Dec. 13, 1966 P. DE LA MOTTE 3,291,414

AUTOMATIC REEL

Filed April 26. 1965 4 Sheets-Sheet 1

Fig. 2.

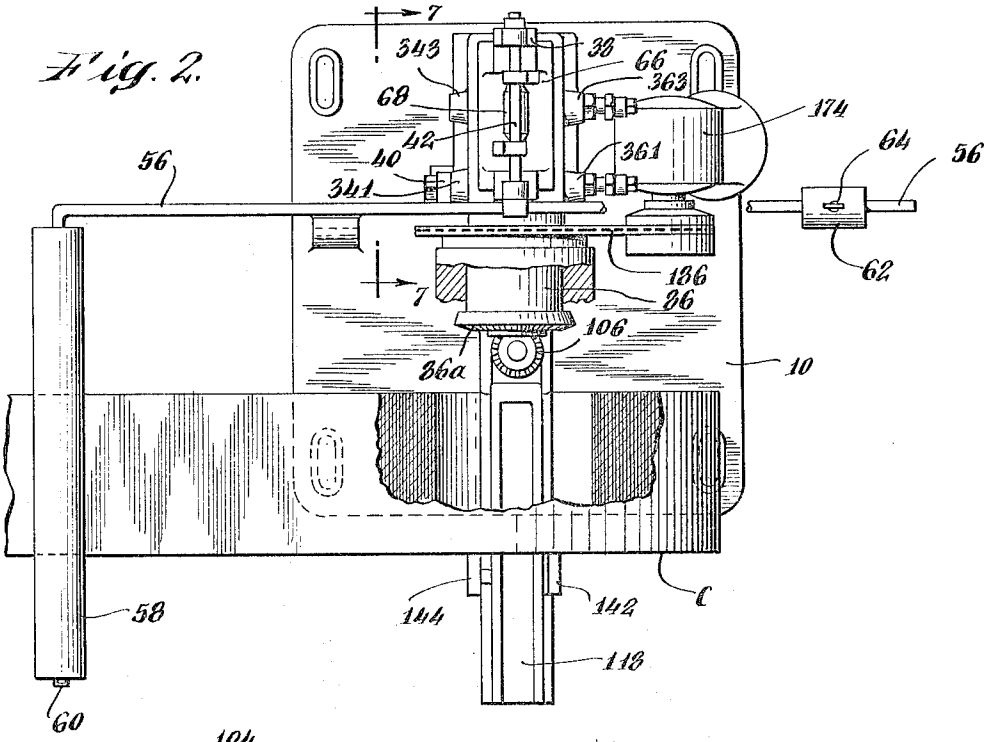
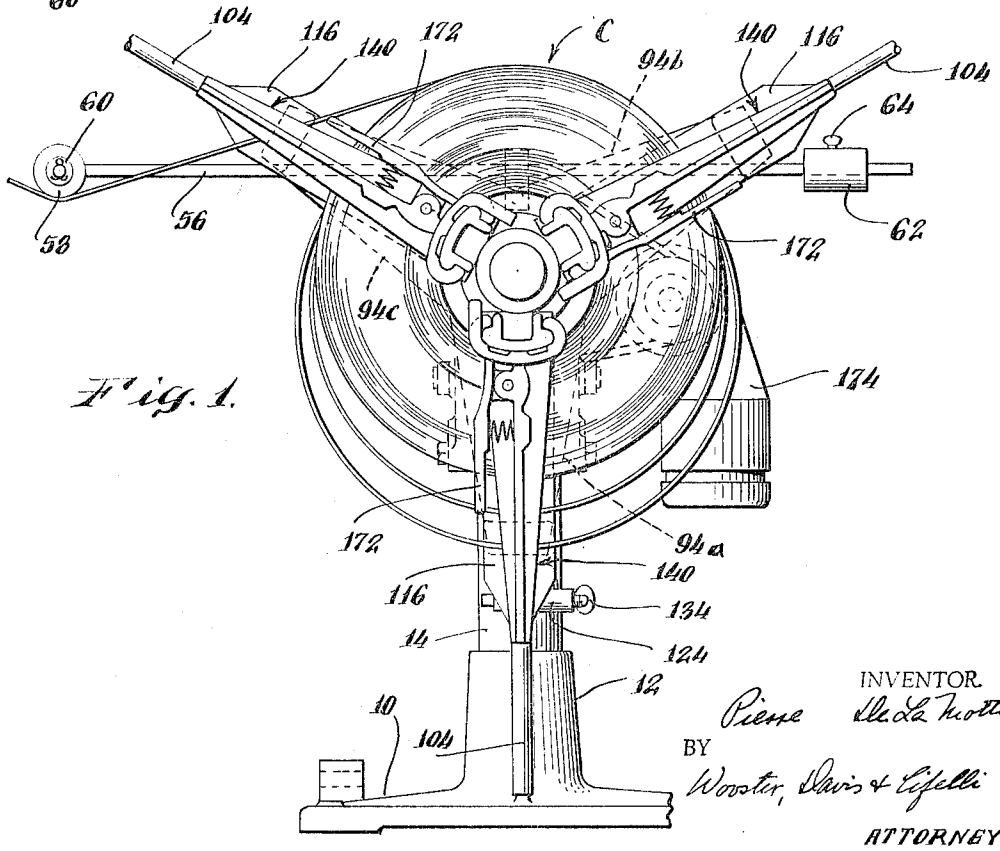


Fig. 1.



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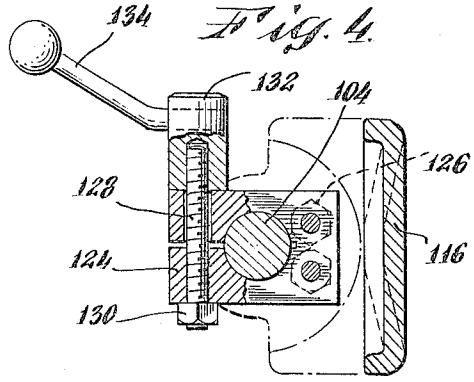


Fig. 4.

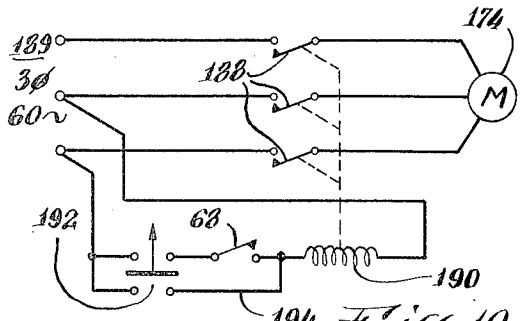


Fig. 10.

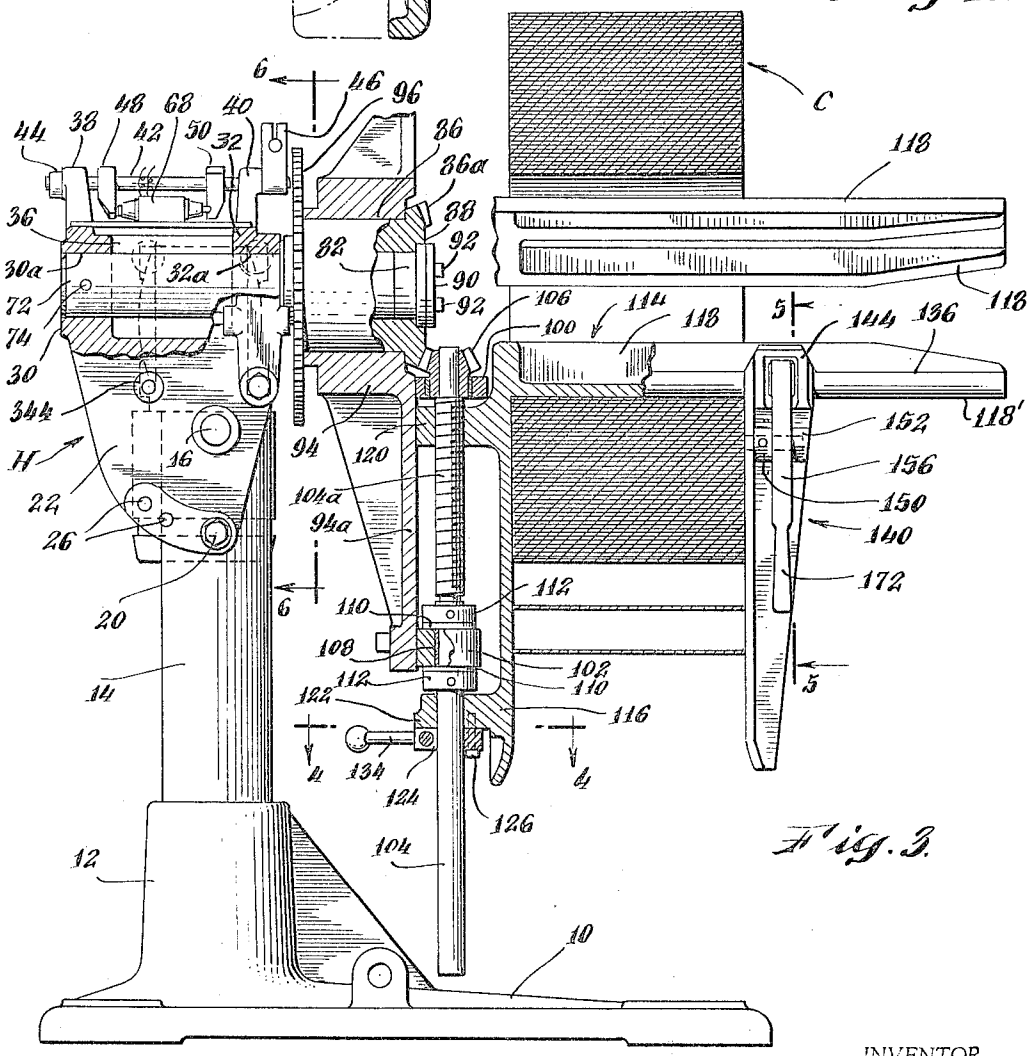


Fig. 3.

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AUTOMATIC REEL

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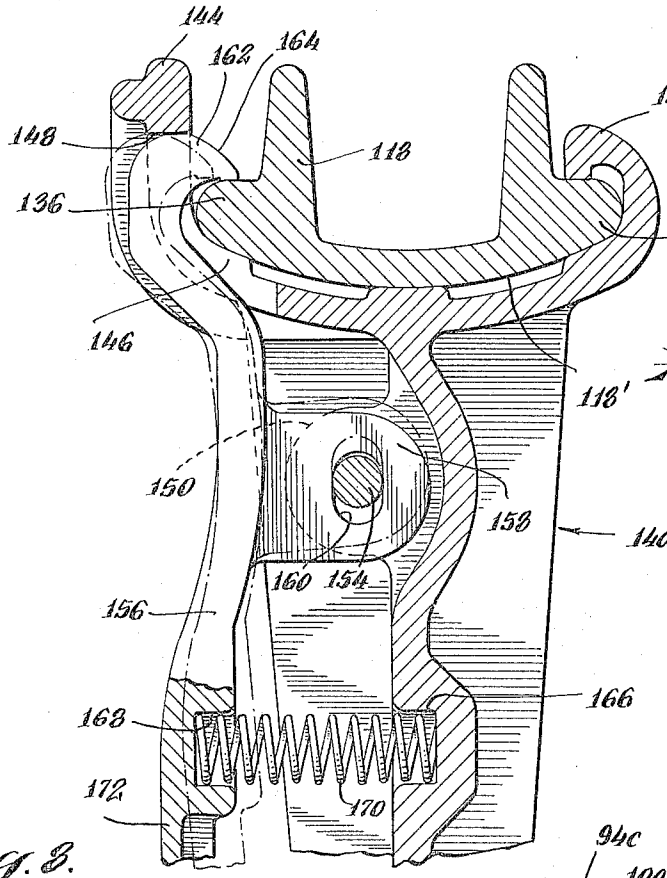


Fig. 5.

Fig. 8.

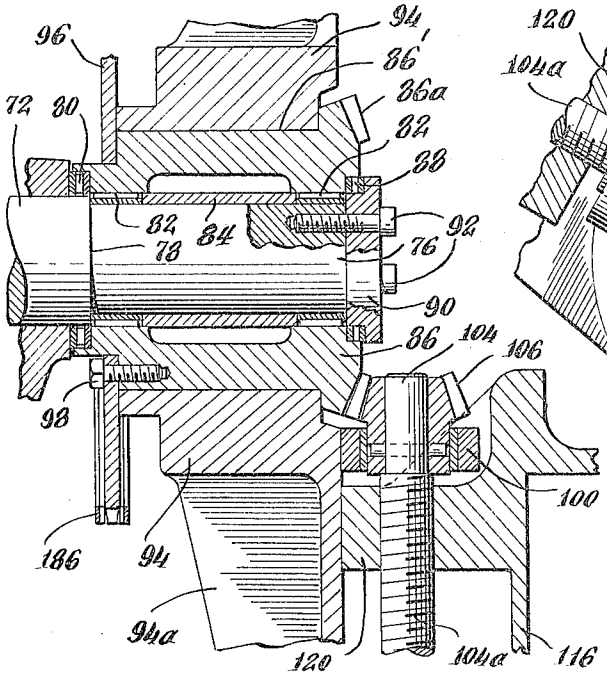
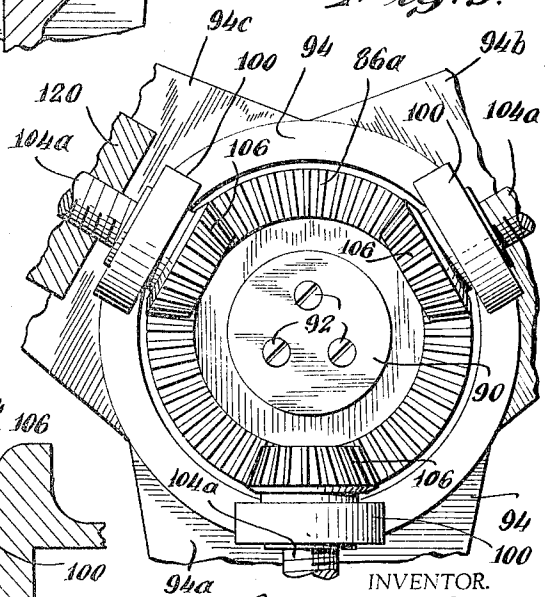


Fig. 9.



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Fig. 6.

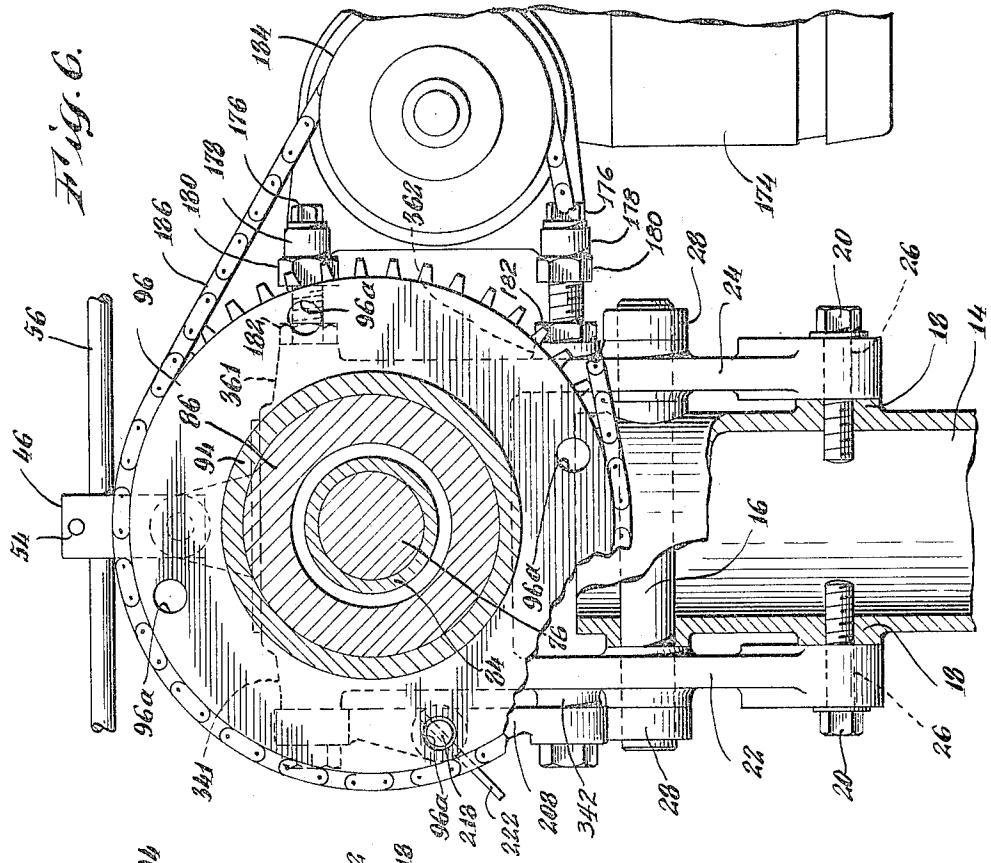
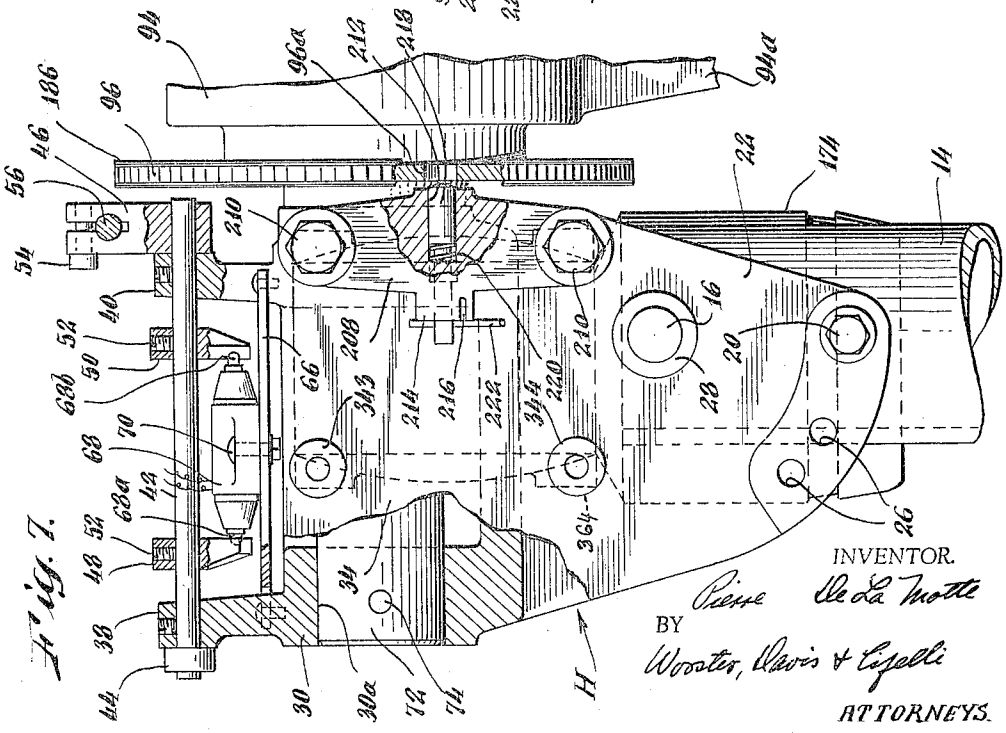


Fig. 7.



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United States Patent Office

3,291,414

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3,291,414

AUTOMATIC REEL

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Filed Apr. 26, 1965, Ser. No. 450,720
16 Claims. (Cl. 242—78.6)

This invention relates to reels for suporting coils of strip and wire stock and, more particularly, to such a reel of the power driven, automatic centering type.

Reels of the power driven automatic centering type are not new to the metal working art. An example of such a reel is contained in the disclosure of U.S. Patent No. 2,161,228 which issued June 6, 1939 to F. M. Littell. Such reels are utilized for feeding wire and strip stock to metal working machines such as punch presses and the like. Automatic centering reels normally include a plurality of axially extending support arms which are positioned within the coil of stock. The automatic centering feature of such a reel permits the support arms to be simultaneously advanced radially outward against the inner surface of the coil so as to automatically center it for rotation on the reel. In addition, such reels utilize outer fork members which are adjustably positionable on the support arms and extend radially therefrom to retain coils of varying width.

A number of deficiences are present in the automatic centering power driven reels known to the prior art. For example, they are relatively complex and are, therefore, expensive to manufacture, use and maintain. For example, in one such construction, an annular bevel gear is rotatably mounted about the hub of the reel and operates a plurality of pinion gears. Each pinion gear is associated with a threaded adjusting shaft which controls the radial position of one of the supporting arms. A latch mechanism is employed to lock the annular bevel gear to a central hub which rotates the various supporting arms and the coil. This latch can be engaged only at discrete locations of the bevel gear relative to the hub. For purposes of convenience, it would be desirable to activate the power driven feature of the reel without regard to the particular rotational location of the coil. In order to utilize the automatic centering feature of such a reel, it is normally necessary to perform two operations. First, the latch must be disengaged so as to free the bevel gear from the hub and, secondly, the hub must be locked by a second locking lug. Rotation of the bevel gear then rotates the pinion gears—advancing the support arms inwardly or outwardly of the coil. This is obviously an undesirably complex arrangement.

Another disadvantage of prior art reels is that the outer forks are either not easily adjustable to conform to the width of stock or they do not grip their respective supporting members with sufficient firmness.

Accordingly, it is the primary object of the present invention to provide a power driven reel of improved construction having automatic centering features. Other objects are to provide such a reel which may be converted from automatic centering operation to power driven operation without regard to the particular rotational location of the reel; to provide a reel wherein a single, easily operable, locking member may be employed to convert from automatic centering to power driven operation; to provide such a reel wherein a single annular bevel gear performs both the automatic centering and the power driving operations; to provide such a reel wherein the outer fork members are easily attached and adjustable on the support arms and firmly grip the supporting arms; and to provide such a reel which is of simplified construction, is inexpensive to manufacture, is simple to use, and is less subject to mechanical difficulties. The

manner in which the foregoing objects are achieved will be more apparent from the following description, the appended claims, and the figures of the attached drawings, wherein:

FIG. 1 is a front view of a reel constructed in accordance with this invention;

FIG. 2 is a top view of the reel of FIG. 1, the upper two support arms removed for clarity;

FIG. 3 is an enlarged left side view of the reel of FIG. 1, portions thereof being broken away to illustrate its internal construction;

FIG. 4 is an enlarged cross section taken along the line 4—4 of FIG. 3;

FIG. 5 is an enlarged cross section taken along the line 5—5 of FIG. 3;

FIG. 6 is an enlarged cross section taken along the line 6—6 of FIG. 3;

FIG. 7 is an enlarged cross section taken along the line 7—7 of FIG. 2;

FIG. 8 is an enlarged detail view showing the hub and pinion construction in vertical cross section;

FIG. 9 is a front view of the detail of FIG. 8; and

FIG. 10 is a circuit diagram of the motor control circuit.

The principal objects of this invention are achieved by means of a construction wherein an annular bevel gear is selectively employed to either rotate the individual pinion gears of the automatic centering support arms relative to their axes or rotate the supporting arms relative to the axis of the bevel gear. The adjustable outer forks are mounted on these support arms by means of a novel cam latch which permits rapid but secure adjustment.

With particular reference to the drawings, there is illustrated a reel having a base **10** with an integral upwardly extending pedestal **12**. A vertical tubular post **14** is mounted at one end in pedestal **12**. The upper end of post **14** contains two parallel passages, each defined by a pair of diametrically positioned openings. Mounted through the upper pair of openings is a pivot pin **16** (FIG. 3). The lower passage terminates in a pair of internally threaded bosses **18** (FIG. 6), each of which receives a locking screw **20**. Mounted atop the post **14** is a main housing H. The main housing includes a downwardly extending left yoke member **22** and a downwardly extending right yoke member **24**.

The yoke members are positioned on opposite sides of the post **14** and include pivot openings retaining the pivot pin **16** therebetween. Each of the yoke members defines a plurality of positioning holes **26** arranged on the circumference of a circle concentric with the pivot pin **16**. These permit the main housing H to be tilted on the pivot pin **16** and selectively positioned by means of the locking screws **20**. The yoke members are secured to the pivot pin **16** by means of shaft collars **28** mounted on the ends of the pin. The upper portion of housing H includes a rear shaft support **30** and a front shaft support **32** defining respective alinged openings **30***a*, **32***a* and joined by side members **34**, **36** which are extensions, respectively, of the left yoke member **22** and the right yoke member **24**. Side member **34** includes four raised bosses **341**, **342**, **343**, **344** and side member **36** includes similar bosses **361**, **362**, **363**, **364**. The bosses of each side member are located at the corners of an imaginary rectangle (FIGS. 6 and 7) and each boss is drilled and tapped. A pair of spaced aligned brackets **38**, **40** extend above the supports **30**, **32** and rotatably support a loop control shaft **42**. The loop control shaft **42** extends through both brackets and is secured against axial movement by means of a shaft collar **44** mounted on one end and an adjusting block **46** mounted on the other, as illustrated most clearly in FIG. 7. Fixed to the loop control shaft **42** are a pair of spaced switching cams **48**, **50** secured by means of set

screws 52. The adjusting block 46 is of the split type, and utilizes a screw 54 to clamp therein a control rod 56. One end of the control rod 56 is bent at a right angle as illustrated in FIG. 2 and carries a roller 58 secured by cotter pin 60. The opposite end of control rod 56 carries a counterweight 62 slidably mounted thereon and positionable by means of thumbscrew 64.

Mounted atop the housing H and on the shaft supports 30, 32 is a switch bracket 66 in the form of a generally rectangular plate to which is secured a switch 68 by means of bolts 70. The switch 68 is of the maintained contact type and so positioned that the operating buttons 68*a*, 68*b* at each end are controllable from cams 48, 50 which have different angular positions relative to control shaft 42.

Supported between the rear shaft support 30 and the front shaft support 32 is a main shaft 72. The main shaft 72 is non-rotatably secured in rear shaft support 30 by means of a taper pin 74. The main shaft 72 forms a cantilever beam having a smaller diameter portion 76 (FIG. 8) extending outwardly from the main housing H. Mounted on the large diameter portion at the annular shoulder 78 thus formed is a thrust bearing 80. A pair of bearings 82 are mounted on the small diameter portion at opposite ends of a cylindrical bearing spacer 84. Mounted for rotation on these bearings is a bevel gear 86 which is axially positioned by means of a front thrust bearing 88 and a bearing retainer 90 secured to the end of the main shaft 72 by means of cap screws 92. The bevel gear 86 is of substantially cylindrical construction, with the teeth 86*a* being formed at one end thereof. The outer cylindrical surface of the bevel gear 86 forms a bearing surface 86' upon which is rotatably mounted a swivel head 94 having three circumferentially spaced radial arms 94*a*, 94*b*, and 94*c* extending therefrom. A driven sprocket 96, having circumferentially spaced openings 96*a*, is secured to the bevel gear 86 by means of the screws 98. Each of the radial arms 94*a*, *b* and *c* carries on its inner end an inner bearing block 100 and at its outer end an outer bearing block 102 (FIG. 3). Rotatably mounted in the bearing blocks 100, 102 of each of the radial arms is an adjusting shaft 104. The extreme inner end of each of the adjusting shafts 104 carries a bevel pinion gear 106 which meshes with the teeth 86*a* of the bevel gear 86. The adjusting shaft 104 also includes an inner threaded portion 104*a*. The unthreaded outer portion of the adjusting shaft 104 is rotatably secured in the outer bearing block 102 by means of a cylindrical bushing 108 and a pair of thrust bearings 110 mounted between collars 112 pinned to the adjusting shaft 104.

Mounted for radial positioning on each of the adjusting shafts 104 is an inner fork 114. Each of the inner forks 114 is substantially L-shaped and includes a radial portion 116 and an axially extending support arm 118. The radial portion 116 of each of the inner forks carries a pair of spaced guide lugs. The inner guide lug 120 includes an internally threaded guide opening which engages the threaded portion 104*a* of adjusting shaft 104. The outer guide lug 122 defines an opening which is slidable along the unthreaded portion of the adjusting shaft 104.

The three inner forks 114 are similar to one another although only one is completely illustrated in FIG. 3. However, there is one additional feature on the fork illustrated in FIG. 3 which is not present on the other two. This is the shaft lock which is shown in detail in FIG. 4. The shaft lock comprises a split block 124 which encircles the adjusting shaft 104 and is secured to the outer guide lug by means of cap screws 126. A shaft lock screw 128 is threaded into one side of the split block 124 and retained by a jam nut 130. The opposite end of the shaft lock screw engages an internally threaded locking nut 132 provided with a locking lever 134.

As will be apparent from FIG. 5, each of support arms 118 is substantially U-shaped in cross section, the radially outer surface 118' being slightly curved to fit the inside of a coil of stock. In addition, a pair of ribs 136, 138 extend longitudinally to each support arm. An outer fork member 140 is arranged to slide along each of the support arms 118 and to be clamped against the arm so as to extend radially therefrom. Each of the outer fork members 140 is essentially T-shaped in cross section, the bar of the T being positionable against the side of a coil C mounted on the support arms (FIG. 3). The innermost end of the outer fork member 140 terminates, on one side, in a hook 142 which engages the rib 138 and, on the other side, in an inwardly extending locking lug 144 which includes an opening 146 partially defined by an upper camming surface 148. A pair of spaced pivot support lugs 150, 152 are mounted on the outer fork member 140 and support therebetween a pivot pin 154. An outer fork clamp 156 is mounted on the pivot pin 154 by means of a flat pivot member 158 which extends between the pivot support lugs and defines a floating pivot slot 160 which is engaged by pivot pin 154. The inner end of clamp 156 terminates in a hook 162 for engaging rib 136. The upper surface of the hook 162 has a cam surface 164 which cooperates with the camming surface 148, as will be later explained. The outer fork member 140 defines a spring socket 166 and a similar and aligned spring socket 168 is provided on the inner surface of clamp 156. A coil compression spring 170 is mounted with one end in each of the spring sockets. The outer end of the clamp 156 terminates in a clamping handle 172.

Referring to FIG. 6, it will be noted that a geared head motor 174 is mounted against the main housing by means of cap screws 176 which extend through the mounting feet 178 of the head portion of the motor. Each of cap screws 176 is mounted in the head of a motor adjusting screw 180 which is tapped to receive it. Each of screws 180, in turn, is mounted in the tapped opening of one of the bosses 361–364. The amount by which each adjusting screw 180 extends from its boss is variable by means of a jam nut 182. The head of the motor 174 is provided with a driver sprocket 184 aligned with the driven sprocket 96 and operatively connected thereto by means of a roller chain 186.

FIG. 10 illustrates, schematically, the wiring of the motor 174 and switch 68. The motor is connected to a three phase, 60 cycle power supply 189 by means of main contacts 188 operable from a coil 190. The coil is connected in series with switch 68 and a selector switch 192 across one phase of the power supply. A shunt connection 194 permits switch 68 to be bypassed by selector switch 192.

Mounted on side member 34 of the main housing and alongside sprocket 96 is a stop pin bracket 208 (FIG. 7). The stop pin bracket is elongated and is mounted on bosses 341, 342 by means of screws 210 which pass through its extreme ends. The central portion of the bracket is thickened and defines a bore 212 which extends perpendicular to the plane of the sprocket 96 and terminates at the opposite end in a raised boss 214. The boss includes a slot 216 which extends radially from the bore 212. A stop pin 218 is seated within the bore and an outward force in the direction of the sprocket is exerted on the pin by a coil spring 220. The reduced diameter end of stop pin 218 which extends out of boss 214 is provided with a rod shaped handle 222 having a diameter less than the width of slot 216.

Operation

The operation of the coil reel of the invention is as follows. With the outer fork members 140 removed from their corresponding support arms 118, the coil C of strip stock is placed on the reel with its central opening encircling the support arms. The outer fork members 140 are then replaced on the corresponding support arms as follows: The hook 142 is positioned over the

rib 138 and the fork member 140 is rotated about rib 138 as a pivot. As the hook 162 moves upward, the rib 136 acts against the cam surface 164 to retract the hook against the force of spring 170 until it snaps into position over the rib 136. The camming surface 148 of locking lub 144 cams the hook 162 downwardly as it advances onto the upper surface of rib 136, causing the slot 160 to slide downwardly against pivot pin 154. The hook is thus caused to tightly engage the rib 136 to firmly position the outer fork member 140 on the support arm 118. The fork members 140 are positioned against the edge of coil C so as to retain it in its proper axial position on the support arm 118. In order to remove a fork member 140, the clamping handle 172 is depressed against the force of compression spring 170 until the slot 160 slides upwardly against the pivot pin 154 as illustrated by the broken lines of FIG. 5. In this position, the hook 162 is withdrawn into the opening 146 releasing the fork member from support arm 118.

To automatically center the support arms 118 within the coil C, the locking lever 134 (FIGS. 3 and 4) is backed off so that the split block 124 releases the adjusting shaft 104. Stop pin 218 is released by turning its handle 222 to allow it to enter slot 216. Spring 220 forces pin 218 outwardly and into one of the openings 96*a* in sprocket 96. The sprocket is thus locked against rotation. The shafts 104 are then rotated manually about the centerline of shaft 72. As the bevel gear 86 is fixed to sprocket 96, it remains stationary and swivel head 94 rotates around it. Each of the pinion gears 106 rolls around the periphery of bevel gear 86, causing each of the adjusting shafts to rotate within its inner bearing block 100 and its outer bearing block 102. as the threaded portion 104*a* of each of the adjusting shafts 104 rotates, the threaded inner lug 120 of each inner fork 114 is caused to move outwardly along the adjusting shaft. The support arms 118 are thus caused to move outwardly at the same speed until their outer surfaces 118′ contact the inner surface of coil C, causing it to be exactly centered on the reel.

In order to drive the reel to unwind the coil it is merely necessary to disengage stop pin 218 from sprocket 96 and then turn the locking lever 134, thereby tightening the shaft locking nut 132 on the shaft lock screw 128 to clamp the split block 124 on the adjusting shaft 104. Such a locking arrangement is required on only one of the three adjusting shafts 104 and is operable regardless of the rotational position of the shaft. With the adjusting shaft 104 thus rendered incapable of rotation about its own axis, the motor 174 may be started. As bevel gear 86 rotates, the pinion gear 106 will be unable to rotate due to the locking features just described. Accordingly, gear 106 and shaft 104 will remain locked with the bevel gear 86 and will rotate with it about the axis of the main shaft 72. As the shaft 104 rotates, the swivel head 94 is also caused to rotate about the axis of the main shaft, as are the inner forks 114. In order to reverse the operation and remove the coil, it is merely necessary to re-engage stop pin 218 and release the locking mechanism by backing off locking lever 134. The shafts 104 may then be rotated in the reverse direction, causing the support arms 118 to be retracted inwardly.

The reel of this invention also has provision for automatic intermittent control of the reel drive. This is accomplished by means of the roller 58 (FIG. 2) and switch 68 (FIG. 7) which is connected to control the operation of motor 74. In normal operation, the strip material from coil C passes beneath roller 58, as shown in FIGS. 1 and 2. During normal feed of the machine being supplied, a few of the outer turns of the strip material become slack and depend from the coil C as shown in FIG. 1. This slack material is gradually used up and, when it has finally disappeared, the strip begins to tighten and exerts an upward force against the roller 58. This upward force is aided by the counterweight 62, tipping the adjusting block 46 and rotating the loop control shaft 42. As shaft 42 rotates, switching cam 50 is caused to move into engagement with actuating button 68*b*. Switch 68 then closes, energizing the motor 174 and starting the reel. The switch remains closed and the motor continues to run, even after button 68*b* is released. When upward pressure against the roller 58 is released sufficiently, the weight of roller 58 causes loop control shaft 42 to rotate in the opposite direction, causing switching cam 48 to depress actuating button 68*a*, opening switch 68 and stopping the motor.

A further feature of the reel of this invention is its symmetrical construction which allows the motor to be mounted on either side of the reel. Thus, motor 174 may be mounted against bosses 341–344 on the opposite side of the main housing. Stop pin bracket 208 would then be mounted against bosses 361, 362.

In addition, the reel may be readily converted to non-motorized use. When the motor is removed, a clamp-type friction drag brake may be mounted to bear against the reduced diameter portion of head 94 adjacent sprocket 96.

It will now be apparent that, by means of this invention, all of the objectives which have been set forth above are achieved. It will also be obvious that a number of variations and modifications may be made by those skilled in the art without departing from its spirit and scope. Accordingly, it is to be understood that the foregoing description is illustrative only rather than limiting. This invention is limited only by the scope of the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A reel for supporting coils of stock which comprises: a base; a housing mounted on said base; a main shaft supported in said housing; a bevel drive gear mounted on said main shaft and including an outer bearing surface; means for rotatably driving said bevel drive gear about the longitudinal axis of said main shaft; a swivel head including a hub portion rotatably mounted on said bearing surface and a plurality of arms extending radially outward therefrom; an adjusting shaft means rotatably supported on each arm and extending radially therealong, each of said adjusting shaft means including a threaded portion; a bevel pinion gear mounted on the radially inner end of each adjusting shaft means in operative engagement with the teeth of said bevel drive gear; fork means mounted on each of said adjusting shaft means for radial movement therealong, each of said fork means including threaded guide means engaging the threaded portion of its corresponding adjusting shaft means and an axially extending coil support arm; and shaft locking means operable to selectively prevent rotation of at least one of said adjusting shaft means about its longitudinal axis.

2. The reel of claim 1 wherein said shaft locking means comprises a screw clamp.

3. The reel of claim 1 wherein said main shaft is fixed and said bevel drive gear is rotatable thereon.

4. The reel of claim 1 wherein said means for driving comprises an electric motor.

5. The reel of claim 1 wherein said housing includes stop means for selectively fixedly positioning said bevel drive gear.

6. A reel for supporting coils of stock which comprises: a base; a housing mounted on said base; a motor mounted on said base; a main shaft supported in said housing; a bevel drive gear rotatably mounted on said main shaft and including an outer bearing surface; drive means between said motor and drive gear for rotating said drive gear about the longitudinal axis of said main shaft; a swivel head including a hub portion rotatably mounted on said bearing surface and a plurality of arms extending radially outward therefrom; an adjusting shaft means rotatably supported on each arm and extending

radially therealong, each of said adjusting shaft means including a threaded portion; a bevel pinion gear mounted on the radially inner end of each adjusting shaft means in operative engagement with the teeth of said bevel drive gear; fork means mounted on each of said adjusting shaft means for radial movement therealong, each of said fork means including threaded guide means engaging the threaded portion of its corresponding adjusting shaft means and an axially extending coil support arm; shaft locking means operable to selectively prevent rotation of at least one of said adjusting shaft means about its longitudinal axis; and motor control switch means electrically connected to start and stop said motor.

7. The reel of claim 6 wherein said housing includes stop means selectively engageable to prevent rotation of said bevel drive gear.

8. The reel of claim 6 wherein said shaft locking means is a screw clamp.

9. The reel of claim 8 wherein said screw clamp is mounted on one of said fork means and is arranged to lock its associated adjusting shaft means to said fork means to prevent their relative rotation.

10. The reel of claim 6 wherein each of said fork means is substantially L-shaped and supports an axially adjustable radial outer member detachably secured to said coil support arm.

11. The reel of claim 10 wherein said coil support arm includes spaced first and second ribs therealong; and said radial outer member comprises an elongated body portion having a first and a second end, a fixed hook on said first end position to engage said first rib, a lug on said first end positionable adjacent said second rib when said first hook and first rib are engaged, said lug having a camming surface thereon, pivot means on said body portion, an elongated clamping member pivotally mounted intermediate its ends on said pivot means and including a clamping hook at its first end and a clamping handle at its second end, said clamping hook engaging said camming surface to be forced into tight clamping engagement with said second rib upon outward displacement of said clamping handle from said body portion.

12. The reel of claim 6 which further includes switch control means responsive to the tension on the stock from said reel to actuate said switch means.

13. A coil support which comprises: a substantially L-shaped fork having a first arm disposable along a first side of a coil and a coil support arm axially disposable within such coil, said coil support arm including first and second, spaced, oppositely disposed ribs therealong; an elongated outer member radially disposable along the second side of said coil and having a first and a second end; a fixed hook on said first end positioned to engage said first rib; a lug on said first end positionable adjacent said second rib when said fixed hook and first rib are engaged, said lug having a camming surface thereon; pivot means on said outer member; an elongated clamping member pivotally mounted on said pivot means and including a clamping hook at a first end thereof and a clamping handle at a second end thereof, said clamping hook engaging said camming surface to be forced into tight clamping engagement with said second rib upon outward displacement of said clamping handle from said outer member.

14. The coil support of claim 13 wherein said pivot means comprises a floating pivot interconnecting said outer member and said clamping member.

15. The coil support of claim 13 wherein said lug defines an opening for receiving said clamping hook, said camming surface defining a portion of said opening.

16. The coil support of claim 13 wherein a compression spring is disposed between said clamping handle and said outer member.

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