentioned automatic adjustment is afforded.

These and other objects of the invention will become apparent in the course of the following description and from an examination of the concerned drawings, wherein:

Figure 1 is a fragmentary elevational view of the operative parts of one embodiment of the invention;

Figure 2 is a sectional view taken along line 2—2 of Figure 1;

Figure 2*a* is a fragmentary view taken on line 2*a*—2*a* of Figure 2;

Figure 3 is a fragmentary side elevational view, similar to Figure 1, of another embodiment of the invention;

Figure 4 is a sectional view taken along line 4—4 of Figure 3, and

Figure 5 is another view similar to Figure 1 of another embodiment of the invention.

Describing the invention in detail and considering Figure 1, the numeral 2 indicates a pull rod, the left end of which is connected to a braking mechanism (not shown) as is well understood by those skilled in the art. The pull rod 2 has formed thereon a ratchet or series of gear teeth 4, said teeth being formed on the end of the pull rod that cooperates with the slack adjusting mechanism hereinafter described. A positioning link 6 is provided with one end pivotally fixed as at 8 to the vehicle frame indicated at 10. The opposite end of the positioning link 6 is provided with an elongated slot 12. An actuating lever 14 is preferably pivoted to the frame as at 16 and extends downwardly toward the rod 2 and link 6. The lower end of the lever 14, as seen in Figure 2, is bifurcated as at 18, 18, said bifurcated portion receiving or embracing the pull rod 2 and the positioning link 6. A roller 20 is pivotally mounted by means of pin 22 to the lower or bifurcated end of the actuating lever 14. The pin 22 in addition to carrying the roller 20 also pivotally mounts an actuating link 24, said actuating link having a cam 26 rigidly formed therewith. The cam 26 is generally oblong in shape having at the lower end thereof a V-shaped opening 27 as seen most clearly in Figure 2*a*. Figure 2*a* is similar to Figure 1 but with members 18 and 6 removed. The pin 22 is disposed in the slot 12 formed at the end of the positioning link 6 in such a manner as to provide a lost motion

connection between the actuating lever 14 and the frame 10 via the positioning link 6. The lower end of the actuating link 24 is pivotally connected to the lower end of a connecting link 28, said connecting link extending upwardly to make pin and slot connection as at 30 with an extended portion of a pawl 32. The pawl 32 is pivotally connected by means of pin 34 to one side of the bifurcated end portion of the actuating lever 14. The positioning link 6 is provided with a cam actuating lug 36 immediately below the elongated slot 12. The lug 36 serves to actuate the cam 26 during the action hereinafter described. It should be noted that the actuating link 24, the connecting link 28 and the cam 26 together comprise a toggle indicated generally at 40, said toggle cooperating with the pawl 32 during the action hereinafter described.

The operation of the arrangement of Figures 1 and 2 is relatively simple. Brake actuation is accomplished by counterclockwise movement of the actuating lever 14, said movement being carried to the pull rod 2 via the pawl 32 which is engaged with one of the teeth of the ratchet 4. Brake actuating movement is, of course, to the right as seen in Figure 1. Under normal operation the lever 14 carries the pin 22 and toggle 40 horizontally in the slot 12 of the positioning link 6 to a position in the slot short of the lug 36. As the friction surfaces begin to wear the toggle 40 and pin 22 are carried further to the right of the slot 12 until finally after a predetermined amount of wear the lug 36 strikes the left side of the V-shaped opening of the cam 26 causing the actuating link 24 to pivot in a clockwise direction about the pin 22 whereby the connecting link 28 is raised vertically. After the lug 36 strikes the cam 26, the cam and the link 24 move to the right of the lug 36. Maximum vertical movement of the connecting link 28 will cause the pin and slot connection 30, between the connecting link 28 and the pawl 32, to take up a position at the lower end of said slot. When this occurs the toggle 40 no longer exerts any pressure on the pawl 32 to maintain said pawl in engagement with a particular tooth of the ratchet 4. Thus upon release of the brake, that is, clockwise movement of the actuating lever 14, pawl 32 will skip a certain number of teeth on the ratchet 4 and take up a new position on the pull rod 2. When the new position is reached the actuating lug strikes the right side of the V-shaped opening of the cam 26 as the cam 26 an the link 24 move from the right to the left of the lug 36, causing the actuating link 24 to rotate in a counterclockwise direction which returns the connecting link 28 to original position, that is, with the pin and slot connection 30 disposed in the upper end of said slot. In this position the toggle 40 maintains the pawl 32 in engagement with a particular tooth of the ratchet 4. During both clockwise and counterclockwise movements of the actuating lever 14 the new position is maintained until wear in the brake mechanism or slack in the linkage again causes the actuating lever 14 to carry the pin 22 and toggle 40 an excessive distance in the slot 12.

Directing attention now to Figures 3 and 4 wherein is illustrated a second embodiment of the invention, it will be seen that in this embodiment a pull rod 44 is again provided, said pull rod being connected to a brake mechanism as is well understood by those skilled in the art. A series of ratchet or gear teeth 46 are formed on one side of the pull rod 44. A positioning link or pawl bar 48 is also provided, said pawl bar 48 being disposed adjacent pull rod 44 and preferably parallel thereto. One end of the bar 48 is provided with a conventional lost motion connection 50 to the vehicle or vehicle frame 10. The other end of the pawl bar 48 is provided with a spring loaded pawl 52, said pawl 52 being disposed to engage the gear teeth 46 formed on the pull rod 44,

Intermediate the mentioned ends of the pawl bar **48** another series of gear teeth **54** are formed on the bar on the side adjacent the gear teeth **46** formed on the pull rod **44**. An actuating lever **56** is again pivotally attached as at **58** to the vehicle or vehicle frame **10**. A differential connection indicated generally at **60** is provided between the actuating lever **56**, the pull rod **44** and the pawl bar **48**. As best seen in Figure 4, the differential connection comprises a lower bifurcated end of the actuating lever **56**, said lower end pivotally mounting by means of pin **62** a pinion gear **64**. The pinion gear **64** is disposed intermediate guide plates **66, 66**, said guide plates also being pivotally carried by the pin **62**. In vertical arrangement the pinion gear **64** is disposed intermediate the pull rod **44** and the pawl bar **48** in such a manner that the pinion gear **64** is engaged with the gear teeth **54** on the pawl bar and the gear teeth **46** on the pull rod. The guide plates **66, 66** extend vertically and embrace at opposite ends the pawl bar **48** and the pull rod **44**. Rollers **68, 68** are pivotally carried by opposite ends of the guide plates **66, 66**, each roller being disposed outboardly of the adjacent pull rod or pawl bar and engaged with a flat surface on the adjacent side of the pawl bar or pull rod. The rollers **68, 68** serve to maintain the pull rod **44** and the pawl bar **48** in substantially parallel arrangement during the action hereinafter described.

In normal operation of the embodiment of Figures 3 and 4, the pawl bar and carried pawl **52** are maintained in relatively fixed position with the pull rod **44**. The brake mechanism is actuated by moving the lever **56** in a counterclockwise direction. The counterclockwise movement of the lever **56** carries the pinion gear **64** to the right which in turn carries the pull rod **44** and the pawl bar **48** to the right. Thus the pawl bar and pull rod move as a unit with the actuating lever **56** during normal operation of the brakes or until excessive brake wear or other slack causes the lost motion connection **50** to prevent further movement to the right of the pawl bar **48**. When said excessive brake wear occurs the pawl bar **48** is halted and continued movement of the actuating lever **56** causes the gear **64** to roll on the gear teeth **54** and further drive the pull rod **44** to the right. As this action occurs, the spring loaded pawl **52** is urged to skip the teeth **46** on the pull rod **44** whereby the pull rod takes up a new position relative to the pawl bar **48**. Thus again the embodiment of Figures 3 and 4 provides automatic take up of the slack in a brake linkage due to excessive wear on the brake mechanism or in any part of the linkage.

The embodiment of Figure 5 is in principle similar to the embodiment of Figures 3 and 4. A pull rod **70** is again provided, said pull rod having a series of ratchet teeth **72** formed on the upper side thereof. On the lower side of the pull rod **70** a series of gear teeth **74** are provided. A positioning unit comprising a link **76** having one end pivotally fixed to the frame **10** and at the other end having a pin and slot or lost motion connection **78** to a pawl bar **80** serves to cooperate with the pull rod **70** so as to provide the desired automatic slack adjustment. The pawl bar **80** is guidably and reciprocally mounted in a slot **82** formed on an arm **84** of the pull rod **70**. The other end of the pawl bar **80** is provided with a bifurcated section which carries a spring loaded pawl **86**, said pawl being engageable with the ratchet teeth **72** of the pull rod **70**. An actuating lever **88** is again pivotally connected to the frame or vehicle as at **90**. The lower end of the actuating lever **88** pivotally carries a pinion gear **92**, said gear **92** being operatively connected to the gear teeth **74** formed on the pull rod **70** and to other gear teeth **94** formed on the pawl bar **80**.

In operation of the embodiment of Figure 5, the actuating lever **88** is moved counterclockwise to energize the associated brake mechanism. The counterclockwise motion of the actuating lever **88** carries the pull rod **70** and pawl bar **80** to the right as seen in the figure. When the operation is normal, the pull rod and pawl bar move as a unit. However, upon excessive wear in the brake mechanism the link **76** takes up the slack offered by the lost motion connection **78** and prevents the pawl bar **80** from further movement to the right. This restriction of movement of the pawl bar **80** causes the pinion gear **92** to the roll on the gear teeth **94** and drive the pull rod **70** further to the right, whereupon the spring loaded pawl **86** takes up a new position on the ratchet **72** and the slack in the brake linkage is automatically absorbed.

I claim:

1. In an automatic slack adjuster, a pull rod having a ratchet formed thereon, a positioning link having one end thereof fixed to the vehicle frame, an actuating lever pivoted to the vehicle and having a bifurcated end embracing the rod and link, a roller pivoted to the lever and supporting the rod, a lost motion connection between the lever and the positioning link, a pawl pivoted to the lever and engaging the ratchet, a toggle connected to the pawl and having an operative connection to the link, said toggle being operative to maintain the pawl and ratchet in engagement, and means associated with the link and toggle to trigger the pawl and accommodate movement of same on the ratchet after a predetermined movement of the lever relative to the link.

2. A slack adjuster according to claim 1, wherein said toggle consists of a connecting link having at one end a pin and slot connection to the pawl, an actuating link pivotally connected to the other end of the connecting link, a cam on the actuating link and a lug on the positioning link engageable with the cam.

3. In an automatic slack adjusting mechanism, a pull rod having a ratchet formed thereon, a positioning link fixed to the vehicle frame at one end and having a slot at the other end, an actuating lever pivoted to the vehicle frame, a pin on the lever disposed in said slot, a pawl pivoted to the lever and engaged with the ratchet, means to lock the pawl in position on the ratchet during a normal operation within a predetermined range of movement of the lever, said means accommodating movement of the pawl on the ratchet in movement of the lever beyond said predetermined range.

4. An automatic slack adjusting mechanism according to claim 3, wherein said means comprises a cam pivoted on said pin, an actuating link fixed to the cam, a connecting link pivoted to the actuating link and having a pin and slot connection to the pawl, and a lug on the positioning link engageable with the cam to actuate same.

5. In an automatic slack adjuster for the brake actuating mechanism of a railed vehicle, a pull rod having an operative connection to a brake mechanism, ratchet teeth formed on one end of the pull rod, a positioning link having at one end thereof a connection with the vehicle and having its other end adjacent said end of the pull rod, an actuating lever pivoted on the vehicle and positioned substantially normal to the pull rod, said actuating lever having a roller mounted thereon on an axis parallel with pivot axis of the actuating lever, said roller having rolling engagement with the underside of the pull rod to support the same, the actuating lever having means for supporting the positioning link, and means operatively interconnecting the adjacent ends of the pull rod and positioning link including a pawl carried by the actuating lever and engageable with said ratchet teeth for controlling the movement of the pull rod by the actuating lever, the positioning link having lost motion between its connection with the pull rod and its connection with the vehicle.

6. In an automatic slack adjuster for a brake actuating mechanism of a railed vehicle, an actuating lever pivoted to the vehicle, a pull rod connected to a brake mechanism, ratchet teeth formed on the pull rod, a single pawl pivoted on the actuating lever and engageable with the ratchet teeth, and means to change the position of the pawl on the ratchet teeth and thereby adjust for wear on the

brake mechanism including lost motion connection between the actuating lever and the vehicle operative at a predetermined portion of movement of the actuating lever for positively retaining the pawl in engagement with the rachet teeth and releasing it therefrom, respectively, and rotative means for supporting the pull rod.

7. In an automatic slack adjusting device in a railed vehicle, a pull rod having ratchet teeth thereon, an actuating lever pivoted on the vehicle and having a swinging end disposed substantially normal to the pull rod, a roller carried by the lever adjacent the swinging end thereof and supporting the pull rod, a single pawl pivotally mounted on the lever and engageable with any of said ratchet teeth, and means for varying the relative positions of the pawl and ratchet teeth, said means including a positioning link having a connection to the vehicle and to the actuating lever, one of said connections being a pivotal connection and the other of said connections being a lost motion connection.

8. In an automatic slack adjuster for a brake actuating mechanism of a railed vehicle; an actuating lever pivoted to the vehicle and having a roller pivotally carried adjacent the swinging end thereof; a pull rod supported by

said roller, said rod having at one end thereof an operative connection to the brake mechanism and having ratchet teeth formed therein adjacent the other end thereof, and a single pivotal pawl on the lever engageable with said teeth; a positioning link having at one end thereof a connection with the vehicle and having at the other end thereof a connection with the lever, one of said connections of the positioning link including a lost motion device, the connection between the positioning link and lever including means supporting the adjacent end of the positioning link by the lever and linkage connected between the positioning link and pawl for adjusting the position of the pawl relative to the ratchet teeth in response to relative movement between the lever and positioning link.

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