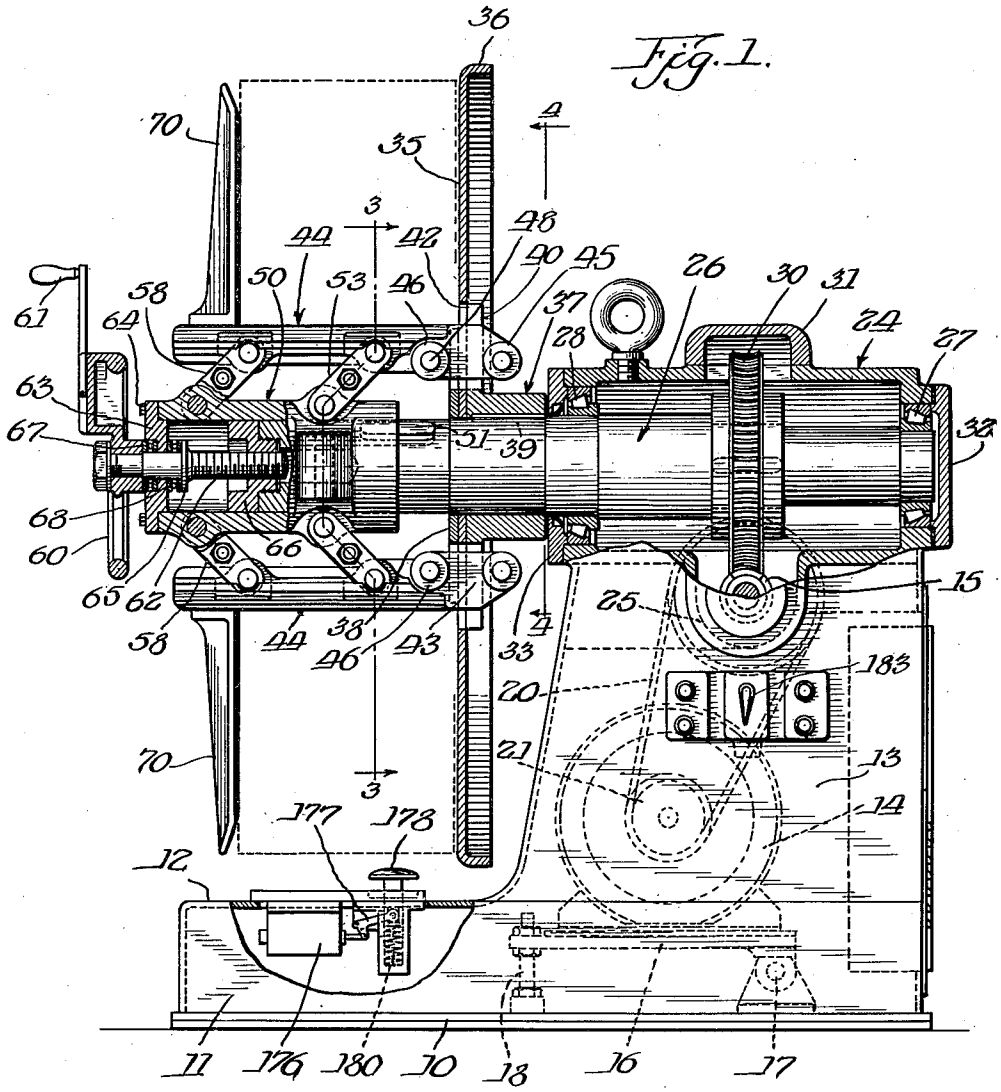
Jan. 13, 1942. F. M. LITTELL 2,270,064

SPINDLE REEL WITH TOGGLE ARMS

Filed Dec. 31, 1940 4 Sheets-Sheet 1

Fig. 1.



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SPINDLE REEL WITH TOGGLE ARMS

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Fig. 2.

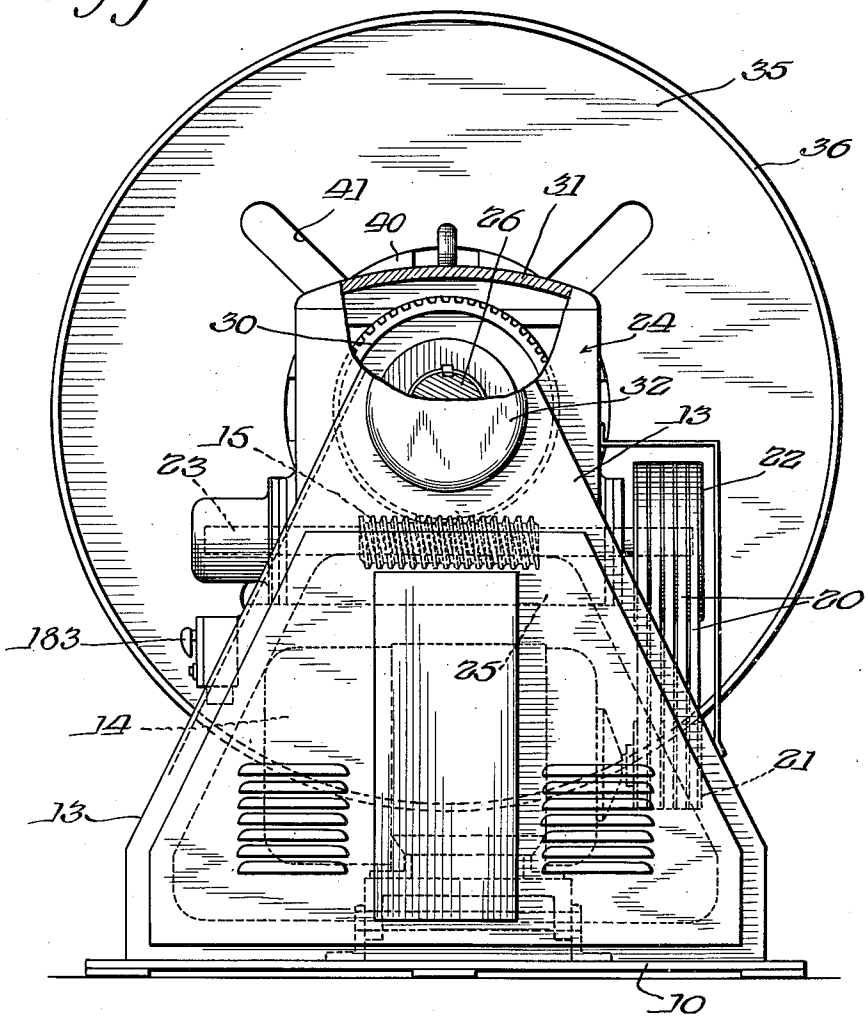
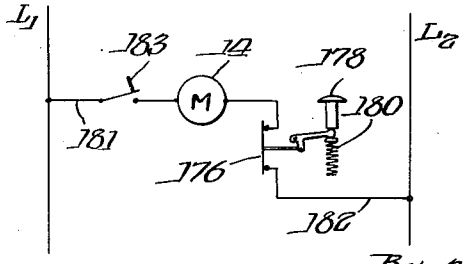


Fig. 5.



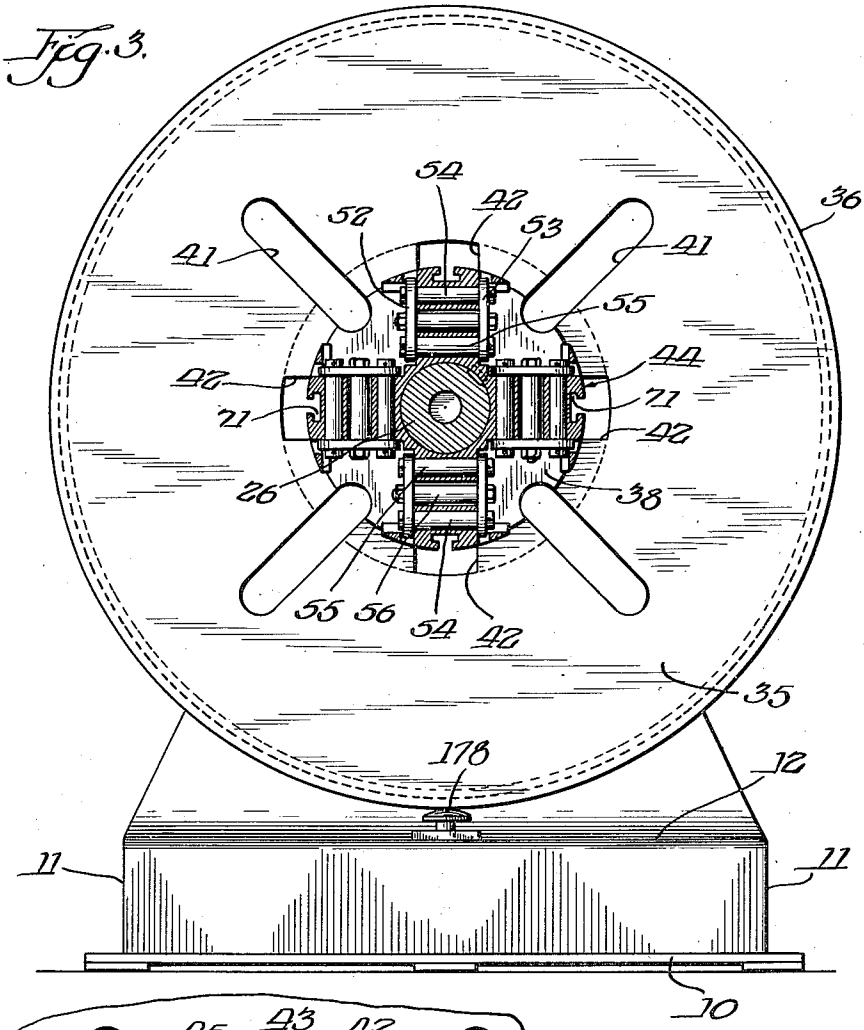
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SPINDLE REEL WITH TOGGLE ARMS

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Fig. 3.



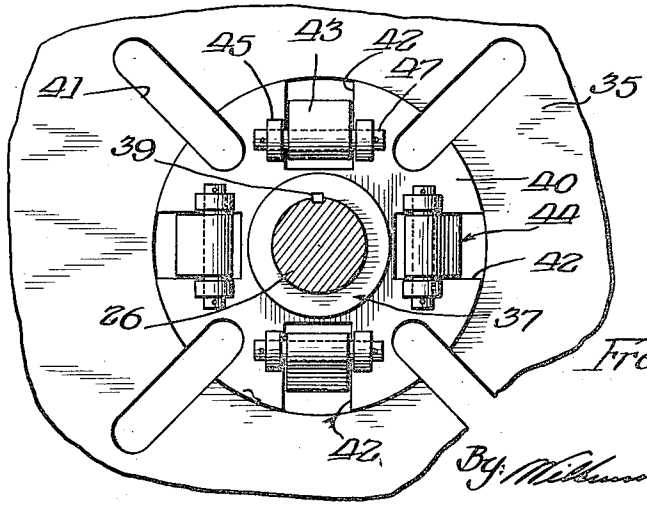


Fig. 4.

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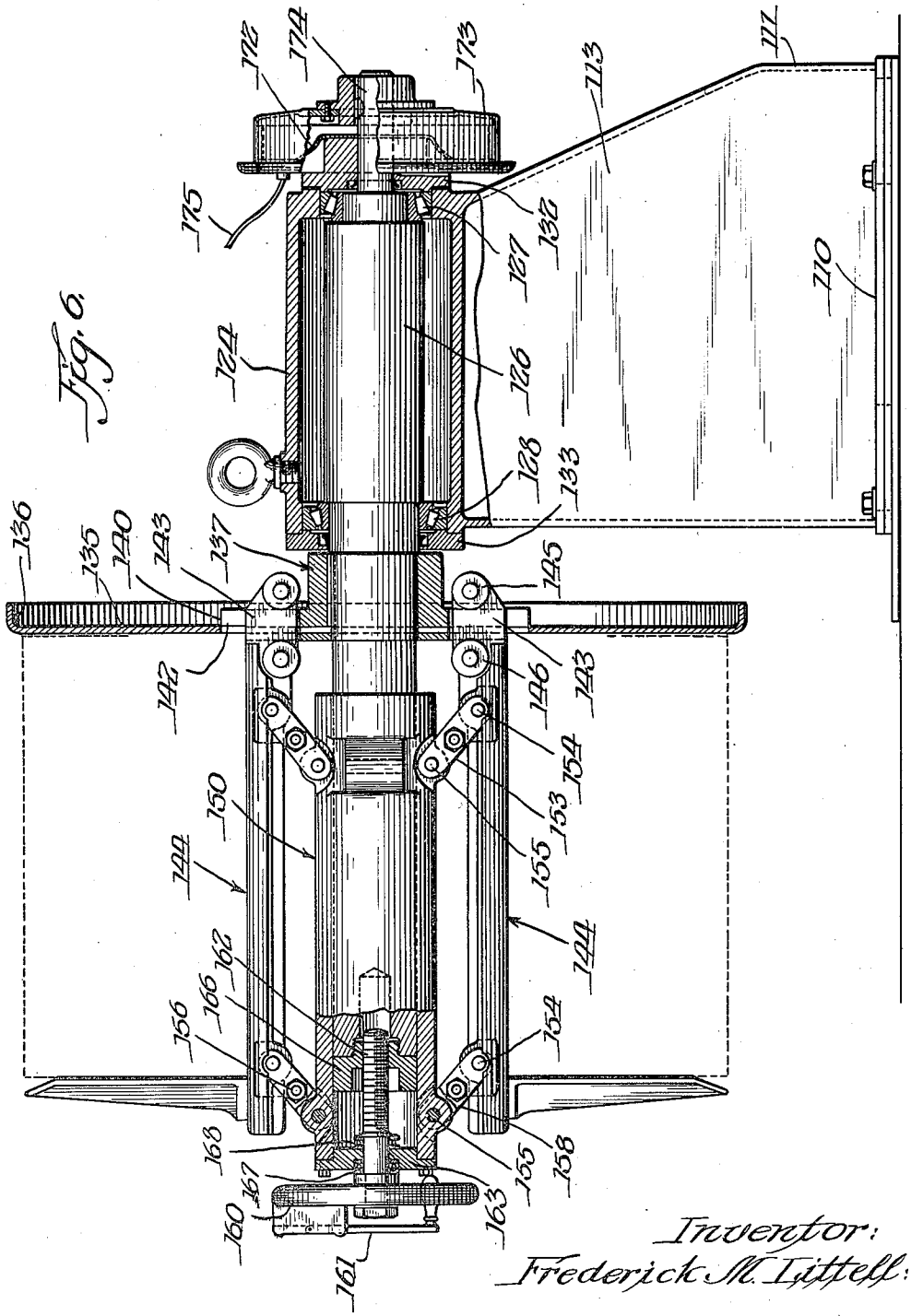
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SPINDLE REEL WITH TOGGLE ARMS

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Fig. 6.



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Patented Jan. 13, 1942

2,270,064

UNITED STATES PATENT OFFICE

2,270,064

SPINDLE REEL WITH TOGGLE ARMS

Frederick M. Littell, Detroit, Mich., assignor to F. J. Littell Machine Company, Chicago, Ill., a corporation of Illinois

Application December 31, 1940, Serial No. 372,529

10 Claims. (Cl. 242—111)

The invention relates to reels for metal strip material in coil form and has more particular reference to spindle reels of the centering type in which a plurality of coil supporting arms can be caused to move radially outward or inward to grip or release the coil supported thereby.

An object of the present invention is to provide an improved reel of the spindle type which will be rugged in construction, embodying relatively few parts, and which will rotatively support a coil of metal or the like so that the same may be unwound without damage to edges of the material.

Another object resides in the provision of a spindle type reel having toggle supported arms.

Another object is to provide a spindle reel of the centering type having toggle supported arms mounted for movement in a radial direction whereby a coil is securely gripped by expanding movement of the arms and may be released when the arms are moved in a contracting direction.

Another object of the invention is to provide a spindle reel having coil supporting arms mounted for movement in a radial direction only and wherein the arms have connection to an actuating sleeve for expanding or contracting the arms by adjustment of the sleeve in an axial direction.

Another object of the invention is to provide novel drive mechanism for rotating the reel including the circular flanged plate, the coil supporting arms mounted on the plate, and the axially movable sleeve connecting with the arms by means of toggles. In order to maintain the outside loop of material free of the coil and of the proper size an electric switch is provided for controlling the drive mechanism in accordance with the size of the outermost loop of the coil.

Another object of the present invention is to provide a spindle reel wherein the actuating sleeve for expanding and contracting the coil supporting arms can be adjusted by manual means located at the front of the reel.

With these and various other objects in view the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate an embodiment of the invention and wherein like reference characters are used to designate like parts—

Figure 1 is a sectional view, part of the drive mechanism being shown in elevation, of the spindle reel of the invention embodying the improved toggle actuated mechanism for expanding or contracting the radially movable arms for supporting a coil of stock material;

Figure 2 is a rear elevational view, part of the drive mechanism being shown in section, of the spindle reel of Figure 1;

Figure 3 is a vertical sectional view taken through the coil supporting arms and the actuating means therefor substantially on line 3—3 of Figure 1;

Figure 4 is a vertical sectional view taken substantially along line 4—4 of Figure 1 and looking toward the rear of the flanged circular plate;

Figure 5 is a wiring diagram showing the electrical connection for the driving means of the reel; and

Figure 6 is an elevational view, parts being shown in section of a modified form of spindle reel embodying the improvements of the invention.

Referring more particularly to Figure 1, the standard for supporting the main shaft of the present spindle reel includes a base 10 having side members 11 forming a platform 12 and an upright supporting portion 13 within which is mounted an electric motor 14 and which suitably journals a worm gear 15. The motor is supported on the base 16, pivoted at 17, and wherein provision is made for adjusting the vertical position of the base by means of the threaded bolt 18. This adjustment assures tension being maintained at all times on the pulley belts 20 which operatively connect the pulley 21, fixed to the shaft of the electric motor 14, with the pulley 22, fixed to shaft 23, suitably journalled as described by the upright supporting portion 13, which provides the casting 24 for the purpose. The worm gear 15 is fixed to said shaft 23 and thus the said worm gear is driven by the electric motor to comprise the driving mechanism for the spindle reel of the invention.

The said casting 24 includes a transversely extending arcuate portion 25 which encloses the worm gear 15 and forms a oil sump for said gear. The major portion of casting 24 extends in a direction at right angles to the arcuate portion 25 and although the sides of the casting are substantially vertical the same is hollow and is provided with end members which journal the main shaft 26 of the reel. The end members may be described as in the form of roller bearings, the assembly at the rear end of the machine being indicated by 27 and the assembly at the forward end of casting 24 being indicated by numeral 28. In this manner the shaft 26 is journalled by roller

bearings within the casting which is in turn part of the upright 13 extending from the base 10. Shaft 26 is reduced at its lower end to receive the worm wheel 30 suitably keyed to this end of the shaft and which has meshing engagement with the worm gear 15 whereby the shaft is rotated by the driving mechanism of the reel including the electric motor 14. The top cap 31, as best shown in Figure 2, is located substantially centrally of the casting directly over the worm wheel 30 and by removing the cap it is possible to inspect the driving mechanism within the casting. An end cap 32 closes the rear end of the casting, thereby sealing the roller bearing assembly 27. In a somewhat similar manner the end cap 33 closes the forward end of the casting and thus seals the roller bearing assembly 28.

The spindle reel of the invention is supported by the end of shaft 26 projecting from the housing or casting 24 above described. Since the shaft is entirely journalled at one end and the heavy coil of stock material is supported by the reel at the other end of the shaft a cantilever action is set up, requiring the use of frictionless bearings in the journalling means. The device has been found to operate very satisfactorily when the shaft is journalled at 27 and 28 by the roller bearings previously described.

The spindle reel includes a circular plate 35 of fairly large diameter, preferably flanged at 36 around the periphery of the plate and which is mounted on the shaft 26 by a hub portion 37 and a disc 38. The hub portion 37 is keyed to the shaft as at 39 and said hub portion has formed integral therewith outwardly extending flange 40, as best shown in Figure 4, the same being slotted at a number of points spaced around its periphery, as will be more particularly described. The circular plate 35 is suitably secured to the flange 40 of the hub as by welding and in a similar manner the disc 38 is also secured to the circular plate. In this manner the three elements are united and the same form one element of the spindle reel, being suitably fixed to the shaft 26 so as to rotate therewith. The long slots 41 formed in the circular plate provide sight openings in order that the operator located at the rear of the machine may observe the diameter of the coil of stock supported on the reel. These openings 41 extend into the flange 40 of the hub member and also into the disc 38, as clearly shown in said figures. Additional slots are provided in said elements, the same being indicated by numeral 42. These slots extend substantially from the hub 37 in a radial direction outwardly to the periphery of the flange 40. The slots in effect comprise aligned openings formed in the flange 40, the circular plate 35 and the disc 38, and it will be observed that said openings have a width somewhat in excess of the openings 41. The slots 42 receive the rear portion 43 of the coil supporting arms indicated in their entirety by 44 and said slots confine the arms for movement in a radial direction. This radial movement of the arms when in an outward direction expands the arms for the purpose of gripping the interior opening of a coil of metal stock whereby the coil is securely held and thus supported by the arms. When the radial movement is in an inward direction the coil is correspondingly released and the same may be removed or if the reel is empty a coil of stock may be located thereon. The rollers 45 journalled at the rear of the portion 43 of the arms has a rolling contact with the flange 40, whereas, the rollers 46, also journalled by portion 43 of the arms, has rolling contact with the face of the disc 38. As shown in Figure 4, each supporting arm 44 has a pair of rollers 45 and a pair of rollers 46 suitably journalled thereon whereby any radial movement of the arms takes place as a result of the rolling contact which the rollers have with the parts making up the circular plate. Rollers 45 are located on the respective sides of the portion 43 of each arm and stud shaft 47 suitably supports said rollers. In a similar manner rollers 46 are carried by a stud shaft 48.

In the embodiment shown in the drawings the spindle reel employs four coil supporting arms indicated by numeral 44 and each arm is operatively connected with an axially movable sleeve by toggle means, which structure will now be described.

The sleeve 50 is tubular, having an internal diameter to telescope the forward end of shaft 26 and said sleeve is mounted for axial movement with respect thereto. This movement is permitted by the key 51 which has the additional function of uniting the sleeve in a non-rotatable manner to the shaft. The toggles comprise spaced arms having a pivotal connection with the sleeve at one end and with the arms at their other end. The rear toggles or those located adjacent the circular plate are shown in Figure 3. These are formed by spaced arms 52 and 53, being pivotally connected at their upper end to the arm 44 by the stud 54 and at their lower end to the sleeve by the stud 55. An intermediate connection is provided indicated by numeral 56 which includes a stud bolt joining the spaced arms and confining between the arms a spacer in the form of a tube. The toggles at the forward end of the reel are constructed in a similar manner. These toggles include spaced arms 57 and 58. The supporting arms are formed with bosses to receive the studs 54 for securing the toggle arms thereto and the sleeve 50 is likewise formed with bosses for receiving the studs 55.

Actuating movement is imparted to sleeve 50 by manual means located at the front of the spindle reel and for this purpose the wheel 60 is provided, having a crank handle 61 suitably associated therewith. The wheel is threaded to the projecting end of the actuating stud 62 which passes through the cap 63, closing the forward end of the sleeve, and which is securely united to the sleeve by the bolts 64. The portion of the actuating stud beyond the flange 65 is threaded and the same has threaded engagement with the part 66 suitably secured to the end of shaft 27. The shaft and said part 66 are substantially one element and the actuating stud can be considered as having threaded engagement with said shaft. Thrust bearings 67 and 68 are located on the respective sides of the cap 63 and through said bearings movement of the actuating stud in an axial direction is imparted to the sleeve 50. This axial movement of the sleeve on shaft 26 will cause the supporting arms 44 to move radially within the slots 42 provided therefor. When movement of the sleeve is in a direction toward the right the arms are caused to move radially outward in an expanding direction. When the sleeve is moved in a direction toward the left the arms move radially inward to contract.

The actuating stud and its association with the sleeve is an important feature of the present invention. Rotation imparted to the actuating stud by movement of the wheel 60 will cause the actuating stud to travel inwardly with respect to

part 66 or outwardly with respect to said part. It will be observed that the end of the shaft 26 is cored in order to permit full movement of the actuating stud in an inward direction. The sleeve 50 is caused to move with the actuating stud since the parts are connected by the thrust bearings 67 and 68. Thrust bearing 67 is confined between cap 63 and the hub of wheel 60, while thrust bearing 68 is confined between the cap and the flange 65 on the actuating stud. Even though a relatively heavy coil may be supported by the arms 44, very little effort is required on the part of the operator in rotating wheel 60 to securely hold the coil on the reel and which will automatically center the same with respect to shaft 26. The coil is preferably located on the arms, with one side in contact with the face of the circular plate 35. Upright retaining members 70 are located in contact with the outside face of the coil. Said retaining members have releasable connection with the supporting arms, being associated therewith by means of a T-slot 71, Figure 3, formed in the upper surface of each arm.

In the modified form of spindle reel shown in Figure 6 the base 110 suitably supports members 111 and 113 forming an upright supporting portion for the housing 124 in the form of a steel casting, which functions in a manner as explained with respect to Figure 1, to journal the main shaft 126 of the spindle reel. Said shaft is supported at spaced points by the roller bearing assemblies 127 and 128. The cap member 133 seals the end of the casting adjacent the roller bearing 128 and cap 132 seals the rear end of the casting adjacent roller bearing 127. In this modified form cap 132 carries the internal brake drum 172 of hydraulically operated brake mechanism additionally comprising an external brake drum 173. Said drum 173 is suitably secured to extension 174 of the shaft 126 and it will be understood that said brake drum rotates with said shaft. The internal construction of the brake will not be further described as the same forms no part of the present invention. Any conventional mechanism which will operate hydraulically or mechanically to expand the internal brake drum so as to frictionally brake shaft 126 will accomplish the functions required by the present reel. In the illustrated embodiment the brake is of the internal hydraulically actuated type and accordingly a tube connection 175 is shown as the actuating instrumentality therefor.

The spindle reel shown in Figure 6 is constructed substantially as shown in Figure 1 except that the supporting arms are longer and the reel is therefore adapted to support a wider coil of stock. The hub 137 is keyed to the shaft and the same has a flanged portion 140 to which the circular plate 135 is secured. Said circular plate, the flanged portion 140, and the disc 138, are formed with aligned openings to form radially extending slots 142 within which the rear portion 143 of the supporting arms is located. The said arms have movement within the slots and movement is facilitated by the rollers 145 and 146. A sleeve 150 has telescoping association with the projecting end of shaft 126 and the supporting arms are operatively connected with the sleeve by toggles which comprise spaced arms pivotally secured at their outer end to the supporting arms and at their inner end to the sleeve. Each arm 144 is provided with bosses for receiving studs 154 which secure the toggle arms thereto and the sleeve is likewise provided with bosses for receiving the studs 155 whereby the toggle arms are secured in a pivotal manner to said sleeve.

Actuating movement is imparted to the sleeve 150 by means located at the front of the spindle reel including a wheel 160 having a crank handle 161 associated therewith. The wheel is non-rotatably secured to the actuating stud 162 which passes through an opening in the cap 163 secured to the forward end of the sleeve and the rear threaded end of the stud has threaded connection with the shaft 126. Thrust bearings 167 and 168 are provided and these bearings function to effectively transmit the thrust to the sleeve 150, causing axial movement of the sleeve in accordance with axial movement of the actuating stud. As a result of the thrust bearings very little effort is required to rotate wheel 160 and effect axial adjustment of the sleeve to cause the supporting arms to expand or contract. Movement of the arms in a radial direction is facilitated by the rollers 145 and 146 which mount each supporting arm on the circular plate. If preferred the flange 140 may be formed of hardened steel and the disc 138 is likewise formed of similar material in order to resist the wear resulting from the rolling contact of said rollers.

In the modification of Figure 6 the driving means for the spindle reel has been eliminated. In this form of the invention it has been found that some form of braking means for the spindle reel is desirable in order to prevent the reel from overrunning the machine using the material from the coil supported by the reel. Therefore a brake is conveniently provided at the end of the device for frictionally retarding the rotation of shaft 126. It is understood that said brake is suitably operated by the attendant either through hydraulically operated means or other conventional mechanism. The drive to the spindle reel of Figure 1 may also drive the reel at times at a speed in excess of requirements. A switch 176 is provided having actuation through a toggle arm 177 which is associated with plunger 178. Said plunger is backed by the coil spring 180. Said switch structure and plunger is conveniently located on the platform 12 and directly below the supporting arms 44 of the reel. The outermost loop of material being unwound from the coil will contact plunger 178 and if said loop reaches an excessive size the plunger will be depressed to actuate switch 176 and break the electric circuit to motor 14. The operation of the motor is therefore stopped until the excess material unwound from the coil is used up, whereupon operation is automatically resumed.

The electrical connections for the reel of Figure 1 is shown in Figure 5. The motor 14 is electrically connected through conductors 181 and 182 to a source of current indicated by the wires L_1 and L_2. A manual switch 183 is provided in order to stop or start the spindle reel. Said manual switch, as shown in Figure 1, is located on the upright supporting portion of the base. The switch 176 is of the normally closed type, being held in closed position by coil spring 180. It is necessary to actuate the plunger 178 in a downward direction to break the electrical circuit to motor 14 through switch 176.

What is claimed is:

1. In a spindle reel, in combination, a standard, a shaft journalled by said standard and having a portion extending forwardly of the standard, a circular plate member fixed to the extending portion of the shaft and adapted to rotate therewith,

said plate member having radially extending slots formed therein, a supporting arm extending through each slot in a forward direction and disposed substantially parallel to the shaft, axially movable means carried by the extending portion of the shaft for effecting radial movement of the supporting arms, and rollers carried by each supporting arm adapted to have rolling contact with said plate member during radial movement of the supporting arms.

2. In a spindle reel, in combination, a standard, a shaft journalled by said standard and having a portion extending forwardly of the standard, a circular plate member fixed to the extending portion of the shaft and adapted to rotate therewith, said plate member having radially extending slots formed therein, a supporting arm extending through each slot in a forward direction and disposed substantially parallel to the shaft, axially movable means having telescoping relation with the extending portion of the shaft, toggle means operatively connecting the supporting arms with said axially movable means whereby adjustment of said axially movable means effects radial movement of the supporting arms, and rollers supported by each supporting arm adapted to have rolling contact with said plate member during radial movement of said supporting arms.

3. In a spindle reel, in combination, a standard, a shaft journalled by said standard and having a portion extending forwardly of the standard, a circular plate member fixed to the extending portion of the shaft and adapted to rotate therewith, said plate member having radially extending slots formed therein, a supporting arm extending through each slot in a forward direction and disposed substantially parallel to the shaft, a sleeve mounted on the extending portion of the shaft for rotation with the shaft and for axial movement relative thereto, toggle means operatively connecting the supporting arms with said sleeve, whereby adjustment of said sleeve in an axial direction effects radial movement of the supporting arms, and rollers carried by each supporting arm adapted to have rolling contact with said plate member during radial movement of the said supporting arms.

4. In a spindle reel, in combination, a standard, a shaft journalled by said standard and having a portion extending forwardly of the standard, a circular plate member fixed to the extending portion of the shaft and adapted to rotate therewith, said plate member having radially extending slots formed therein, a supporting arm extending through each slot in a forward direction and disposed substantially parallel to the shaft, a sleeve mounted on the extending portion of the shaft for rotation with the shaft and for axial movement relative thereto, means operatively connecting the supporting arms with said sleeve, whereby axial adjustment of said sleeve effects radial movement of the supporting arms, and means carried by said sleeve and having threaded connection with the shaft for adjusting said sleeve axially of the shaft.

5. In a spindle reel, in combination, a standard, a shaft journalled by said standard and having a portion extending forwardly of the standard, a circular plate member fixed to the extending portion of the shaft and adapted to rotate therewith, said plate member having radially extending slots formed therein, a supporting arm extending through each slot in a forward direction and disposed substantially parallel to the shaft, a sleeve telescoping the forwardly extending portion of the shaft and having rotation therewith and axial movement relative thereto, toggle means operatively connecting the supporting arms with said sleeve, whereby axial adjustment of the sleeve effects radial movement of the supporting arms, and means for adjusting the sleeve in an axial direction including a stud rotatably carried by the sleeve and having threaded connection with the shaft.

6. In a spindle reel of the centering type, a rotatable shaft having means journalling the same at one end, a sleeve mounted on the other end of the shaft for rotation with the shaft and for axial movement relative thereto, a circular plate member fixed to the shaft and located between the sleeve and said journalling means, said plate member having a plurality of radial slots formed therein, a supporting arm extending through each slot forwardly of the shaft and disposed substantially parallel thereto, rollers carried by each supporting arm on the respective sides of the plate member and adapted to have rolling contact on the plate member during radial movement of the arms, and toggle means operatively connecting the supporting arms with said sleeve, whereby axial adjustment of the sleeve will effect radial movement of the supporting arms.

7. In a spindle reel of the centering type, a rotatable shaft having means journalling the same at one end, a sleeve mounted on the other end of the shaft for rotation with the shaft and for axial movement relative thereto, a circular plate member fixed to the shaft and located between the sleeve and said journalling means, said plate member having a plurality of radial slots formed therein, a supporting arm extending through each slot forwardly of the shaft and disposed substantially parallel thereto, rollers carried by each supporting arm on the respective sides of the plate member and adapted to have rolling contact on the plate member during radial movement of the arms, and means operatively connecting the supporting arms with said sleeve including spaced members pivotally connecting at one end with the sleeve and at the other end with one of said arms, whereby axial adjustment of said sleeve will effect radial movement of the supporting arms.

8. In a spindle reel of the centering type, a rotatable shaft having means journalling the same at one end, a sleeve mounted on the other end of the shaft for rotation with the shaft and for axial movement relative thereto, a circular plate member fixed to the shaft and located between the sleeve and said journalling means, said plate member having a plurality of radial slots formed therein, a supporting arm extending through each slot forwardly of the shaft and disposed substantially parallel thereto, connections between each supporting arm and the sleeve whereby axial movement of the sleeve will cause said arms to move in a radial direction, and means threaded to the forward end of said shaft and rotatably connecting with the sleeve for axially adjusting said sleeve.

9. In a spindle reel, in combination, a standard, a housing provided by said standard at the upper end thereof, a shaft extending through said housing and projecting forwardly of the standard, said shaft having association with spaced roller bearings located within the housing whereby the shaft is rotatably journalled by the standard, said forwardly projecting portion of the shaft providing a reel for supporting a coil of ma-

terial including radially movable supporting arms, and means located at the forward end of the shaft for effecting movement of the arms.

10. In a spindle reel, in combination, a standard, a housing provided by said standard at the upper end thereof, a shaft extending through said housing and projecting forwardly of the standard, said shaft having association with spaced roller bearings located within the housing whereby the shaft is rotatably journalled by the standard, said forwardly projecting end of the shaft providing a reel for supporting a coil of material including a plate member fixed to the shaft for rotation therewith, a plurality of supporting arms disposed parallel to the shaft and extending into radial slots formed in the plate member whereby said arms are guided for movement in a radial direction, and axially movable means having telescoping relation with the shaft and operatively connecting with said arms for moving the arms in a radial direction upon axial movement of said means.

FREDERICK M. LITTELL.