United States Patent

Speicher

[15] **3,636,871**

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[54] APPARATUS FOR REMOTELY ROTATING A MARKING WHEEL ON A MARKING DEVICE

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[52] **U.S. Cl.** **101/95**, 101/4, 101/110

[51] **Int. Cl.** **B41j 5/04**, B41j 7/34

[58] **Field of Search** 101/4, 29, 95, 110

[56] **References Cited**

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[57] **ABSTRACT**

The characters on the periphery of a rotatable marking wheel are selectively rotated into marking position by a remotely controlled actuating mechanism. The marking wheel has a ratchet portion with a ratchet tooth for each character. The actuating mechanism includes a reciprocating slide with an actuating pawl pivotally connected thereto. For each forward stroke of the slide the actuating pawl engages a tooth and rotates the marking wheel and moves the adjacent character into marking position. A depending finger on the slide also moves into overlying relation with the adjacent tooth to prevent the wheel from rotating through too large an angle to move the adjacent character beyond the marking position. A centering and locking pawl is engaged by the slide on the reverse stroke and moved into engagement with another tooth on the ratchet to center the character in the marking position and maintain the wheel in that position.

3 Claims, 5 Drawing Figures

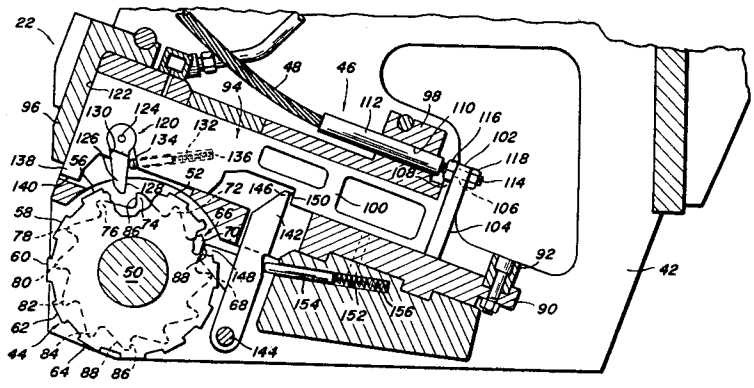


FIG. 1

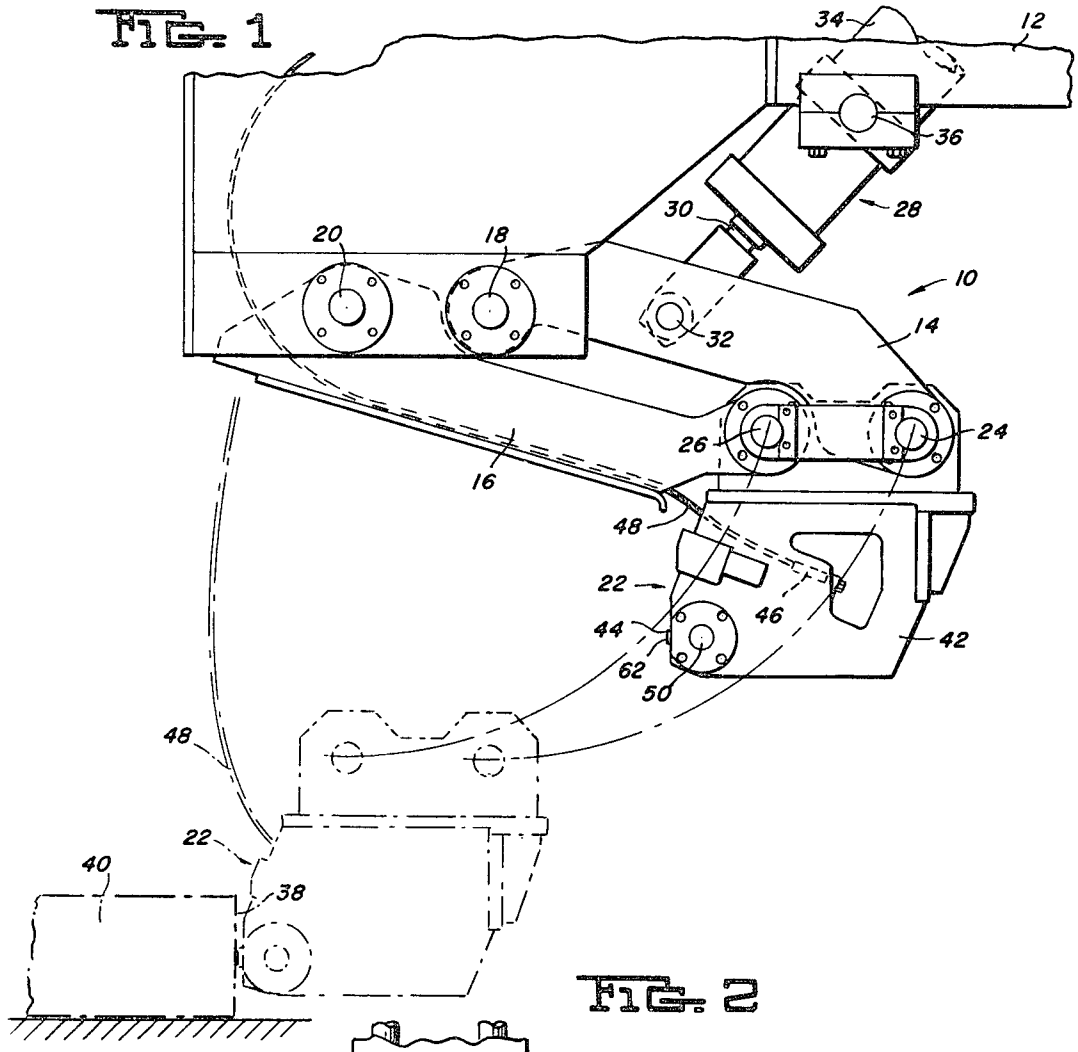
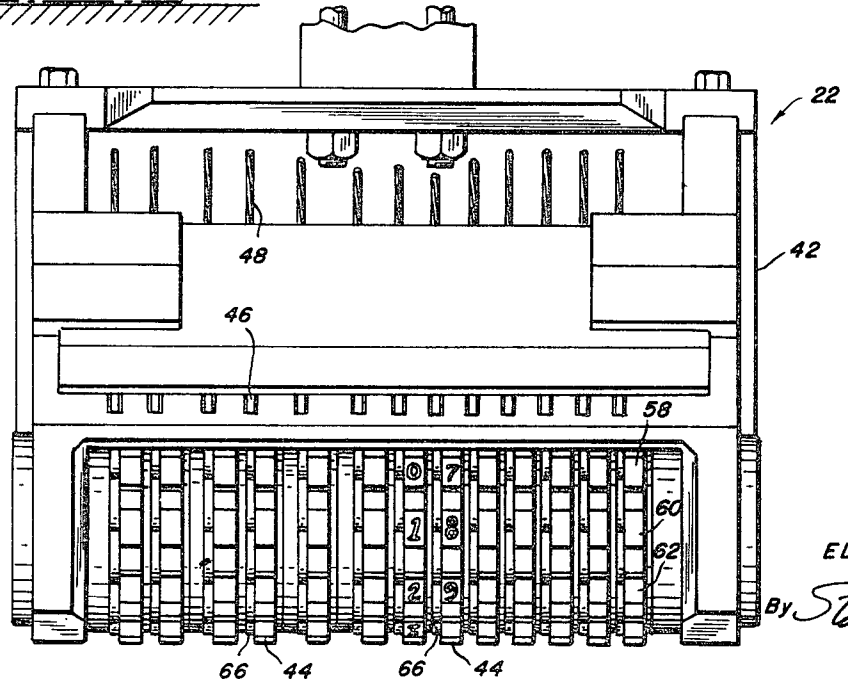


FIG. 2



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FIG. 3

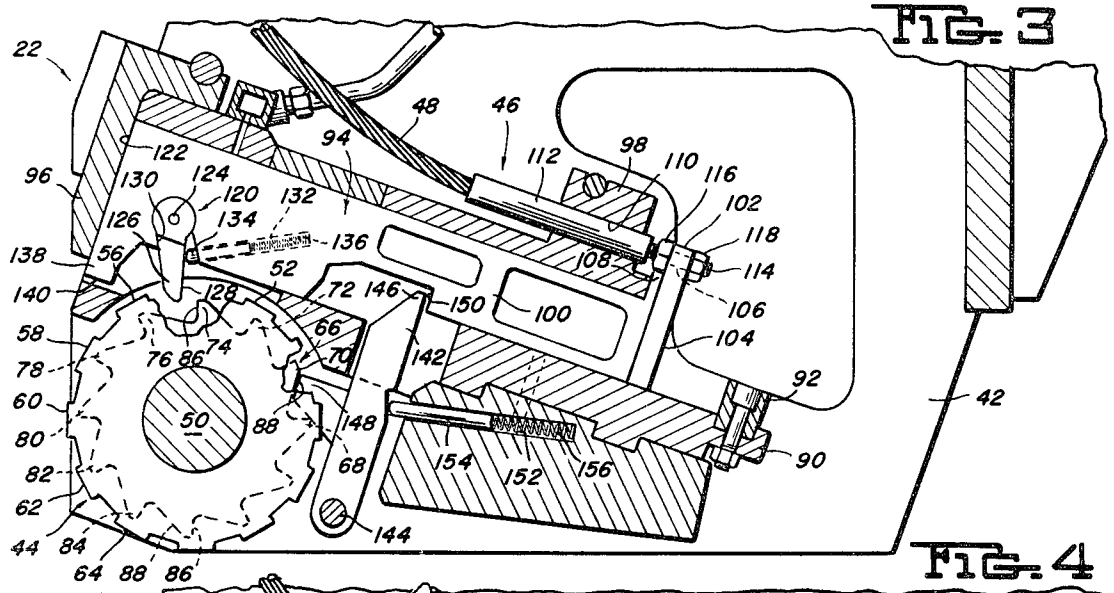


FIG. 4

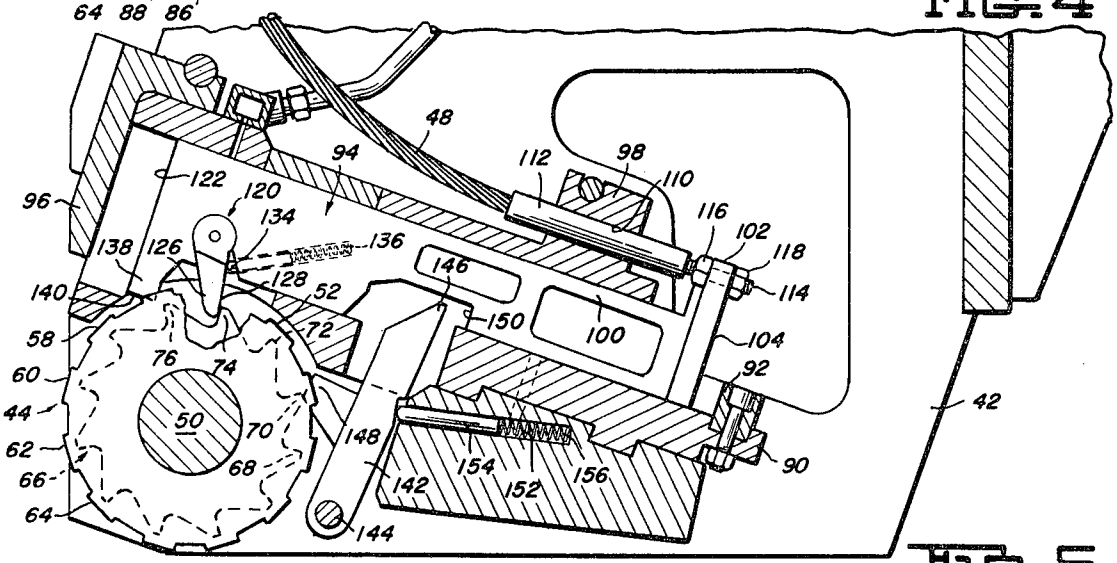
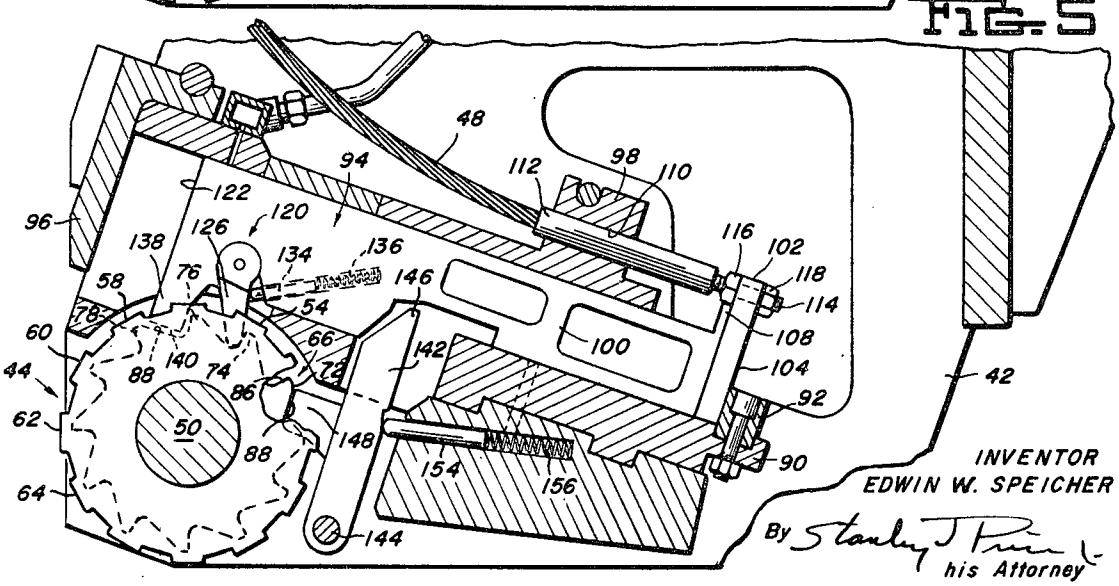


FIG. 5



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APPARATUS FOR REMOTELY ROTATING A MARKING WHEEL ON A MARKING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method and apparatus for rotating a wheel through a preselected angle and more particularly to a method and apparatus for rotating a marking wheel to position an adjacent peripheral character in marking position.

2. Description of the Prior Art

Remotely operated marking devices reduce both the cost and time required for the marking function. To identify the heat number, ingot number, and other identifying information by impressing on the slab, billet, or bloom various characters by a remotely located marking device has reduced the cost per ton for the marking function and eliminates the need to slow down the other operations in the steel mill to keep pace with the marking functions. U.S. Pat. No. 2,994,264 discloses marking apparatus that performs the above-discussed marking functions. With the apparatus disclosed in the above patent, a marking head is pivotally supported from an overhead support and is swung downwardly in an arcuate path and the marking head strikes a portion of the slab, preferably a vertical edge portion, and impresses thereon the characters on the marking heads in marking position. The marking wheels are rotatably supported within the marking head and have a plurality of characters on the outer periphery. Character selection is made from an operating console positioned remotely from the marking machine. An actuator device rotates the wheel with each stroke and moves the adjacent character into marking position. The marking wheels are rotatable on a supporting shaft and movement of the actuator has, in the past, rotated the marking wheel a greater distance than a single character so that character selection by the operator was not the same as the character in marking position. There is a need, therefore, for a fail-safe actuating device for positively rotating the marking wheel to move only the next adjacent character into marking position for each stroke of the actuator.

SUMMARY OF THE INVENTION

The hereinafter described invention is directed to an actuating mechanism for positioning preselected characters in the marking position and includes an actuating slide mechanism that has an actuating pawl depending therefrom. As the actuating slide advances, the actuating pawl engages a tooth of the ratchet forming a part of the marking wheel and the rotates the marking wheel to move the next adjacent character toward the marking position. Means associated with the actuating slide extends into the recess of the ratchet tooth adjacent the ratchet tooth engaged by the actuating pawl and prevents the ratchet and marking wheel from rotating so that the adjacent character cannot move beyond the marking position. A locking pawl is urged against another tooth of the ratchet to further turn the ratchet wheel and center the adjacent character in the marking position. The actuating slide engages the locking pawl in this latter position to maintain the adjacent character in a center marking position. With this arrangement the actuator cannot inadvertently move the marking wheel to an extent that the adjacent character moves beyond the marking position.

Accordingly, the principal object of this invention is to provide an actuating device for a marking wheel that includes means to prevent the marking wheel from rotating beyond the adjacent character.

These and other objects and advantages of this invention will be more completely disclosed and described in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation of a remotely operated marking device with the marking head illustrated in full lines in a retracted position and in phantom lines in a marking position.

FIG. 2 is a view in front elevation of a marking head illustrating a plurality of marking wheels with peripheral raised surfaces with raised characters thereon.

FIG. 3 is a fragmentary view partially in section with a portion of the marking wheel removed to illustrate the relative position of the actuating pawl and the locking pawl relative to the ratchet portion of the marking wheel.

FIG. 4 is a view similar to FIG. 3 with portions of the marking wheel removed to again illustrate the manner in which the actuating pawl engages the ratchet tooth and the locking pawl is moved rearwardly by the ratchet tooth as the slide portion of the actuating mechanism moves forwardly.

FIG. 5 is a view similar to FIGS. 3 and 4 illustrating the slide portion of the actuating mechanism at the forward end of the stroke with the depending finger on the slide member positioned in a recessed portion of the ratchet wheel between adjacent teeth to prevent further rotation of the ratchet wheel while the locking pawl engages and moves the ratchet wheel to center the adjacent character in marking position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2** the marking apparatus generally designated by the numeral **10** includes an upper support frame **12** suitably positioned adjacent a location where slabs or billets are to be marked. Pairs of arms **14** and **16** are pivotally secured to the frame **12** by pins **18** and **20**. A marking head generally designated by the numeral **22** is pivotally secured to the opposite ends of the arms **14** and **16** by pins **24** and **26**. A piston cylinder assembly **28** has a piston rod **30** pivotally secured to the pair of arms **14** by pins **32** and a cylinder **34** pivotally secured to the frame **12** by pin **36**. The piston cylinder assembly **28** extends the piston rod **30** to swing the marking head **22** through an arcuate path to the position illustrated in phantom lines where the characters in marking position are impressed on the vertical side **38** of billet **40**.

The marking head generally designated by the numeral **22** has a housing member **42** that rotatably supports a plurality of marking wheels **44** and a plurality of actuating mechanisms generally designated by the numeral **46**. There is an actuating mechanism **46** for each character marking wheel **44** and each actuating mechanism has a cable **48** secured to a slide of the actuating mechanism and at the other end to a remotely controlled servomechanism (not shown). The servomechanism within the frame **12** is arranged to reciprocate the cable **48** and advance the adjacent character into marking position. The servomechanism advances and retracts the cable **48** to advance the marking wheels in the marking head **22** in the following manner.

Referring to FIGS. **3–5**, one of the marking wheels generally designated by the numeral **44** is associated with an actuator mechanism generally designated by the numeral **46**. The actuator mechanism **46** and marking wheels **44** are suitably supported within the housing **42** of the marking head **22**. The marking wheel **44** is rotatably supported on a shaft **50** and has a plurality of spaced raised portions along the periphery, for example in FIG. **3**, the raised portion **60** is in the marking position. In FIG. **5**, however, the raised portion **62** is in the marking position after the marking wheel **44** has been rotated by the actuator mechanism **46**. Each marking wheel has 12 raised portions with different raised characters thereon. Each marking wheel has a ratchet portion **66** associated therewith that is coaxial with the wheel **44**. The marking wheel **44** is rotated by means of the ratchet portion **66**. The ratchet wheel **66** has radially extending teeth, as for example **68**, **70**, **72**, **74**, **76**, **78**, **80**, **82**, and **84**. Each raised portion of the marking wheel has a ratchet tooth associated therewith. For example, raised portion **52** has ratchet tooth **72** and raised portion **54** has ratchet tooth **74**. All of the ratchet teeth have a vertical portion **86** and an inclined portion **88**.

The housing **42** has a slide support **90** with an upwardly extending stop member **92** secured thereto arranged to limit the forward movement of the slide member generally designated by the numeral **94**. The housing **42** has a depending rear stop

member **96** that limits the rearward movement of the slide member **94** so that the slide member **94** is free to reciprocate between the stop members **92** and **96** by means of longitudinal reciprocatory movement of the cable **48**. The slide member **94** is slidably positioned on the slide support **90** and guided thereon by an upper member **98**. The slide member has a body portion **100** with an upstanding front end portion **102** with a front edge **104**. The upstanding portion **102** has a longitudinal aperture **106** and an upstanding stop member **108** on the opposite side of the upstanding member **102**. The upper support member **98** has a longitudinal bore **110** therethrough and the cable **48** has a cylindrical jacket **112** therearound with a threaded end portion **114**. The cylindrical jacket **112** is slidably positioned in the longitudinal bore **110** in support member **98** and the threaded end portion **114** extends through the longitudinal bore **106** in upstanding portion **102**. A first bolt **116** is threadedly secured on the cable threaded end portion **114** and has a sidewall that abuts the upstanding stop member **108** on slide member **94**. A second bolt **118** is threadedly secured to the cable end portion **114** and abuts the front surface **104** of the slide member **94**. With this arrangement the bolt **116** nonrotatably abuts the stop portion **108** so that bolt **116** is prevented from rotating on the threaded cable **114** by the stop member **108** and thus prevents the slide mechanism **94** from disengaging from the cable **48** after repeated actuation of the slide member and after repeated marking operations.

The slide body portion **100** has an actuating pawl **120** pivotally secured thereto adjacent the slide mechanism rear edge portion **122** by means of a pin member **124**. The pawl **120** has a finger portion **126** with a vertical front edge portion **128**. The slide mechanism body portion has a shoulder portion **130** against which the pawl finger portion abuts so that the shoulder portion **130** on the slide body portion **100** provides a stop means to limit clockwise pivotal movement of the pawl member **120** so that in the position illustrated in FIGS. **3–5** the pawl mechanism **120** functions as a lever extension of the slide mechanism **94**. However, on the return stroke of the slide mechanism **94** the pawl member **120** rotates in a counterclockwise direction as the finger portion **126** slides up the inclined portion **88** of the ratchet tooth. The slide body portion **100** has a bore **132** therein in which a rod member **134** is slidably positioned with a spring **136** in the bore **132**. The spring **136** urges rod member **134** outwardly so that the positioning pawl **120** compresses spring **136** as it pivots in a counterclockwise direction and is urged against the stop member **130** by the rod **134** and spring **136** to thus assure the downward clockwise engagement of the pawl **120** against the shoulder **130** so that the pawl finger **126** will be positioned as illustrated in FIGS. **3–5** and engage the ratchet tooth upon forward movement of the slide mechanism **94**.

To rotate the ratchet wheel **44** and advance the character raised portion **62** into marking position where character raised portion **60** is presently positioned in FIG. **3**, the servomechanism in the frame member is actuated to move the cable **48** forward and advance the slide mechanism **94**. As is illustrated in FIG. **3**, the slide mechanism in its rearward position with the rear edge **122** abutting the rear stop **96** has the actuating pawl finger **126** disengaged from the teeth of the ratchet **44**. As the cable **48** advances the slide mechanism **94**, the ratchet finger front surface **128** engages the vertical surface **86** of a ratchet tooth and rotates the ratchet **44** by advancing the slide mechanism **94**. Continued advance of the slide mechanism **94** into abutting relation with the front stop **92** as illustrated in FIG. **5** simply retains the actuating pawl finger **126** against the vertical wall **86** of the ratchet tooth.

The slide body portion **94** has a depending finger **138** adjacent the slide rear edge portion **122**. The depending finger **138** has a lower edge portion **140** that is so shaped that when positioned in overlying relation with a ratchet tooth inclined portion **88** the finger **138** prevents the marking wheel **44** from rotating beyond the next raised portion. For example, in FIG. **3** the depending finger **138** is clear of the ratchet teeth. As the slide **94** advances toward the stop **92** the pawl **120** engages the vertical portion **86** of the ratchet tooth and rotates the ratchet wheel to move the next raised portion into marking position. The finger **138** follows the pawl **120** and moves into overlying relation with the inclined portion **88** of the tooth behind the ratchet tooth engaged by the pawl **120**. For example, as illustrated in FIGS. **3**, **4**, and **5**, the pawl **120** engages the vertical portion **86** of tooth **74** to rotate the ratchet wheel **44** as the slide mechanism **94** advances toward the front stop **92**. The finger **138** following the pawl **120** moves into overlying relation with the inclined portion **88** between the teeth **76** and **78** as is illustrated in FIG. **5**. Continued rotation of the marking wheel **44** while the finger **138** is in the position illustrated in FIG. **5** would move the inclined portion **88** of the ratchet tooth into abutting relation with the lower edge **140** of finger **138** to thus prevent further rotation of marking wheel **44** beyond the desired single raised portion.

A locking pawl **142** is pivotally secured to the frame **42** by pin **144** and has an upper edge portion **146** and a forwardly extending engaging portion **148**. The locking pawl in the locked position illustrated in FIG. **3** has the engaging portion **148** in abutting relation with an inclined portion **88** of the ratchet wheel. The upper edge portion **146** is in abutting relation with a depending intermediate surface **150** on slide **94**. In the position illustrated in FIG. **3** the engaging portion **148** of locking pawl **142** is maintained in abutting relation with the inclined portion **88** of ratchet tooth **70** by the depending **150** of slide preventing the pawl **142** from pivoting in a clockwise direction to thus prevent the ratchet wheel **66** and marking wheel **44** from rotating and moving the preselected character out from its marking position.

The slide support **90** has a longitudinal passageway **152** with a rod **154** and a coil spring **156**. The coil spring **156** urges rod **154** against the rear edge of the pawl **142** to urge the pawl in a counterclockwise direction. As the slide member **94** is advanced as illustrated in FIGS. **4** and **5**, the locking pawl engaging portion **148** rides over a ratchet tooth as illustrated in FIG. **4** to permit the next raised portion on the marking wheel **44** to move into marking position. The rod **154** maintains engaging portion **148** in abutting relation with the surface of the ratchet wheel **66** so that the engaging portion **148** moves into abutting relation with the inclined portion **88** of the adjacent ratchet tooth. As the slide **94** returns to the position illustrated in FIG. **3**, the locking pawl centers the raised portion on the marking wheel **44** in marking position and maintains that raised portion in centered marking position until subsequently moved therefrom by the previously discussed reciprocal movement of the slide **94**.

OPERATION

The marking wheel **44** illustrated in FIG. **3** has the peripheral raised portion **60** in marking position and the centering and locking pawl **142** maintains the raised portion **60** in operative marking position. Movement of the slide mechanism **94** forwardly toward the stop **92** by the cable **48** first moves the finger portion **126** of actuating pawl **120** into abutting relation with the vertical portion **86** of tooth **84**. Further advance of the slide **94** into abutting relation with the front stop **92** as illustrated in FIG. **5**, moves the lower edge portion **140** of finger **138** into overlying relation with the inclined portion **88** between ratchet teeth **76** and **78** to thus prevent further rotation of the ratchet wheel **66** and marking wheel **44** beyond the position where the raised portion **62** is in marking position. After the ratchet wheel has rotated the marking wheel to move raised portion **62** into marking position, the slide **94** is moved rearwardly toward the rear stop **96**. Locking pawl engaging portion **148** prevents rotation of the ratchet wheel **66** and marking wheel **44** in either direction by the rod **154** urging the engaging portion **148** of locking pawl **142** into abutting relation with the ratchet wheel. During the rearward movement of slide **94** the actuating pawl **120** slides up the inclined portion **88** of the adjacent ratchet tooth to assume the position

illustrated in FIG. 3 and is operatively positioned to engage the adjacent ratchet tooth upon subsequent forward movement of the slide **94**.

With the above-discussed arrangement the ratchet pawl and marking wheel are mechanically controlled by means of actuating pawl **120**, finger **138**, and lock pawl **142** to prevent the ratchet wheel **44** from moving more than one raised portion on the marking wheel and further, the marking wheel is maintained in fixed position with the preselected raised portion in marking position by the locking pawl **142** until the actuating slide **94** is again moved forwardly toward the stop member **92**.

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now considered to represent its best embodiment. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for rotating a marking wheel on a marking device comprising,

a marking head housing,

a wheel rotatably mounted on said housing and having a plurality of raised portions with marking characters on the periphery thereof,

said wheel having a ratchet portion with a plurality of teeth extending radially therefrom, said ratchet portion having the same number of teeth as said wheel peripheral raised portions,

an actuating slide mounted in said housing for reciprocal movement therein, said actuating slide positioned in overlying relation with said wheel ratchet portion,

said housing having a front stop portion and a rear stop portion for said actuating slide,

an actuating pawl connected to said slide and operable upon movement of said slide in one direction to engage a tooth of said ratchet portion and rotate said wheel to advance the next adjacent character into marking position,

a locking pawl pivotally connected to said housing and having pawl portion operable to engage a tooth of said ratchet portion and limit the rotation of said ratchet and said wheel,

said slide having a shoulder portion movable into abutting relation with a portion of said locking pawl to maintain said locking pawl in engagement with a tooth of said ratchet portion,

said slide having a depending finger portion adjacent said actuating pawl, and

said depending finger portion operable upon movement of said slide to move into overlying relation with a ratchet tooth to prevent rotation of said ratchet and said wheel beyond said next adjacent character.

2. Apparatus for rotating a marking wheel on a marking device as set forth in claim **1** which includes,

cable means to reciprocate said slide in said housing.

3. Apparatus for rotating a marking wheel on a marking device as set forth in claim **2** in which,

said slide includes an upstanding front end portion with a longitudinal passageway therethrough,

said cable having a cylindrical jacket positioned thereon adjacent a threaded end portion,

a first bolt member threadedly positioned on said cable threaded end portion with said cable end portion extending through said longitudinal passageway in said slide member,

a second bolt member securing said cable to said slide upstanding end portion,

a stop member abutting said first bolt member and limiting rotation of said first bolt member to thereby maintain said cable secured to said actuating slide.

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