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[54] **SELF-CENTERING REEL SUPPORT**

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[52] **U.S. Cl.** **242/68.7**, 242/78.6

[51] **Int. Cl.** **B65h 19/02**

[58] **Field of Search** 242/68.7, 78.7, 85, 242/129, 76, 78.6, 66, 58.6, 79; 226/192

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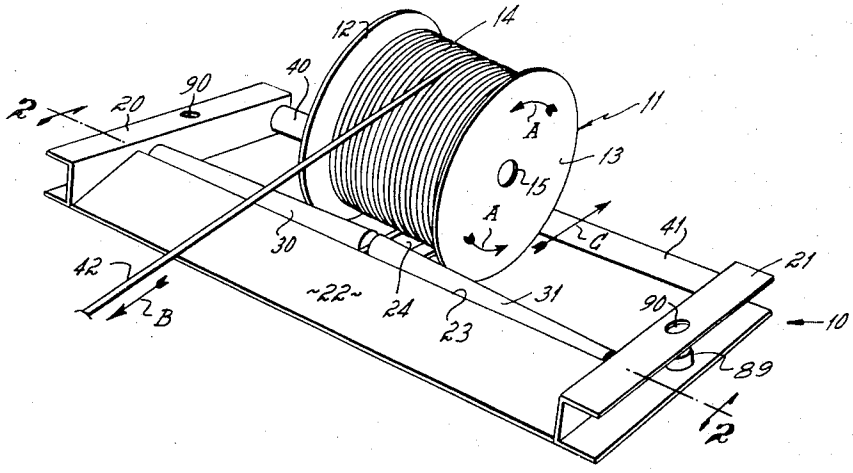
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Assistant Examiner—Edward J. McCarthy
Attorney—James S. Hight, David S. Stallard et al.

[57] **ABSTRACT**

A self-centering reel support has at least a front roller and a rear roller supported between appropriate frame members. The front roller has integral surfaces positioned so as to cooperate with the back roller to center a supported reel against excessive axial translation when strip material is paid off the reel. The front roller may comprise a set of two rollers which may be cylindrical or tapered and which are positioned, with respect to the back roller, so as to center a supported reel. A typical reel includes a core supporting a strip material wound thereon and two parallel coaxial rims, each having a circular periphery.

16 Claims, 5 Drawing Figures



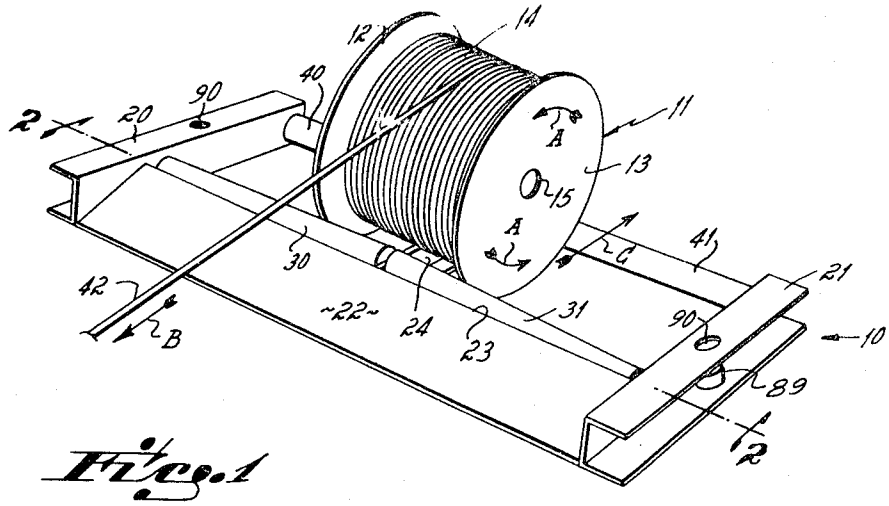


Fig. 1

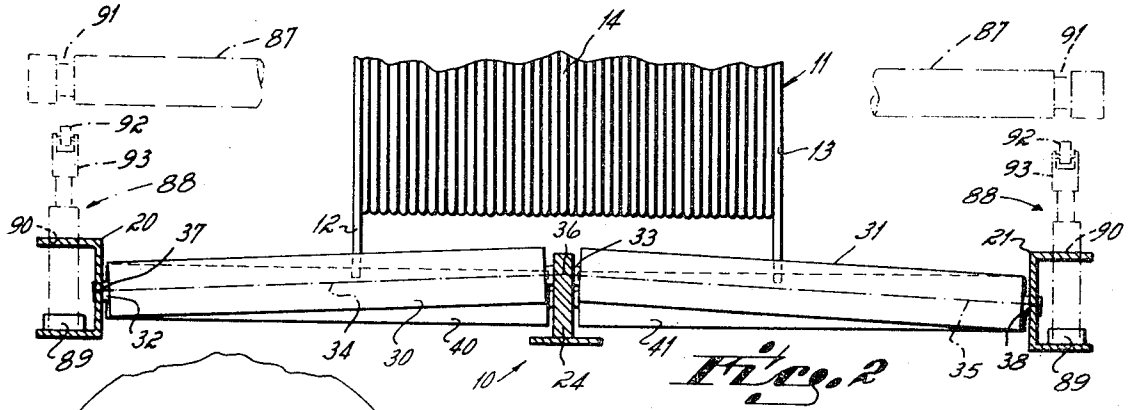


Fig. 2

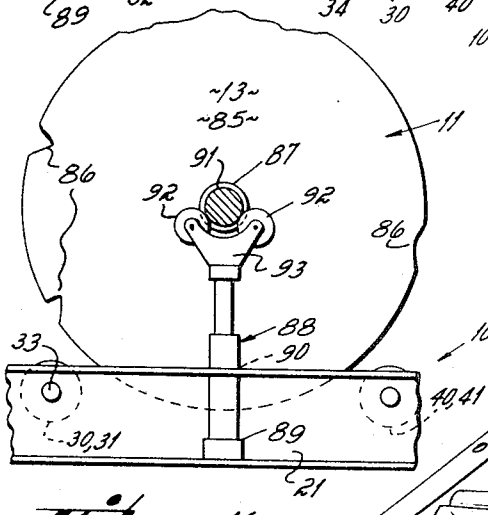


Fig. 3

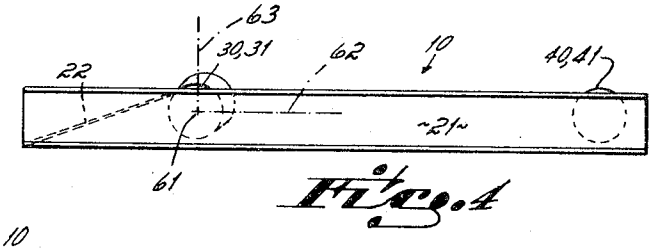


Fig. 4

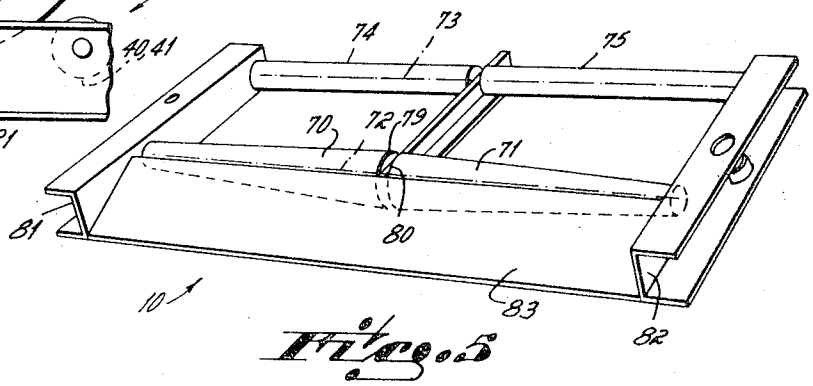


Fig. 5

SELF-CENTERING REEL SUPPORT

This invention relates to reel supports. More particularly, it relates to reel supports adapted to cradle a reel during payout of strip material therefrom, wherein the reel is of the type including two parallel rims, each having a circular periphery.

It is a common practice to store strip material on reels or spools. Such reels generally comprise a core and a rim fixed to each side of the core. The rims are parallel to and coaxial with one another and each has a circular outer periphery. The strip material is coiled or wound about the core of such a reel between its rims for bulk storage or shipping. The term strip material includes such articles as wire, cable, cord, strands, flat strips of various material and the like. The strip material is usually wound about the reel's core, so that it extends radially outward toward the rim's periphery but not beyond.

One particular use for such reels is in electrical supply houses, for instance, where electrical wire or cable is transmitted in bulk to the facility on such reels and is then sold in various lengths to electrical contractors and other customers. In most cases, the length of wire or cable desired is less than the total length carried on the reel and it is necessary to remove only a portion of it from the reel. In a usual transaction, a reel bearing the specific wire or cable required must be removed from storage at the supply house. The desired length of wire or cable is removed therefrom and is cut off, the reel being thereafter returned to storage.

Various devices have been proposed for rotatably supporting a reel to facilitate the payout of a length of strip material originally coiled about or wound on the reel's core. One of these devices includes roller apparatus which supports a reel's rims from the underside (no other support being provided for the reel) so that the reel can rotate simply by pulling the strip material's lead end from the reel. This allows the strip material to be easily and simply paid out from the reel to the desired length.

Specifically, such a reel support includes two parallel, spaced apart, side frame members, and a central support that is located between and parallel to the channel frame members. Two parallel sets of rollers are disposed between the frame members. A rear set comprises two horizontally disposed coaxial rollers, each with an outside end adjustably supported for horizontal movement in respective frame members and each with an inside end, adjustably supported for horizontal movement in the central support. These rollers are horizontally adjustable from a point near the ends of the frame members and central support to a forward point in order that the device can accommodate reels of various sizes. A front set of rollers is provided toward the other end of the frame members and comprises two horizontally disposed coaxial rollers, each with an outside end supported in respective channel frame members, and each with an inside end supported by the central support. Both the two rollers of the front set and the two rollers of the rear set are mounted on respective front and rear longitudinally extending parallel axles or shafts, two rollers being disposed on each shaft. The rollers are mounted on the shafts by ball bearings or other bearing means so they are free to rotate. In addition, a loading ramp is connected between the frame members and is inclined from a bottom forward portion

of the frame members to a point near the top of the forward set of rollers.

In use, a reel is rolled up the ramp and onto both the front and rear rollers where it is free to rotate as material is paid out therefrom. But there is a major problem that occurs during use of this device. The reel tends to translate axially, or to one side of the device or the other, as it rotates, alternately causing one of the rims to bind against a side frame member. This, of course, makes it more difficult to remove material from the reel since the rim may bind against the frame member. To solve this problem, side rollers have been mounted on the side frame members in a position between the front and rear sets of rollers. These side rollers are disposed to engage the outside surface of a rim, when it moves axially toward the side frame member, and to provide a rolling contact with the rim rather than its usually binding effect against the side member. This does not entirely solve the problem, however, as the reel rims typically have rough outside surfaces which tend to catch on the usually small side rollers. Also, the reel translates excessively back and forth across the supporting rollers, banging first into one side frame member or roller and then into the other side frame member or roller. Such operation is noisy and annoying and tends to wear the rims.

It is thus one object of my invention to provide a self-centering reel support including rollers disposed so as to continually center a supported reel against excessive axial translation during unwinding of material on the reel.

A further object of my invention is to provide a relatively portable, economical and easily manufactured self-centering reel support provided with rollers disposed so as to continually center a supported reel against excessive axial translation, during unwinding of material on the reel.

A further object of my invention is to provide means for securely supporting a reel for rotation and unwinding of the material thereon in the event the normally smooth periphery of the reel rims is damaged.

A preferred embodiment of my invention includes two side and one central parallel frame members, and two sets of reel supporting rollers connected between the frame members. A front set of two cylindrical rollers has axes located in a vertical plane. The axes converge centrally of two side frame members and upwardly within the vertical plane in order to present roller surface means for cooperating with a set of rear rollers to center a reel on the support. Due to the positioning of the axes, the upper surfaces of the two rollers are inclined respectively downwardly from the center of the support toward the side frame members. The additional or rear set of rollers includes two horizontal coaxial rolls mounted between the respective side and center frame members, the axis of the two rear horizontal rollers lies in a vertical plane parallel to the vertical plane of the axes of the two front rollers. The rear and front sets of rollers are supported with respect to each other at a distance apart, which is less than the diameter of a reel placed thereon, so as to support the rims of the reel, one normally on each side of the convergence point of the axes of the two front rollers. When wire, cable or the like is pulled from the supported reel so that the top of the reel revolves downwardly toward the inclined rollers, the reel centers itself, with respect

to the side members, over the convergence point of the axes of the inclined rollers.

The present invention thus has the advantage of continually centering a reel thereon by virtue of the relationship between the rollers and thereby eliminates excessive axial translation of the reel and binding engagement of the reel with the side frame members. The present invention has the further advantage of providing means for lifting and rotationally supporting a reel, when its rims are not compatible with normal roller support, the means including an arbor providing a very stable support with a relatively large base. In addition, the invention provides apparatus for centering a reel thereon without regard to variations in the weight of the reel within the support's structural capacity.

These and other objects and advantages will become readily apparent to one of ordinary skill in the art from the following detailed description of a preferred embodiment and from the drawings, in which:

FIG. 1 is a perspective view of the reel support including a reel shown in a centered position,

FIG. 2 is a view taken along lines 2—2 of FIG. 1 showing the relationship of the reel to the front inclined rollers and to the rear horizontal rollers,

FIG. 3 is a side view of the reel support showing the relationship of the jacks, the arbor and the arbor supporting jack heads when used to axially support a reel with irregular rim peripheries,

FIG. 4 is a diagrammatic view illustrating the possible locations of the convergence point of the axes of the forward rollers, and

FIG. 5 shows an alternate embodiment of the invention.

Referring particularly to FIG. 1 of the drawings, the reel support of the invention is shown generally at **10.** A reel or spool indicated at **11** is shown located on the support **10.** The reel includes two circular parallel rims, **12** and **13,** of equal diameter, connected together by a coaxial core (not shown) of lesser diameter than the rims and on which is wound a cable, wire or other similar material **14.** The rims **12** and **13** and the core all have an axial opening or bore **15** through which a reel supporting arbor may be inserted as will be described.

The reel support **10** comprises a frame which includes parallel side frame members **20** and **21.** These members may be structural channels and have connected between them an inclined loading ramp **22** as shown. The ramp **22** extends between the side frame members **20** and **21** and is inclined from a bottom portion of the side frame members upwardly and rearwardly so that its rear edge **23** is at a height approximately equal to the height of a front set of rollers as will be described. A central frame member **24** extends toward the rear of the support **10** centrally of the members **20** and **21** and parallel to them.

For supporting a reel, the reel support **10** includes a front and a rear set of rollers. The front set of rollers includes two rollers **30** and **31** having external cylindrical reel supporting surfaces. As shown in FIG. **2,** the cylindrical rollers **30** and **31** are rotationally mounted on respective shafts **32** and **33** by bearings. The shafts have ends extending beyond the ends of the rollers and are mounted in respective frame members **20, 21** and **23.** The shafts are mounted so that the rollers **30** and **31** are inclined from the central portion of the support **10** downwardly toward the side frame members as shown in FIG. **2.** The longitudinal roller axes **34** and **35,** respectively, lie in the same vertical plane and converge or intersect upwardly at a point **36** in the central area of the support **10** between the side frame members. In addition, the axes coincide with frame members **20** and **21** at points of coincidence **37** and **38,** respectively. It can be noted that a line drawn through these two points is horizontal and is parallel to the axis of the rear set of rollers which will be described. As previously stated, the upper edge **23** of loading ramp **22** is connected between the side frame members at a height approximately equal to the height of the midpoints of the supporting surfaces of the front rollers **30** and **31.**

A rear set of rollers comprises two horizontally coaxially mounted rollers **40** and **41.** Roller **40** is mounted between side frame member **20** and central frame member **24** while roller **41** is mounted between central frame member **24** and side frame member **21.** These two rollers may be mounted on a common shaft. The axis of the rollers **40** and **41** is horizontal and lies in a vertical plane parallel to the vertical plane in which lie the axes of the two front rollers **30** and **31,** i.e. the axes of the front and rear sets of rollers would appear parallel as viewed in a top view of the reel support **10.** While one horizontal roller could be utilized in place of the pair described, I have found it more efficient to use two rollers since such construction compensates for any dissimilarity in the circumference of the two rims. Usually the rims differ to some degree in their circumferential length and the provision of the two rollers (front and rear) for each rim compensates for this difference since each roller is free to turn with respect to the others.

The amount of material placed on the reel is regulated so that the maximum diameter of the wound material does not exceed the diameter of the reel rims and there is some radial space between the rim and the outer surfaces of the material wound thereon. This accommodates any protrusion of the central inclined portion of the front rollers toward the reel core and inwardly of the rim's periphery.

As shown in FIG. **1,** a reel **11** is loaded onto the support **10** so that, as material **14** is pulled off the reel, the reel is rotated in the direction indicated by the arrows "A", so that the top of the reel is rotated toward the front set of inclined rollers. Material may be pulled from the reel in the forward direction noted by arrow "B" by pulling a portion **42** of the material from the top of the reel **11.** If it is desired to remove material **14** from the reel in the rearward direction, noted by arrow "C", the material is pulled from the bottom of the reel in the direction of arrow "C". In this manner, the reel is always rotated in the direction of arrows "A".

The proper loading of the reel **11** onto the support **10** such that the reel always rotates in the direction of arrow "A" during unwinding of material therefrom is necessary in order that the support continually center the reel on the rollers. In the normal mode of operation, where the top of the reel is rotated toward the front inclined rollers, the reel tends to center itself about the convergence point **36** of the axes **34, 35** of the two inclined rollers **30, 31** or rather between the side members **20, 21.** Should, however, the reel be loaded onto the support such that the top of the reel is rotated toward the rear horizontal rollers **40, 41,** the reel would not center on the support but rather would

axially translate so excessively as to engage one or the other of the side frame members **20, 21.**

It is to be noted that the front set of cylindrical rollers **30, 31** may be operably oriented in other positions within a particular area and with the same self-centering effect. While the principles controlling the centering phenomenon are not fully understood, the known extreme operable orientation with respect to that of the preferred embodiment is one in which the front set of rollers are positioned such that their axes lie in a general horizontal plane and converge to, or rather intersect at, a point within that plane and toward the axis of the rear set of rollers. In this orientation, the front rollers' axes coincide with the frame members such that a line drawn through the coincidence points is parallel to the horizontal axis of the rear horizontal roller, the points of coincidence being of equal elevation. In other words, the points of coincidence lie in a vertical plane which is parallel to the vertical plane in which lies the horizontal axis of the rear rollers. This orientation results in the same centering effect as that of the preferred embodiment.

For the purposes of defining the known range of cylindrical roller orientation within which the support will have a centering effect, the device is operable when the convergence or intersection point of the axes of the front set of rollers is positioned between the frame members at an elevation above or equal to that of the points of coincidence of the forward rollers' axes with the side support frames, and directly above or behind that point. While it is known that this range is operable for reels varying from about 2 feet in diameter to about 6 feet in diameter, the operable range for other size reels may be determined by experimentation.

FIG. **4** diagrammatically illustrates the operable region. The points of coincidence **37, 38** of the rollers' axes **34, 35** with the side support frames **20, 21** is designated at **61.** The convergence or intersection point of the rollers' axes is not illustrated, but it can be positioned in the area extending from point **61.** This area specifically is above and includes horizontal line **62,** and is behind and includes vertical line **63.** The area, of course, does not include the point **61.**

Other means could be utilized to accomplish the centering effect. For instance, the convergence or intersection point could be moved toward one frame member or the other, the respective points of coincidence being vertically adjusted so as to maintain the angle of inclination of each roller similar to that of the other with respect to the horizontal. If this were to be done and if the convergence or intersection point were to be positioned in the defined area but outside of the vertical plane, it becomes readily apparent that the points of coincidence would no longer be in a vertical plane, but rather would be located at positions differing in height and lateral displacement with respect to each other.

In an alternate embodiment, tapered rollers could be utilized to achieve the same self-centering effect. FIG. **5** illustrates this embodiment and includes a front set of tapered rollers **70** and **71.** These rollers are positioned on a horizontal axis **72** parallel to the rear horizontal axis **73** of rear horizontal rollers **74** and **75.** Each tapered roller **70, 71** has its respective large end **79** and **80** positioned centrally of the frame supports. The small ends of each roller are positioned outwardly of the center area of the support and toward the side frame members **81** and **82.** As in the preferred embodiment, the rollers are mounted for rotation between the side frame members **81** and **82,** and a ramp **83** is provided to facilitate loading of the support. A reel must be loaded and rotated as in the preferred embodiment, i.e. so that its top moves downwardly toward the tapered rollers, in order to achieve the self-centering effect.

Of course, if one front roller is to be used, a crowned roller, such as those known in the trade, could be provided on the horizontal axis.

For the purposes of description, it can be appreciated that whether cylindrical rollers are utilized or whether tapered rollers are utilized, the front rollers define top surface lines. The lines extend inwardly from respective outer ends of the front roller and, if extended, would converge or intersect at a point intermediate of and above the outer ends of the rollers when viewed from a perspective perpendicular to the common plane containing the axes of the front rollers.

For further purposes of description clarity, it can be appreciated from an elementary knowledge of solid geometry that whatever rollers are used, they present or define surfaces of revolution comprising, in the geometrical sense, elements located in the rollers' surfaces and extending generally along the roller's axis. It can be appreciated from the foregoing descriptions that the forward roller surfaces and elements are inclined both with respect to the surface of the rearward roller and with respect to a line drawn between the coincidence points of the axes of the front roller or rollers with the side frame members. Also, as can be appreciated, all of the elements engaging the rims of a reel, supported on the surface of revolution, are inclined from the ends of the roller toward its center portion and toward the reel.

For further description, it should be noted that the reel rims engage the surfaces of the front roller at respective engagement points. The engagement points in the front roller's surface nearer the roller's ends are closer to the described line drawn between the aforementioned coincidence points, than the engagement points in the front roller's surfaces located inwardly of the roller's ends, or rather, toward the front roller's central area.

In some instances, the periphery of the reel rims becomes chipped or otherwise damaged so that it is not suitable to support the rims on the reels. Such a damaged rim is shown at **85** in FIG. **3,** and has damaged portions as at **86,** for instance. In order to axially support such a reel for rotation when material is to be unwound therefrom, an axle or arbor **87** is provided. One such arbor is shown in phantom in FIG. **2.** The arbor is placed into the axial bore **15** through the reel and is supported at its ends to hold the reel rims above the usual roller supports.

The ends of the arbor are each engaged by jacks **88** which are operable to lift the arbor and reel above the rollers. The jacks **88** may be any type of suitable jack such as an hydraulic jack or such as a typical automobile jack. The jacks are securely held by the side frame members **20** and **21** within appropriate sockets **89** and extend through openings **90** in the top portions of the side members, thus in effect utilizing the whole reel support **10** as a stable base.

In order to provide for further stability, each end of the arbor **87** is circumferentially grooved as at **91.** The securing grooves cooperate with rollers **92** which are rotationally supported on yoke-shaped jack heads **93.**

FIG. 3 depicts the connection between the securing groove and the rollers at one end of the arbor as the reel is supported above the front and rear sets of rollers. While the arbor is thus free to rotate, the cooperation between the securing grooves and the rollers of the jack heads ties the top portions of the two jacks rigidly together. In addition, the arbor could be provided with surface means or attachments to keep a reel thereon in a relatively centered position with respect to the support.

The combination of the substantial base (the reel support) and the rigid connection between the top portions of the jacks provides a highly secure jack stand for supporting damaged reels and negates the necessity or providing two separate devices for maximum handling ability. Furthermore, and due to the relatively substantial base and rigid connection between the top portions of the jacks, the device is capable of handling relatively large and heavy reels which have irregular rim peripheries.

The invention thus provides apparatus for supporting and centering a material carrying reel against excessive axial translation. The apparatus may be used for reels varying in both size and weight, the decrease in the weight of the reel as material is unwound therefrom not affecting the self-centering operation of the reel supporting apparatus.

What I desire to claim and protect by Letters Patent is:

I claim:

1. A reel support adapted to cradle a reel during payout of strip material therefrom, said reel including two parallel rims each with a circular periphery, said support comprising:
at least one front roller,
at least one rear roller having a rear roller surface, said front and rear rollers being independently rotationally mounted with respect to each other; and
said front roller having surface means at least portions of which define roller surfaces inclined with respect to each other for cooperating with said rear roller to maintain said reel in a predetermined relatively centered position with respect to said front roller when said reel is cradled by said front and rear rollers as strip material is paid off from said reel.

2. A reel support as in claim 1 including:
two front rollers each having an axis of rotation, said axes being in a common plane, and wherein said surface means extend along both of said front rollers.

3. A reel support as in claim 2 wherein said front rollers each define a top surface line extending from the respective outer ends of said front rollers inwardly from said ends and which, if extended, would converge at a point intermediate and above the elevation of the outer ends of said front rollers when viewed from a perspective perpendicular to the common plane containing the axes of said front rollers.

4. A reel support as in claim 3 wherein the common plane of the front rollers' axes is vertical and wherein said rear roller's axis is horizontal.

5. A reel support as in claim 2 including two rear rollers each having an axis of rotation, said axes being coaxial.

6. A reel support as in claim 5 including:
side support means for supporting respective outer ends of said front and rear rollers; and
center support means for supporting respective inner ends of said front and rear rollers.

7. A reel support as in claim 3 wherein said front rollers are cylindrical.

8. A reel support as in claim 3 wherein said front rollers are tapered.

9. A reel supprt adapted to cradle a reel, said reel having two spaced rims, said support comprising
rear roller means,
front roller means having ends and a center portion and being spaced from said rear roller means, and
said front roller means presenting surfaces having elements engageable with said rims, all of said elements being inclined toward said reel from the ends of said front roller means toward its center portion.

10. A reel support adapted to cradle a reel during payout of strip material therefrom, said reel including two parallel rims each having a circular periphery, said support comprising,
side frame members,
at least one rear roller rotationally mounted between said side frame members,
at least one front roller mounted between said side frame members, said roller having a center portion and respective outer ends and being rotationally mounted about axes coinciding with said side frame members at respective coincidence points,
said front roller comprising roller surface means having points of engagement for engaging said rims, whereby points of engagement near said ends are closer to a straight line drawn through said coincidence points than points of engagement toward said center portion such that said front roller cooperates with said rear roller to maintain said reel in a predetermined relatively centered position with respect to said center portion when said reel is cradled by said front and rear rollers as strip material is paid off from said reel.

11. A reel support adapted to cradle a reel during payout of strip material therefrom, said reel including two parallel rims each having a circular periphery, said support comprising,
side frame members,
at least one rear roller rotationally mounted between said side frame members,
at least one front roller mounted between said side frame members, said roller having a central portion and respective outer ends and being rotationally mounted about axes coinciding with said side frame members at respective coincidence points,
said front roller comprising surfaces of revolution including elements inclined with respect to a straight line drawn through said coincidence points from said central portion toward said outer ends for cooperating with said rear roller to maintain said reel in a predetermined relatively centered position with respect to said central portion.

12. A reel support adapted to cradle a reel during payout of strip material therefrom, said reel including two parallel rims each with a circular periphery, said support comprising,
at least one rear roller,
at least one front roller having a central portion and respective outer ends,

said front roller comprising a roller surface and said front roller having a relatively large diameter in its central portion and a relatively small diameter at each end such that said roller surface tapers from said central portion toward said outer ends respectively to maintain said reel in a predetermined relatively centered position with respect to said front roller when said reel is cradled by said front and rear rollers as strip material is paid off from said reel.

13. A reel support adapted to cradle a reel during payout of strip material therefrom, said reel including two parallel rims each having a circular periphery, said support comprising,

side frame members,

at least one rear cylindrical, horizontal roller rotationally mounted between said frame members, said roller having an axis lying in a vertical plane, and

a pair of forward inclined cylindrical rollers also rotationally mounted between frame members of the support, each of said forward rollers having respective axes intersecting between said frame members,

said forward rollers cooperating with said rear rollers to center said reel with respect to said front rollers when said reel is cradled by said front and rear rollers as strip material is paid off from said reel.

14. A reel support adapted to cradle a reel during payout of strip material therefrom, said reel including two parallel rims each with a circular periphery, said support comprising

outer side frame members,

at least one rear roller rotationally mounted between said side members,

two front rollers rotationally mounted between said side frame members,

said two front rollers being tapered rollers each having an end of larger diameter and an end of smaller diameter, said respective ends of smaller diameter being positioned outwardly adjacent said side members and said ends of larger diameter being positioned inwardly of said ends of smaller diameter, and

said two front rollers defining surface means extending along said front rollers for cooperating with said rear roller to maintain said reel in a predetermined relatively centered position with respect to said front roller when said reel is cradled by said front and rear rollers as strip material is paid off from said reel.

15. A reel support as in claim **14** wherein said two front tapered rollers have a common horizontal axis, said rear roller has a horizontal axis, and said axes are parallel.

16. A reel support as in claim **15** including two rear rollers.

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