United States Patent [19]

Motus et al.

[11] **3,826,154**

[45] **July 30, 1974**

[54] **MEANS FOR CONTROLLING CHAIN TAKE-UP IN A HAND BRAKE MECHANISM**

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[73] Assignee: **Miner Enterprises, Inc.**, Chicago, Ill.

[22] Filed: **Aug. 7, 1972**

[21] Appl. No.: **278,188**

[52] **U.S. Cl.** **74/505**, 74/411.5

[51] **Int. Cl.** **G05g 1/08**, F16h 57/10

[58] **Field of Search** 74/411.5, 435, 505

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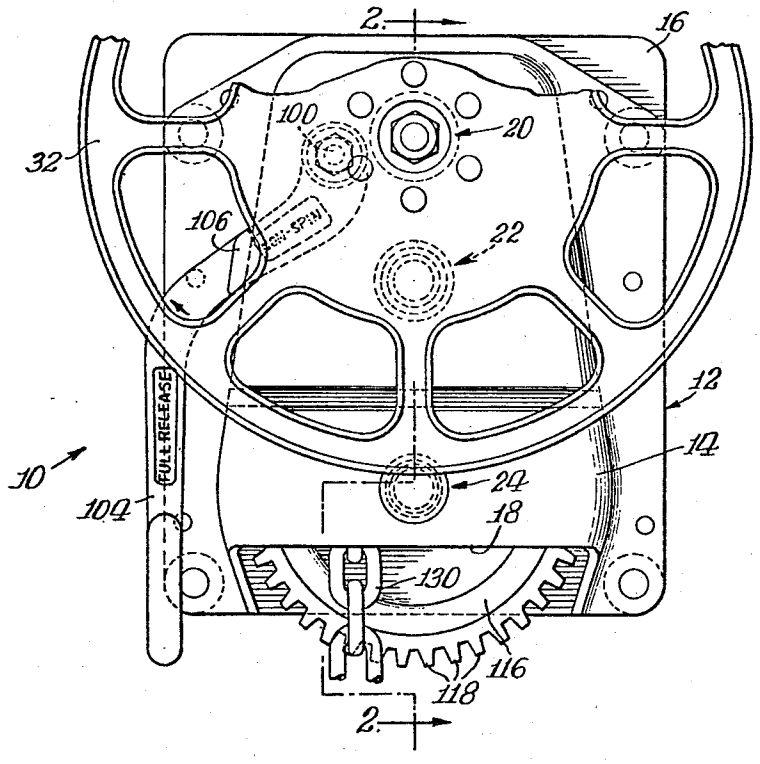
Primary Examiner—Leonard H. Gerin

Attorney, Agent, or Firm—John A. Dienner et al.

[57] **ABSTRACT**

A hand brake mechanism having a rotatable operating spindle, a rotatable pinion adapted to be coupled to the operating spindle, and a rotatable winding drum unit including a gear meshing with the pinion and a drum upon which brake chain may be wound. The pinion has a plurality of standard teeth of uniform face width and at least one special tooth with a lateral extension portion, the gear has a plurality of teeth with stop means intermediate at least two adjacent of the teeth at the ends thereof, and the lateral extension portion of the special tooth of the pinion is engageable with the stop means to prevent interengagement of the special tooth between the two adjacent teeth of the gear whereby to limit rotation of the winding drum unit.

7 Claims, 8 Drawing Figures



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SHEET 1 OF 3

Fig. 1.

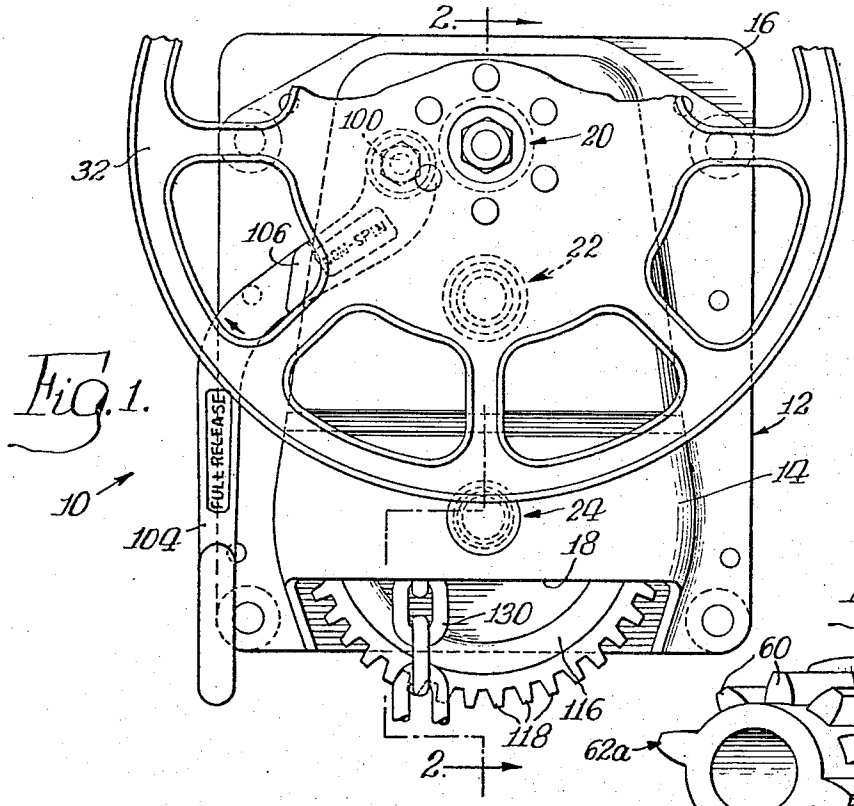


Fig. 8.

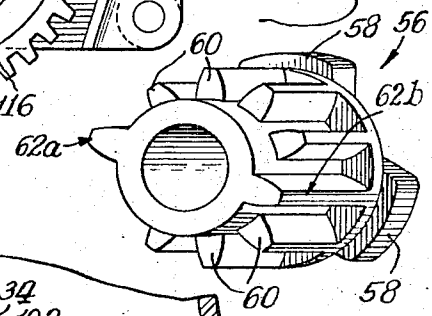


Fig. 4.

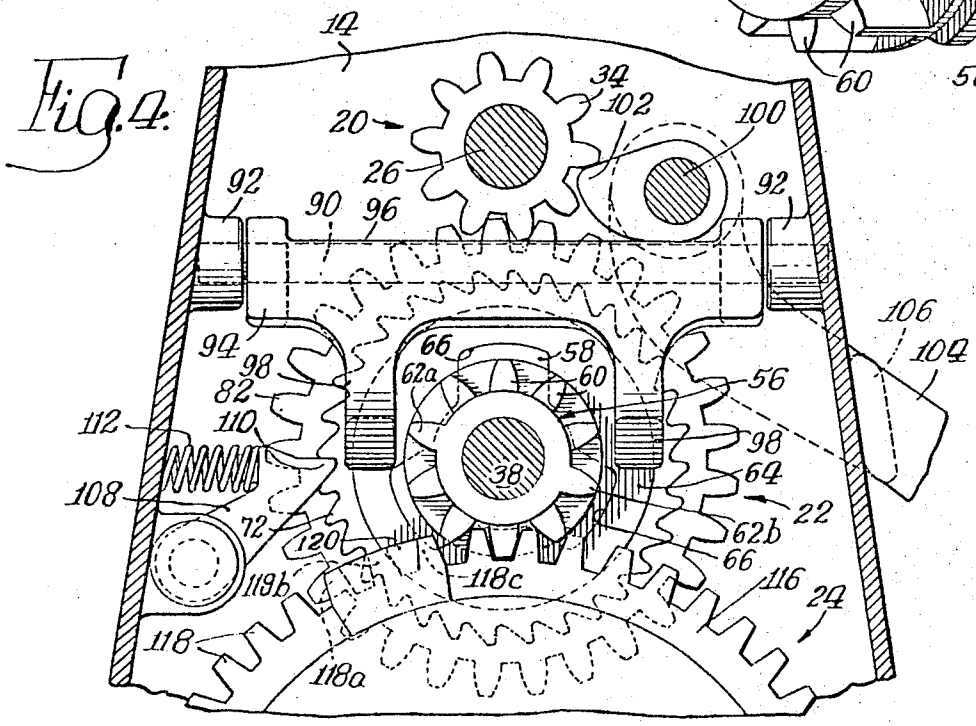


Fig. 2.

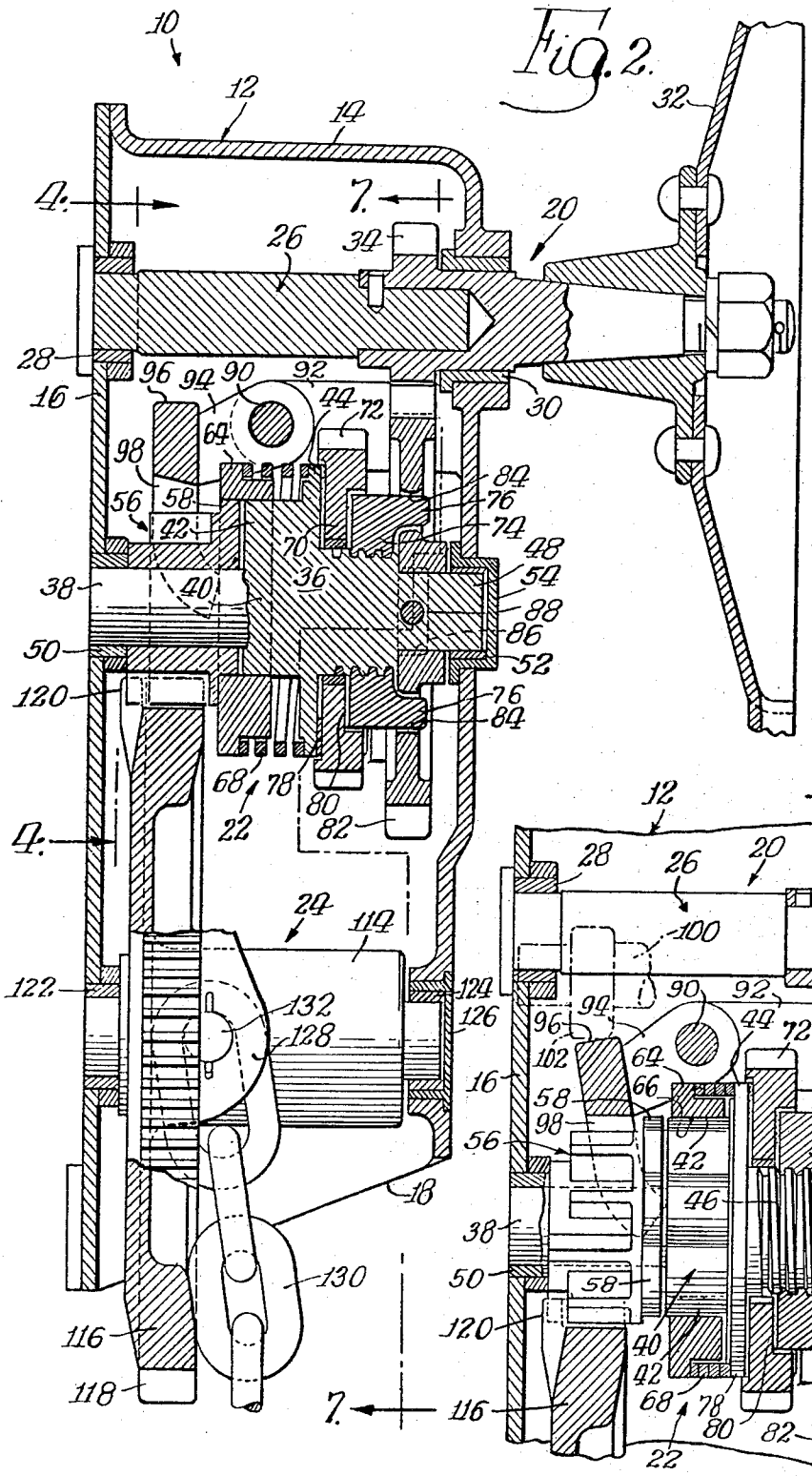

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Fig. 3.

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Fig. 7.

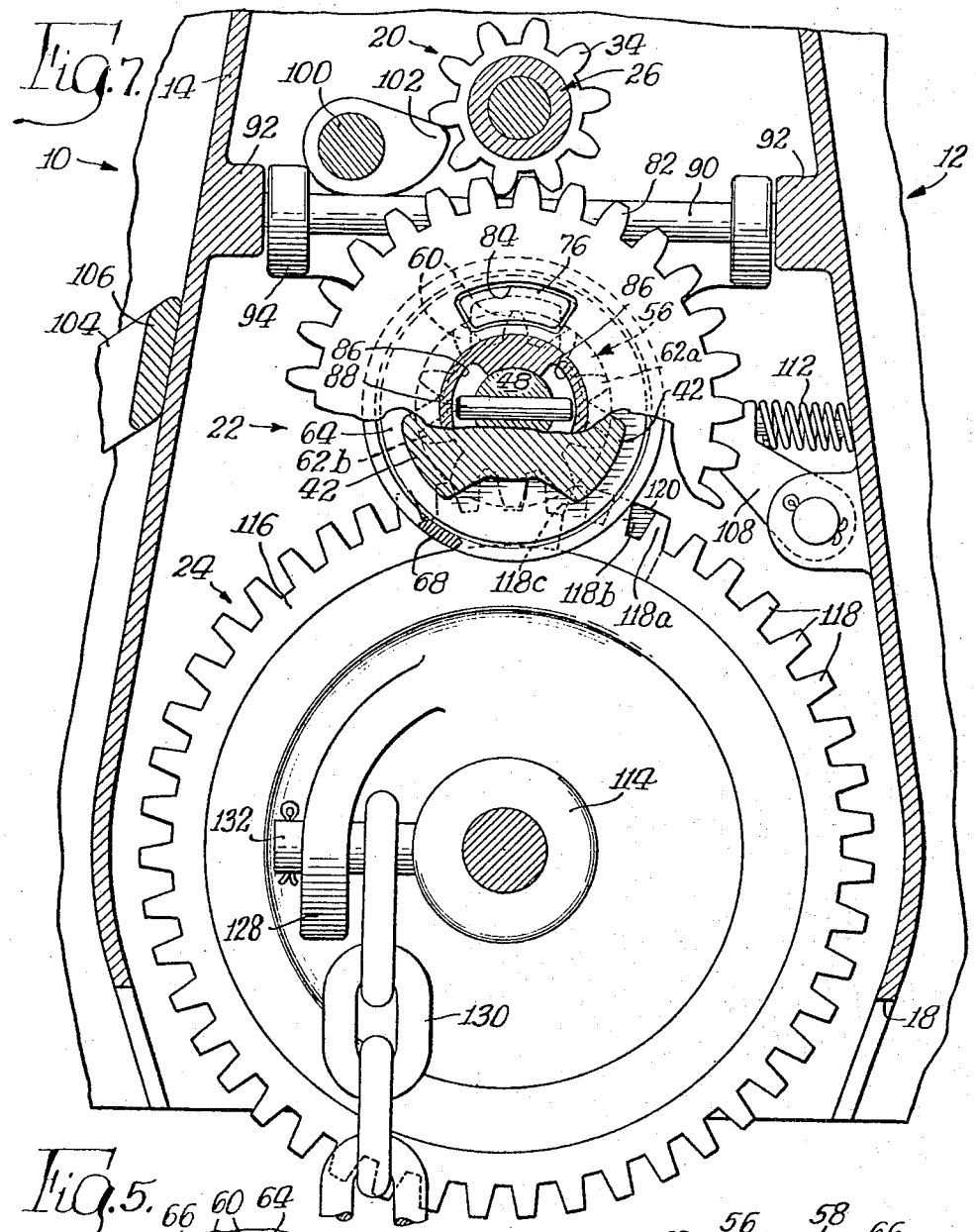


Fig. 5.

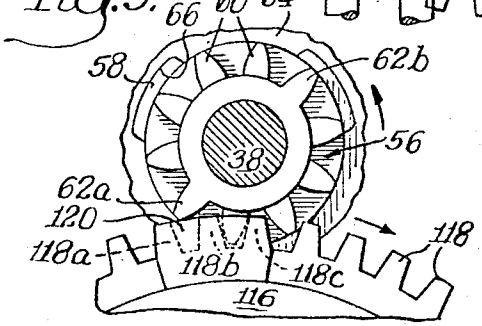
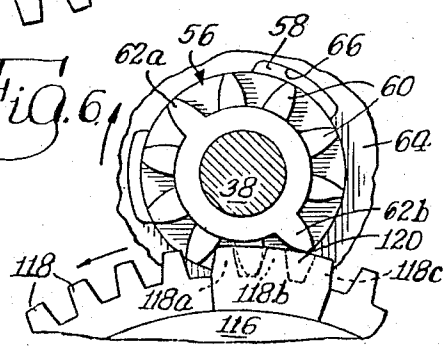


Fig. 6.



MEANS FOR CONTROLLING CHAIN TAKE-UP IN A HAND BRAKE MECHANISM

CROSS-REFERENCE TO RELATED APPLICATION

Application of Laurence T. La Belle, Ser. No. 276,747, filed on July 31, 1972, for Hand Brake Mechanism.

FIELD OF THE INVENTION

The present invention relates generally to hand brakes for railway cars, and more particularly to means for controlling chain take-up in hand brake mechanisms.

SUMMARY OF THE INVENTION

A hand brake mechanism conventionally includes a rotatable operating spindle, a rotatable pinion adapted to be coupled to the operating spindle, and a rotatable winding drum unit including a gear meshing with the pinion and a drum upon which brake chain may be wound.

In many hand brake mechanisms, winding or wrapping of brake chain around the brake drum is intended to be effected in one direction only, and reverse winding of brake chain upon the brake drum is undesirable. Also, in many hand brake applications, it is desirable or necessary to limit the extent of vertical chain movement and hence the amount of chain that can be wound around the brake drum. The present invention is concerned with a solution to both problems.

In the improved hand brake mechanism of the present invention, the pinion has a plurality of standard teeth of uniform face width and two special teeth each with a face width greater than that of the standard teeth. The gear has a plurality of teeth with stop means intermediate three adjacent teeth at the ends thereof. The winding drum unit is rotatable from a rest position in one direction by the pinion to effect winding of brake chain upon the drum. The special teeth of the pinion are engageable with the stop means to limit rotation of the winding drum unit from a rest position in the other direction and thereby prevent reverse winding of brake chain upon the drum, and also to limit rotation of the winding drum unit from a rest position in the said one direction and thereby limit forward winding of brake chain upon the drum.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevational view of the hand brake mechanism of the present invention, with a portion of the hand wheel being broken away for convenience;

FIG. 2 is an enlarged sectional view, taken substantially along the line 2—2 in FIG. 1, looking in the direction indicated by the arrows;

FIG. 3 is a fragmentary sectional view, corresponding to the upper portion of FIG. 2, and illustrates the mechanism in a quick brake release position.

FIG. 4 is a fragmentary sectional view, taken substantially along the line 4—4 in FIG. 2, looking in the direction indicated by the arrows;

FIGS. 5 and 6 are fragmentary views, corresponding to the central portion of FIG. 4, and show the winding drum gear and meshing pinion in different rotative positions;

FIG. 7 is a sectional view, taken substantially along the line 7—7 in FIG. 2, looking in the direction indicated by the arrows; and

FIG. 8 is a perspective view of the pinion which meshes with the winding drum gear.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, a hand brake mechanism incorporating the principles of the present invention is indicated generally by the reference numeral 10. The hand brake mechanism 10 includes a housing 12 comprised of a front casing 14 suitably secured to a vertical base plate 16 adapted to be mounted to the end wall of a railway car body. The casing 14 is formed with a cut-out or opening 18 at its lower end.

Rotatably mounted in the housing 12 on vertically alinged horizontal axes are an upper operating spindle unit 20, an intermediate control shaft assembly 22, and a lower winding drum unit 24.

The operating spindle unit 20 comprises an operational spindle 26 which may be fabricated either in two sections and interconnected as shown, or in one piece if desired. The rear end of the operating spindle 26 is journaled in a bushing 28 secured in the base plate 16; the intermediate body portion of the spindle 26 is journaled in a bushing 30 secured in front casing 14; and the forward end portion of the spindle 26, which extends outwardly of the housing 12, has suitably secured thereon a hand wheel assembly 32. Formed integrally with the operating spindle 26 for rotation therewith is a pinion 34. If desired, the pinion 34 may be fabricated as a separate part and suitably secured to the operating spindle 26.

As shown in FIGS. 2 and 3, the control shaft assembly 22 includes a shaft 36 which comprises a rear end portion 38, a rear body portion 40 having radial ear portions 42, an intermediate flange or lock ring clutch 44, a forward threaded body portion 46, and a forward end portion 48. The rear end portion 38 of the shaft 36 is journaled in a bushing 50 secured in the base plate 16; while the forward end portion 48 of the shaft 36 is journaled in a bushing 52 press fitted in a cup-shaped retainer 54 secured in the front casing 14.

Rotatably mounted on the rear end portion 38 of the shaft 38 is a pinion 56. As best shown in FIG. 8, the pinion 56 is formed with forward radial ear portions 58 corresponding to the ear portions 42 of the rear body portion 40 of the shaft 36. Also, the pinion 56 has a plurality of standard teeth 60 of uniform face width, and two circumferentically opposed special teeth 62*a* and 62*b* each with a face width greater than that of the standard teeth 60 whereby to define lateral extension portions for a purpose to be more fully described hereinafter.

Slidably mounted on or keyed to the rear body portion 40 of the shaft 36 (FIG. 2) is an axially shiftable jaw clutch member 64 having interior recesses 66 (FIG. 4) adapted to conformably mate with the shaft ear portions 42 (FIG. 3) and the pinion ear portions 58 (FIG. 4). A coil spring 68 is interposed between the lock ring clutch flange 44 and the jaw clutch member 64 for normally biasing the latter to the position shown in FIG. 2 whereby the pinion 56 is clutched to the shaft 36 for rotation therewith.

Rotatably mounted concentric of the forward threaded body portion 46 of the shaft 36 is the flange portion 70 of a ratchet wheel 72; and threaded on the body portion 46 is a lock ring 74 having axially forwardly projecting arm members 76. Interposed be-

tween the adjacent faces of the lock ring clutch **44** and the ratchet wheel **72** is a friction disc **78**, and interposed between the adjacent faces the ratchet wheel **72** and lock ring **74** is a friction disc **80**. Mounted on the forward end portion **48** of the shaft **36** is a lock ring gear **82** which has constant meshing engagement with the operating spindle pinion **34**. As shown in FIG. **7**, the gear **82** is formed with axial openings **84** which receive the axial arm members **76** of the lock ring **74**. This arrangement provides a floating interconnection between the lock ring **74** and the lock ring gear **82** and accommodates axial movement of the ring **74** relative to the gear **82**. The hub of the lock ring gear **82** is formed with interior arcuate recesses **86**, and a pin member **88** is disposed transversely through the shaft portion **48** with the end portions thereof projecting into the arcuate recesses **86** whereby to limit relative rotation between the control shaft **36** and the lock ring gear **82**.

Operating means for the jaw clutch member **64**, as shown in FIGS. **2, 4** and **7**, comprises a secondary spindle **90** which is located intermediate of the operating spindle **26** and the control shaft **36** transversely of the latter, and which is journaled at its ends in bosses **92** formed at the sides of the front casing **14**. Secured to the secondary spindle **90** is a release fork **94** having an upper flat **96** depending arms **98** engageable at their lower ends with the rear face of the jaw clutch member **64**. Located immediately above the secondary spindle **90** on one side of the operating spindle **26** is a cam shaft **100** having a cam portion **102** engageable with the upper flat **96** of the release fork **94**. The rear end of the cam shaft **100** is journaled in the base plate **16**, while the forward end of the cam shaft **100** is journaled in the front casing **14** and extends outwardly thereof. A release lever **104** is secured to the outer forward end of the cam shaft **100**, and is provided with a flange section **106** that normally engages the outer side of the front casing **14** (FIG. **1**). Associated with the ratchet wheel **72**, as shown in FIGS. **4** and **7**, is an upwardly extending pivotally mounted pawl **108** having a tooth portion **110**. Interposed between the side of the front casing **14** and the pawl **108** is a coil spring **112** which serves to bias the pawl tooth portion **110** into engagement with the ratchet wheel **72**.

The winding drum unit **24**, as shown in FIGS. **2** and **7**, is comprised of a hub or drum portion **114**, and a spur gear portion **116** which has meshing engagement with the pinion **56** mounted on the control shaft **36**. The spur gear **116** has a plurality of teeth **118** with stop means **120** intermediate three adjacent teeth **118***a*, **118***b* and **118***c* at the ends thereof. More particularly, the stop means **120** comprises a lug portion extending circumferentially across the ends of the three adjacent teeth **118***a*, **118***b* and **118***c* and radially the depth of the latter. During meshing rotation of the pinion **56** and the gear **116**, the standard pinion teeth **60** are freely engageable between all of the gear teeth **118**, while the special pinion teeth **62***a* and **62***b* are engageable between all of the gear teeth **118** except between teeth **118***a*, **118***b* and **118***c*. The stop means **120** is operationally related to the special pinion teeth **62***a* and **62***b* in a manner and for a purpose that will be explained more fully hereinafter.

The rear end of the winding drum unit **24** is journaled in a bushing **122** secured in the base plate **16**; correspondingly, the forward end of the unit **24** is journaled in a bushing **124** press fitted in a cup-shaped retainer **126** secured in the front casing **14**. Extending axially and arcuately from the spur gear portion **116**, and radially spaced from the drum portion **114**, in a cam ramp sector **128**. One end of the brake chain **130** is connected to the winding drum unit **24** by means of a removable pin member **132** extending radially between the cam sector **128** and the drum portion **114**. The other end of the chain **130** is connected in the usual manner to the braking system of a railway car.

When the parts occupy the several positions shown in FIGS. **1** and **2**, the mechanism is conditioned for winding to set the brakes. To effect brake setting the hand wheel **32** is rotated clockwise, as viewed in FIG. **1**, and the operating spindle **26** and the pinion **34** are thereby correspondingly rotated. Clockwise rotation of the pinion **34**, as viewed in FIG. **7**, effects counterclockwise rotation of the lock ring gear **82**. When the sides of the lock ring gear openings **84** engage the lock ring arm members **76**, the lock ring **74** is moved rearwardly or to the left, as viewed in FIG. **2**, by reason of the threaded interconnection with the control shaft **36**, and the ratchet wheel **72** is clutched or clamped between the lock ring **74** and the lock ring clutch **44**. Thereafter, the control shaft **36**, the jaw clutch member **64**, and the pinion **56** are caused to rotate with the lock ring gear **82**.

Upon counterclockwise rotation of the pinion **56**, the gear **116** is rotated clockwise, as viewed in FIG. **7**, and the chain **130** is wound around the drum **114** to set the brakes. During winding operation, the cam ramp **128** serves to guide the chain **130** axially forwardly over the drum **114** to space the chain along the drum. Also, during the winding operation, the pawl tooth **110** rides over the teeth of the ratchet wheel **72** and prevents unwinding of the chain **130** while the brakeman shifts his grip on the hand wheel **32**.

To release the brakes slowly, the hand wheel **32** is rotated a short distance counterclockwise, as viewed in FIG. **1**. The operating spindle **26** and the pinion **34** are thereby correspondingly rotated counterclockwise, while the lock ring gear **82** is rotated clockwise as viewed in FIG. **7**. The ratchet wheel **72** is prevented from rotating clockwise with the lock ring gear **82** by reason of the pawl **108**. As the sides of the lock ring gear openings **84** engage the lock ring arm members **76**, the lock ring **74** is threaded forwardly on the control shaft **36** thereby momentarily unclutching or unclamping the ratchet wheel **72** whereby the lock ring clutch **44** is released for limited rotation to permit limited unwinding of the chain **130**. As the lock ring clutch **44** rotates and catches up with the lock ring **74**, the lock ring **74** is threaded rearwardly on the control shaft **36**, and the ratchet wheel **72** is again clutched or clamped between the lock ring **74** and the lock ring clutch **44** to stop unwinding. When the hand wheel **32** is rotated another short distance counterclockwise, the foregoing procedure is repeated. By successively rotating the hand wheel **32** counterclockwise in incremental steps, the brakes may be slowly released, without spin of the hand wheel, until the point of full release is reached.

To release the brakes quickly, the lever **104** is swung upwardly from the position shown in FIG. **1** for rotating the cam shaft **100**. In this manner, the high point of the cam **102** is rotated against the flat **96** of the release fork **94** and the latter is pivoted counterclockwise from the

position shown in FIG. 2 to the position shown in FIG. 3. The jaw clutch member 64 is thus moved to the right from the position shown in FIG. 2 to the position shown in FIG. 3 and disengaged from the pinion ear portion 58 whereupon the pinion 56 is released for free rotation to permit quick rotation of the winding drum 24 without spin of the operating spindle 26 and hand wheel 32.

The mechanism may be restored to brake setting position by returning the lever 104 to the position shown in FIG. 1 with the flange 106 thereon in engagement with the side of the front casing 14. During return movement of the lever 104, the cam shaft 100 is rotated and the high point of the cam 102 is moved away from the flat 96 of the release fork 94. At the same time, the spring 68 returns the jaw clutch member 64 and the release fork 94 to the position shown in FIG. 2 whereupon the pinion 56 is again clutched to the control shaft 36. Slight rotation of the hand wheel 32 may be necessary to secure engagement of the pinion ear portions 58 with the jaw clutch recesses 66.

The function of the special pinion teeth 62a and 62b and the spur gear stop means 120 will now be described. If the hand wheel 32, together with the operating spindle 26 and the pinion 34, is incorrectly rotated counterclockwise, as viewed in FIG. 1, when the mechanism is conditioned for brake winding, the pinion 56 is caused to be rotated counterclockwise, as viewed in FIG. 4, tending to cause the gear 116 to be rotated clockwise. In these circumstances, the lateral extension portion of the special pinion tooth 62*a* engages the spur gear stop means 120, as shown in FIG. 5, to prevent interengagement of the special tooth 62*a* between the gear teeth 118*a* and 118*b* whereby to limit rotation of the winding drum unit 24 from a rest position in a direction opposite normal winding and thereby prevent reverse winding of the brake chain 130 upon the brake drum 114.

When the hand wheel 32, together with the operating spindle 26 and the pinion 34, is rotated as intended for brake setting, the pinion 56 is caused to rotate clockwise, as viewed in FIG. 4, and the gear 116 is caused to rotate counterclockwise. After the gear 116 has been rotated approximately 720° counterclockwise, the lateral extension portion of the special pinion tooth 62*b* engages the stop means 120, as shown in FIG. 6, to prevent interengagement of the special tooth 62*b* between the gear teeth 118*b* and 118*c* whereby to limit rotation of the winding drum unit 24 from a rest position in the normal winding direction and thereby limit forward winding of the brake chain 130 upon the drum 114. In this manner, the extent of vertical chain movement is limited to a predetermined maximum.

It will be appreciated by those skilled in the art that the number of teeth on the pinion 56, the number of teeth on the gear 116, the arcuate spacing between the special pinion teeth 62*a* and 62*b*, and the circumferntial location of the stop means 120 on the gear 116, may be varied to obtain proper phasing between the special pinion teeth 62*a* and 62*b* and the stop means 120 for the desired control of chain takeup or limitation on the number of degrees that the gear 116 can be rotated in either direction. Also, while the winding drum gear and meshing pinion of the present invention have been shown and described in the environment of a specific type of hand brake mechanism, it will be understood that the improved elements may be readily incorporated in other types of hand brake mechanisms without departing from the spirit and scope of the invention.

The invention claimed is:

1. In a hand brake mechanism having a housing, an operating spindle rotatably mounted in said housing, a rotatable pinion within said housing and adapted to be coupled to said operating spindle, and a winding drum unit rotatably mounted in said housing and including a gear meshing with said pinion and a drum upon which brake chain may be wound, the improvement wherein said pinion has a plurality of standard teeth of uniform face width and at least one special tooth with a lateral extension portion, said gear has a plurality of teeth with stop means intermediate at least two adjacent of said teeth at the ends thereof, and said lateral extension portion of said special tooth of said pinion is engageable with said stop means to prevent interengagement of said special tooth between said two adjacent teeth of said gear whereby to limit rotation of said winding drum unit.

2. In a hand brake mechanism having a housing, an operating spindle rotatably mounted in said housing, a rotatable pinion within said housing and adapted to be coupled to said operating spindle, and a winding drum unit rotatably mounted in said housing and including a gear meshing with said pinion and a drum upon which brake chain may be wound, the improvement wherein said pinion has a plurality of standard teeth of uniform face width and at least one special tooth with a lateral extension portion, said gear has a plurality of teeth with stop means intermediate at least two adjacent of said teeth at the ends thereof, said winding drum unit is rotatable from a rest position in one direction by said pinion to effect winding of brake chain upon said drum, and said lateral extension portion of said special tooth of said pinion is engageable with said stop means to prevent interengagement of said special tooth between said two adjacent teeth of said gear whereby to limit rotation of said winding drum unit from a rest position in the other direction and thereby prevent reverse winding of brake chain upon said drum.

3. The improvement of claim 2 wherein said special tooth with said lateral extension portion comprises a special tooth with a face width greater than that of said standard teeth.

4. The improvement of claim 2 wherein said stop means comprises a lug portion extending circumferentially across the ends of said two adjacent teeth and radially the depth of said two adjacent teeth.

5. The improvement of claim 2 wherein said pinion has two special teeth each with a lateral extension portion, said gear includes stop means intermediate three adjacent of said teeth at the ends thereof, said lateral extension portion of one of said special teeth of said pinion is engageable with said stop means to prevent interengagement of said one special tooth between the first and second of said three adjacent teeth of said gear whereby to limit rotation of said winding drum unit from a rest position in the other direction and thereby prevent reverse winding of brake chain upon said drum, and said lateral extension portion of the other of said special teeth of said pinion is engageable with said stop means to prevent interengagement of said other special tooth between the second and third of said three adjacent teeth of said gear whereby to limit rotation of said winding drum unit from a rest position in

the said one direction and thereby limit forward winding of brake chain upon said drum.

6. The improvement of claim 5 wherein each of said special teeth with said lateral extension portions comprises a special tooth with a face width greater than that of said standard teeth.

7. The improvement of claim 6 wherein said stop means comprises a lug portion extending circumferentially across the ends of said three adjacent teeth and radially the depth of said three adjacent teeth.

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