DEVICE FOR HANDLING REELS

Charles W. Ruth, Baltimore, Md., assignor to
Western Electric Company, Incorporated, New
York, N. Y., a corporation of New York
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This invention relates to devices for handling reels, and more particularly to devices for removing heavy reels from driving rolls.

In the process of manufacturing lead sheathed communications cables, a reel may be supported upon a pair of power driven rolls which rotate the reel to wind a length of cable thereon. A typical reel may have a diameter of as much as 7 feet and it may weigh as much as 6 tons when fully loaded. Due to the large size and the great weight of such reels, it is necessary to employ special devices to assist in removing the loaded reels from the driving rolls.

An object of this invention is to provide new and improved devices for handling reels.

Another object of the invention is to provide a new and improved device for removing heavy reels from driving rolls.

A device illustrating certain features of the invention may include an arcuate wedge floating on a driving roll supporting and rotating the reel, and means for selectively connecting the roll to the wedge whereby the wedge is advanced and inserted between the roll and the reel to lift the reel therefrom.

A complete understanding of the invention may be obtained from the following detailed description of apparatus forming a specific embodiment thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a side elevation of a device embodying the invention with a reel resting thereon;

Fig. 2 is an enlarged top plan view of the device without the reel;

Fig. 3 is a vertical section taken along line 3-3 of Fig. 1;

Fig. 4 is a view similar to Fig. 2 with the same parts shown in different operating positions;

Fig. 5 is a vertical section taken along line 5-5 of Fig. 3, and

Fig. 6 is a view similar to Fig. 5 with the parts in positions corresponding to those shown in Fig. 4.

Referring to Fig. 1, the axis of a reel 10 having circular rims 12-12 at opposite ends thereof is disposed horizontally while the reel is being rotated to wind a lead sheathed communications cable 14 thereon. The reel 10 rests upon its rims 12-12 while it is supported and rotated by a pair of hollow, cylindrical driving rolls 16 and 18. As indicated by the arrows in Fig. 3, the rolls 16 and 18 are driven in a counterclockwise direction, whereby the reel 10 resting thereon is driven in a clockwise direction. The axis of the reel is parallel to the axes of the rolls, and the rolls are suitably spaced to support the reel. A pair of stationary shafts 20 and 22 extend axially through the rolls 16 and 18, respectively, and are provided near their ends with suitable bearings, of which a bearing 23 is shown, on which the rolls rotate. The rolls 16 and 18 are mounted within a pit 24 formed in a concrete base 25 of a floor 26.

In many instances it is satisfactory to have the tops of both rolls located at the floor level, so that operators may roll an empty reel across the floor and push it directly onto the rolls. However, when the driving power of the rolls is used to assist in pulling the cable through a processing machine, such as a lead press, it is desirable to have the rolls permanently tilted to prevent the tension on the cable from pulling the reel off the rolls. Of course, this danger does not exist after the cable has been completely wound on the reel, and it is then that devices embodying the invention are necessary to remove the loaded reel from the rolls. The tilted arrangement of the rolls 16 and 18 is best shown in Figs. 3 and 4. It should be observed that the top of the roll 16 is mounted at the same level as that of the floor 26, while the roll 18 protrudes slightly above the level of the floor.

The rolls 16 and 18 are positively driven by a motor 30 having a drive shaft 32 at the outer end of which a gear 34 is secured. A gear 36 mounted at the right-hand end of the roll 16, as seen in Fig. 2, engages the gear 34, and a similar gear 38 mounted at the adjacent end of the roll 18 is driven by means of an intermediate gear 40 which engages both the gears 36 and 38. This gear train causes the rolls 16 and 18 to be rotated at the same speed and in the same direction.

The shafts 20 and 22 are secured rigidly to a frame 42 mounted within the pit 24. The extremities of the shafts 20 and 22 are tapered, as may be observed in the case of one end of the shaft 22 shown in Figs. 4 and 6, wherein a tapered end 43 of the shaft 22 is positioned within a similarly tapered seat 44 formed in the frame 42. The tapering of the ends of the shafts prevents them from moving axially while the rolls are rotating, so that the gears, such as the gear 36 on the roll 16, will at all times adequately clear the frame 42. The shafts are retained within their seats in the frame 42 by means of a plurality of nuts, of which a nut 46 is shown, secured to the extreme ends of the shaft 22.

As shown in Fig. 2, the gears 34, 36, 38 and 40 are intermeshed at the same side of the frame...
42 at which the motor 30 is mounted. At the opposite side of the frame 42, a gear 43 secured to the roll 16 is operatively connected to a gear 55 mounted on the roll 18 by means of an intermediate gear 52. The motive power needed to rotate the loaded cable reel is so great that it is preferred to locate meshed driving gears at both ends of the rolls in this fashion. The opposite ends of the rolls 18 and 16 are provided with peripheral flanges 53—55 located adjacent to the gears on the sides thereof away from the frame 42. The flanges 53—55 protrude radially further than the gears 36, 38, 40 and 50, thereby eliminating any possibility that the reel 10 may slip sideways beyond the driving surfaces of the rolls and land on the gears. Furthermore, the flanges 53—55 keep the reel 10 from straying undesirably far from the center of the rolls 16 and 18.

In accordance with the invention, the reel 10 when fully loaded may be dislodged from the rolls 16 and 18 by elevating the portion of the reel that rests upon the roll 18, to erect the reel and shove it off on to the floor 28. In order to achieve such elevation, the roll 18 is engaged by a pair of arcuate wedges 54—55 shaped to conform to the peripheral surface of the roll, and which preferably extend across substantially the entire length of the roll. The arcuate wedges 54—55 are interlocked in sliding contact with the roll 18, and they engage this roll by extending around somewhat more than half of its circumference. Under ordinary conditions, such as when the cable 14 is being wound upon the reel 10, the wedges 54—55 do not rotate with the roll 18. Instead, these wedges float freely on the roll 18 and hang near the lower portion of the roll with their tapered ends 55—55 pointing upwardly, as is best shown in Fig. 3.

A connecting rod 56 which extends the entire length of the roll 18, and which retains the arcuate wedges 54—55 in sliding contact with this roll and partially encircling it. At each of its ends, one of the arcuate wedges 54—55 is provided with fingers 59—59 which extend a matching tongue 60 formed integrally of the other one of the wedges. The connecting rod 56 extends entirely through the fingers 59—59 and the tongue 60, and it secures these members together by means of nuts, of which a nut 62 (Figs. 5 and 6) is shown, secured at opposite ends of the connecting rod. The fingers 59—59 and the tongue 60 are provided with abutting straight shoulders 63—63 (Figs. 3 and 4) which prevent the wedges 54—55 from hinging on the connecting rod 56.

The roll 18 is provided with a radial bore 64 in which a plunger 65 may reciprocate. Normally, the plunger 65 does not protrude beyond the outer periphery of the roll 16, and it is constantly urged inwardly into contact with a sleeve 66 surrounding the shaft 22 by means of a spring 70 which surrounds the plunger 66. The spring 70 bears against the inner periphery of the roll 18 and extends to a fixed collar 72 secured to the plunger 65 near the end thereof that contacts the sleeve 66. The mounting of the plunger 66 necessarily causes it to rotate with the roll 18. The sleeve 66 is in sliding contact with the shaft 22 and is mounted so that it can reciprocate longitudinally thereof.

A spring 74 constantly urges the sleeve 66 to the right, as viewed in Figs. 5 and 6, towards a collar 76 affixed to the shaft 22. The collar 76 functions as a stop which limits further movement of the sleeve 66 in this direction. One end of the spring 74 bears against a flange 78 secured circumferentially of the sleeve 66, and the other end of the spring 74 bears against an inwardly protruding flange 80 formed integrally of the roll 18.

A lever 82 (Fig. 1) may be manually actuated to pull the sleeve 66 to the left, as viewed in Figs. 5 and 6, in opposition to the action of the spring 74. The lever 82 is generally vertically disposed and it is pivotally mounted at an intermediate point designated 84 located at the level of the floor 28. The upper end of the lever 82 is conveniently accessible to an operator standing on the floor 28 near the reel 10. The opposite end of the lever 82 extends down into the pit 24 and is pivotally connected to one end of a rod 86 which extends axially through the adjacent end of the shaft 22. The other end of the rod 86 is provided with a plurality of radial arms 88—88 which protrude into spaced apertures 90—90 formed in the periphery of the sleeve 66. The rod 86 is free to reciprocate longitudinally of the shaft 22 when the lever 82 is actuated, and in doing so, the rod causes the arms 88—88 to reciprocate within recess 92 formed in the interior of the shaft 22.

The reciprocatory motion of the sleeve 66 is translated into a corresponding reciprocatory motion of the plunger 65 by means of an arcuate cam 94 integrally formed on the outer periphery of this sleeve. The cam 94 presents to the plunger 66 a bearing surface that is concentric with the periphery of the sleeve 66 and extends continuously around somewhat more than half of the circumference of the sleeve while protruding above it a uniform height. The beginning and the end of this bearing surface are located at beveled surfaces 96—96 of the cam 94. The beveled surfaces 96—96 slope gradually from the bearing surface of the cam 94 to the portion of the surface of the sleeve 66 exposed between these beveled surfaces.

When the motive power of the rolls 16 and 18 is being used to wind the cable 14 onto the reel 10, the elements of the apparatus assume the positions shown in Figs. 3 and 5. It should be observed that the cam 94 has the right of the plunger 65, so that the plunger normally does not reciprocate as it is swept around the sleeve 66 by the roll 18. However, when the lever 82 has been actuated to move the sleeve 66 to the position shown in Figs. 4 and 6, the plunger 65 repeatedly rides from the surface of the sleeve 66 up over one of the beveled surfaces 98—98 onto the bearing surface of the cam 94, then the plunger travels around the cam and down over the other one of the beveled surfaces 98—98 back onto the surface of the sleeve 66. In this manner, the plunger 65 is caused to reciprocate once for each revolution of the roll 18 when the cam 94 on the sleeve 66 is in the position shown in Figs. 4 and 6. This condition continues only so long as an operator is actuating the lever 82, since at other times the spring 75 restores the sleeve 66 to its normal position, in which position the cam 94 does not contact the plunger 66, as is shown in Figs. 3 and 5.

The instant the plunger 66 encounters one of the beveled surfaces 96—96 and begins to ride up onto the bearing surface of the cam 94, the plunger 65 is thrust radially outward through the bore 64 in the rotating roll 18. As the roll 18 continues to rotate and the plunger 66 rides further up on this beveled surface, the plunger 66 protrudes gradually beyond the outer periph-
ery of the roll 18 and enters a tapered recess 88 formed in one of the arcuate wedges 54—54. The tapered recess 88 is designed to accommodate the plunger 66 as the plunger is thrust outward increasing further until the plunger reaches the end of this recess, whereupon the plunger 66 will pick up the arcuate wedges 54—54 and begin to carry them around with the rotating roll 10. As the arcuate wedges 54—54 are advanced from the position shown in Fig. 3 to the position shown in Fig. 4, they are inserted between the roll 10 and the reel 10, and then they increase the tilt of the reel 10 by elevating the portion of its rims 12—12 that had been resting upon the roll 10. The size of the wedges 54—54 is determined by the size of the reel to be handled. The wedging action should desirably be sufficient to shift the center of gravity of the reel 10 to the left of the center of the roll 10, as seen in Fig. 4, so that the reel will be ejected from the rolls and shoved off onto the floor 29 by the device itself, without further assistance from the operator.

A spring 109 tends to return the arcuate wedges 54—54 to their original position, as illustrated in Fig. 3. One end of the spring 109 is secured to one of the wedges, and the other end of this spring is secured to a bracket 107 mounted in the center of the bottom of the pit 54. A portion of the spring 109 conveniently lies within a pair of communicating grooves, of which a groove 103 is shown in Figs. 5 and 6, formed in the outer peripheries of the arcuate wedges 54—54. The return motion of the wedges 54—54 occurs the moment the plunger 66 rides off the end of the bearing surface of the cam 94. At this moment, the spring 109 functions to retract the plunger 66 out of the tapered recess 88, thereby releasing the arcuate wedges 54—54 so that the spring 109 may pull them clockwise back to the position illustrated in Fig. 3.

The plunger 66 cannot be cammed into engagement with the tapered recess 88 formed in the arcuate wedges 54—54 unless the plunger is passing through a predetermined portion of its path of revolution corresponding to the open space between the beveled surfaces 94—96 of the cam 94.

Operation

The rims 12—12 of the reel 10 are supported by the rolls 16 and 18 while the motor 39 drives these rolls at the same speed and in the same direction to wind the lead sheathed cable 14 onto the reel. After the reel 10 has been fully loaded, the motor 39 is kept in operation while the lever 82 is being actuated to disengage the reel from the rolls 16 and 18. The upper portion of the lever 82 is grasped by an operator and pushed to the right, as viewed in Fig. 1. The arms 38—38 (Figs. 5 and 6) secured to the rod 66, which is pivotally connected to the lower end of the lever 82, are thereby pulled to the left carrying with them the sleeve 66 on the stationary shaft 32.

The actuation of the lever 82 is in opposition to the action of the spring 74, which constantly urges the sleeve 66 toward its normal position, as viewed in Figs. 3 and 5. The flat face 166 of the arcuate cam 94 integrally mounted on the sleeve 66 makes it impossible for this sleeve to move to the left to the position illustrated in Figs. 4 and 6, until the rotation of the reel 10 has carried the plunger 66 past the flat face 166. Thus, if the operator should happen to push the lever 82 while the plunger 66 is rotating past the flat face 166 of the cam 94, the device will not respond to his efforts until the plunger has rotated with the roll 18 around to the open space between the beveled surfaces 94—96 of the cam 94. Then the sleeve 66 is free to slide from the position shown in Fig. 5 to the position shown in Fig. 6. Continued rotation of the roll 18 causes the plunger 66 to encounter one of the beveled surfaces 94—96 and ride up over it onto the bearing surface of the cam 94.

As the rotation of the roll 18 sweeps the plunger 66 up onto the bearing surface of the cam 94, the plunger is moved radially outward through the bore 94 in the roll 18 in opposition to the action of the spring 74. The plunger 66 protrudes gradually beyond the outer periphery of the roll 18 and enters the tapered recess 88 formed in one of the arcuate wedges 54—54.

These wedges float in sliding contact with the roll 18, and they normally hang in the position shown in Fig. 3.

By the time the roll 18 has carried the plunger 66 to the larger end of the tapered recess 88, the cam 94 has thrust the plunger out to the limit of its radial travel. The plunger 66 then catches the arcuate wedges 54—54 and pulls them around from the position shown in Fig. 3 to the position shown in Fig. 4. In executing this motion, the wedges 54—54 are carried and inserted between the roll 10 and the reel 10. The wedges then lift and increase the tilt of the reel 10 by elevating the portion of its rims 12—12 that had been resting on the roll 10. The resultant wedging action is sufficient to eject and to shove the roll off onto the floor 29.

So long as the lever 82 remains pushed to the right, as viewed in Fig. 1, the plunger 66 is swept counterclockwise, as viewed in Figs. 3 and 4, around the cam 94 once during each revolution of the roll 18. Each time the plunger 66 reaches the end of the cam 94, the spring 74 retracts the plunger, pulling it back out of the recess 88 to a position in which it does not protrude beyond the outer periphery of the roll 18. This action releases the arcuate wedges 54—54, thereby permitting the spring 109 to pull the wedges back around to their normal position, shown in Fig. 3.

It is to be observed that the device cannot be actuated unless the plunger 66 is in a predetermined portion of its path of revolution with the roll 18. Thus, when the arcuate wedges 54—54 are in their normal position hanging near the bottom of the roll 18, and at the same time the plunger 10 is adjacent to the tapered recess 88, actuation of the lever 82 is effective to cause the plunger to pick up the wedges and tilt the reel 10 immediately. However, when the plunger 66 is at some other portion of its path of revolution, the lever 82 does not yield to the efforts of the operator until the roll 18 has carried the plunger completely past the flat face 166 of the cam 94, so that the sleeve 66 can be moved to locate the plunger between the beveled surfaces 94—96 of the cam 94.

Devices embodying the invention offer manifold advantages in readily and conveniently disassociating heavy reels and other similar objects from driving rolls with the application of
A device for removing a reel from a driving roll, supporting and rotating the reel, which comprises an arcuate wedge floating on the roll, and having a bearing surface designed to actuate the plunger only in a predetermined portion of the path of rotation of said roll, spring means for retracting the plunger, and means for moving the cam along the shaft to a position in which its bearing surface actuates the plunger to engage the wedge and thereby advance and insert the wedge between the reel and said roll to lift and eject the reel from the rolls.

A device for removing a reel from a plurality of hollow, cylindrical driving rolls on which the reel is supported and rotated, which comprises an arcuate wedge floating in sliding contact with and partially encircling one of the rolls, a plunger reciprocable in a radial bore formed in the periphery of said roll, a stationary shaft extending axially through said roll, an arcuate cam movable longitudinally of the shaft for pushing the plunger radially outward into engagement with the wedge, said cam having a bearing surface designed to actuate the plunger only in a predetermined portion of the path of rotation of said roll, spring means for retracting the plunger, and means for moving the cam along the shaft to a position in which its bearing surface actuates the plunger to engage the wedge and thereby advance and insert the wedge between the reel and said roll to lift and eject the reel from the rolls.

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said cam being concentric with and partially encircling the shaft so as to provide a bearing surface for actuating the plunger only in a predetermined portion of the path of rotation of said roll, a spring associated with the plunger for urging it to a position in which the plunger does not protrude beyond the periphery of the roll, one of said wedges being provided with a recess designed to receive the plunger when the plunger protrudes beyond the peripheral surface of said roll, a rod movable longitudinally of the shaft for sliding the sleeve to a position in which the bearing surface of the cam pushes the plunger into the recess to engage the wedges and thereby advance and insert them between the reel and said roll to lift and eject the reel from the rolls, means for urging the sleeve to a position in which the cam does not actuate the plunger, and means for restoring the wedges to their normal position after the reel has been ejected.

10. A device for handling reels, which comprises a pair of hollow, cylindrical rolls mounted rotatably and spaced to support a reel, a pair of stationary shafts one for each roll extending axially through the rolls, means for driving the rolls at the same speed and in the same direction to rotate such a reel, a pair of arcuate wedges floating in sliding contact with and shaped to conform to the peripheral surface of one of the rolls, each of said wedges having one end tapered and the opposite end shaped to interlock with the other wedge, said wedges extending across substantially the entire length of and around somewhat more than half of the circumference of said roll and normally hanging near the lower portion of said roll with their tapered ends pointing upwardly, a plunger reciprocable in a radial bore formed in the periphery of said roll, a sleeve slidable longitudinally of the shaft extending through said roll, an arcuate cam secured to and partially encircling the sleeve, said cam having tapered ends leading to a bearing surface across which the plunger rides during the rotation of said roll when the cam has been moved along said shaft to an actuating position and having a flat face for preventing movement of the cam to its actuating position unless the plunger is in a predetermined portion of the path of rotation of said roll, a spring associated with the plunger for urging it to a position in which the plunger does not protrude beyond the periphery of the roll, one of said wedges being provided with a recess designed to receive the plunger when the plunger protrudes beyond the peripheral surface of said roll, a rod movable longitudinally of the shaft and connected to the sleeve for sliding the cam to its actuating position to push the plunger into the recess so as to engage the wedges and thereby advance and insert them between the reel and said roll to lift and eject the reel from the rolls, means for urging the cam away from its actuating position, and means for restoring the wedges to their normal position after the reel has been ejected.

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