Sept. 4, 1951 A. O. JACKSON ET AL 2,566,801

WIRE UNWINDING REEL

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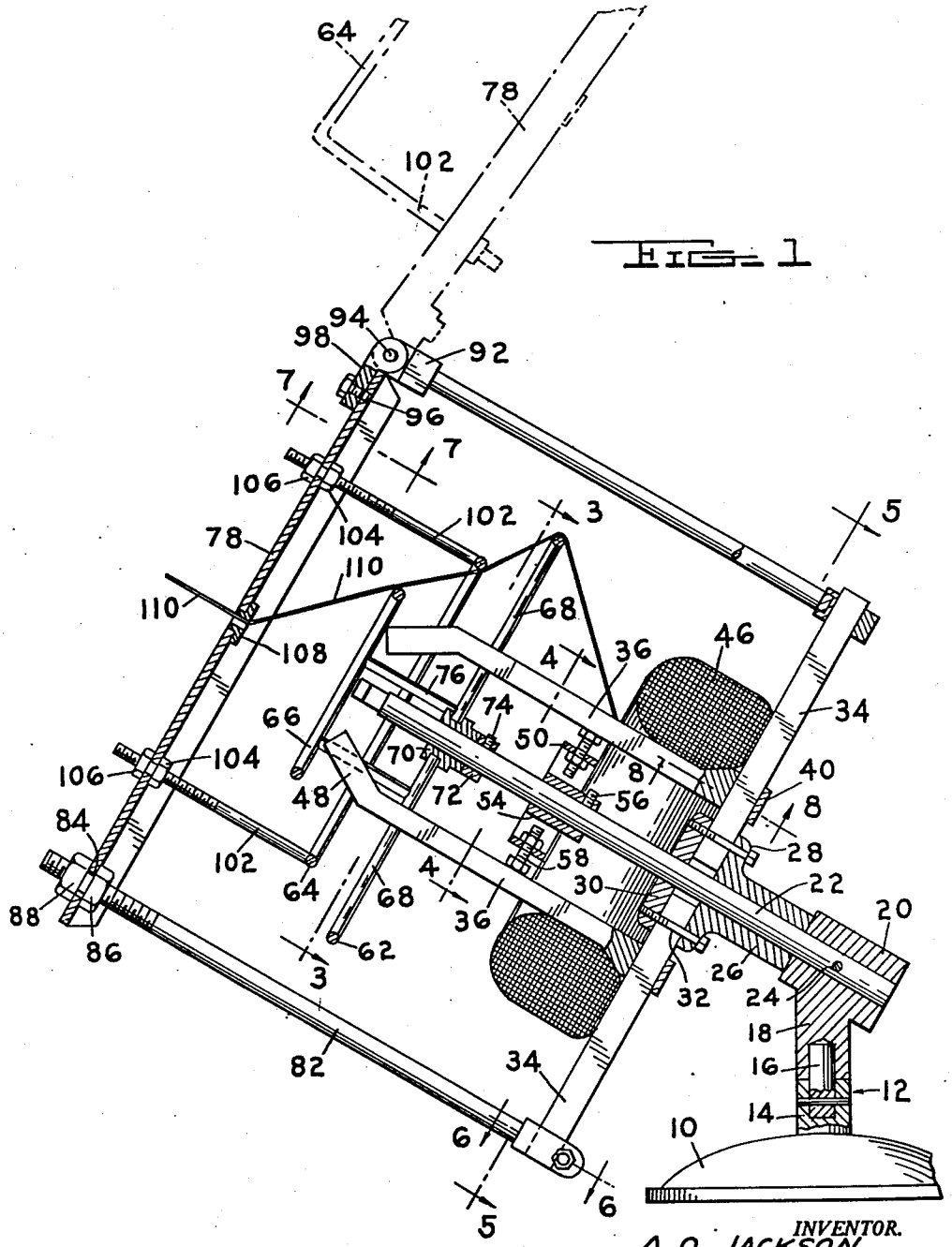


FIG. 1

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FIG. 2

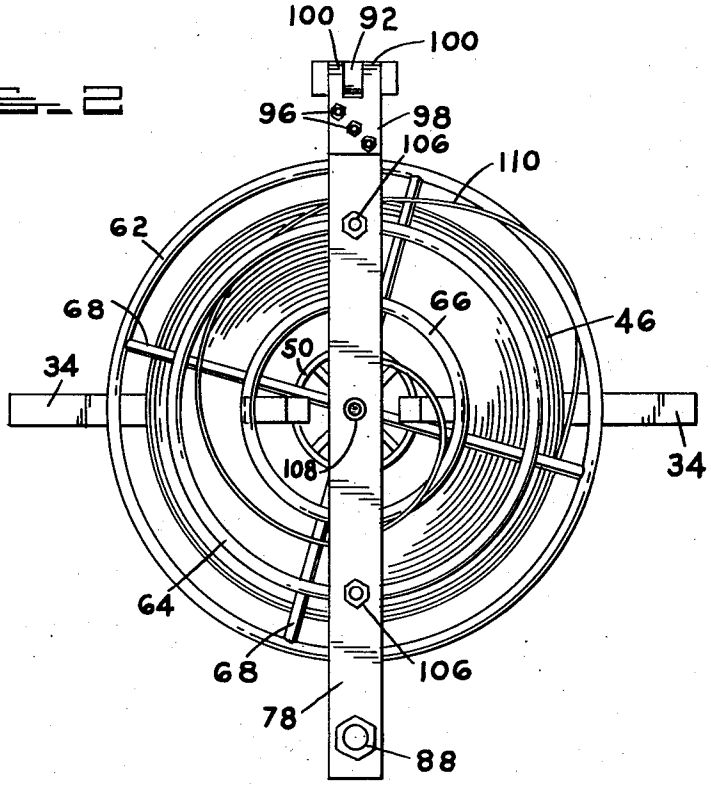
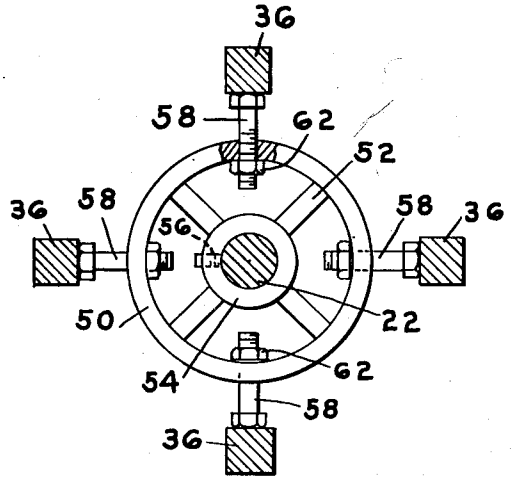


FIG. 4



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FIG. 3

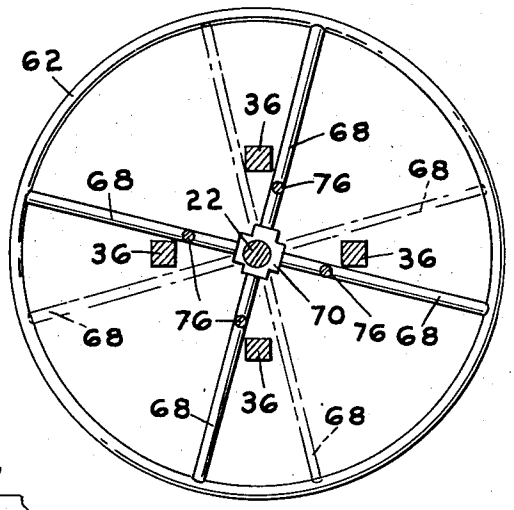


FIG. 5

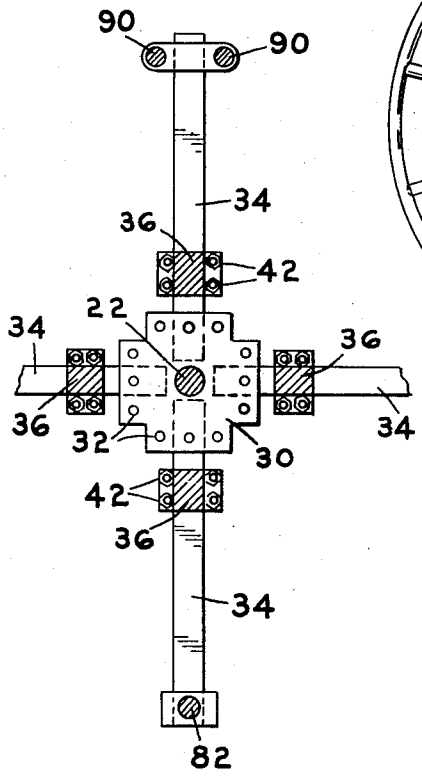


FIG. 7

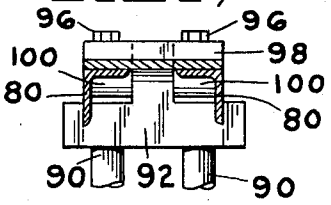


FIG. 8

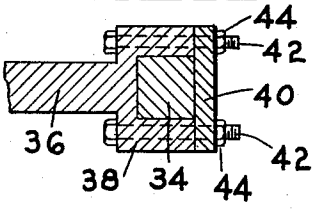
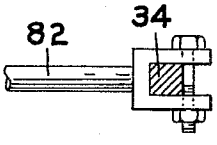


FIG. 6



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UNITED STATES PATENT OFFICE

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WIRE UNWINDING REEL

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Application September 3, 1948, Serial No. 47,724

6 Claims. (Cl. 242—128)

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This invention relates to wire unwinding or pay-off reels and particularly to a non-rotative reel structure from which the wire is drawn in an axial direction and fed to wire-processing and fabricating machines.

Heretofore, it has been the general practice to loosely mount a roll or coil of a continuous strand of wire upon a revolving reel from which the successive sections of wire were drawn off tangentially from the coil while the latter rotated. It has been necessary to apply retarding means to the revolving reel to slow its rotation in order to prevent the reel from revolving faster than the requirements of the machine to which it is fed. However, it has been found in commercial practice that there is a limit to the maximum speed at which the revolving reels could be operated, usually approximately three hundred feet per minute, otherwise a higher speed of the reel plus the variable tension placed on the wire caused the wire sections to unwind irregularly producing undesired loops and kinks which interfered with the feed of the wire into the fabricating machines.

An important object of this invention is to provide an improved wire unwinding or pay-off reel structure which unwinds the wire from a stationary coil or roll of wire at high rates of speed and which, although operated at high speed, eliminates any undesired looping or kinking of the wire during the feed thereof to the processing or fabricating machine. Another important object of the invention is to provide a reel structure which does not contain any revolving parts yet enables the wire to be drawn from a stationary coil at high rates of speed under uniform tension. A further important object of the invention is to provide a reel structure of this character which is composed of parts capable of manufacture and assembly at low cost and yet rugged and durable for long periods of use. A still further important object of this invention is to provide a reel structure which is easy and convenient to load with wire coils and which is so inclined to the vertical that the reel may be located immediately adjacent to the processing and fabricating machine and feed the unwound wire sections directly thereto.

Important features of the invention relate to the novel method of unwinding the wire sections from the coil or roll of wire, which method contemplates drawing the wire in an axial direction away from a stationary coil of wire and positively guiding the drawn sections of the wire into helical or spiral loops of progressively less diameter

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the further removed the loops are from the plane of the coil. Another feature of the invention relates to the provision of a series of circular members or rings disposed on the pay-off side of the wire coil coaxial therewith and over and under which the drawn sections of wire are slidably guided. The ring members are supported in a particular relation to one another and to the coil, being progressively of less diameter from the end adjacent to the coil to the other end of the series. A further feature of the invention relates to the supporting frame of the reel structure and particularly to the provision of a movable or swingable frame member disposed in spaced relation to the wire coil and provided with a guiding aperture or eye located substantially on the axis of the coil through which the drawn sections of wire are passed as they leave the structure. The frame member is mounted for swinging movement to a position to one side of the structure to enable wire coils to be loaded on the frame. Other novel features of the invention relate to the mounting of the series of ring members such that the spiral sections of the unwound wire may be alternately slidably guided over and under the members without snagging or engaging any supporting parts thereof. At least one ring member of the series is provided with a limited angular movement about its axis to assist in accomplishing this object.

Various other objects, advantages and meritorious features will become more fully apparent from the following specification, appended claims and accompanying drawings wherein:

Fig. 1 is a longitudinal sectional view through a reel structure constructed in accordance with this invention,

Fig. 2 is an end view of the reel structure taken along line 2—2 thereof,

Fig. 3 is a detail cross sectional view of the reel structure taken along line 3—3 of Fig. 1, and showing the construction and mounting of the largest ring member thereof.

Fig. 4 is a detail cross sectional view of the reel structure taken along line 4—4 of Fig. 1 showing the manner of adjustably mounting the coil supporting members,

Fig. 5 is a detail cross sectional view of the reel structure taken along line 5—5 of Fig. 1 and illustrating the support for receiving a coil of wire,

Fig. 6 is a detail sectional view of the frame of the reel structure taken along line 6—6 of Fig. 1,

Fig. 7 is a detail sectional view of the outermost frame member of the reel structure taken

along line 7—7 of Fig. 1 and showing the pivotal mounting thereof,

Fig. 8 is a detail sectional view of a base part of the reel structure taken along line 8—8 of Fig. 1 and illustrating the manner of mounting one of the coil supporting members for radial adjustment.

In the illustrated embodiment of the invention, the reel structure is provided with a pedestal type of base including a flat bottom base member 10 adapted to rest on a floor support and to which it may be bolted if desired and a two-sectional upright or vertical column generally indicated at 12. The lower section 14 of the column is secured to the base member and is provided with an upwardly opening axial bore in which a swiveling pin 16 is fixed. The upper section 18 of the column is provided with a downwardly opening axial bore which is of a size to receive the projecting end of the pin 16. The connection between the two sections of the column 12 is such that the upper section may be rotated or swiveled on the lower section to present the wire discharge end of the reel structure at any point circularly around the base member 10. The upper section 18 of the column is widened to provide a tubular shaped support 20 inclined to the vertical. Preferably the longitudnial bore through the support 20 extends at approximately 30° to the horizontal as shown in Fig. 1.

Mounted in the inclined bore or passage of the tubular support 20 is a supporting shaft 22. The latter is shown circular in cross section (Fig. 5) but may be square shaped or non-circular if desired. The shaft 22 is held against rotation in the support 20 by a transverse pin 24. The shaft projects at an upward inclination from the column support. The section of the shaft adjacent to the column is enclosed by a sleeve 26 which is widened at its upper end to provide a flange 28.

Cooperating with the flange 28 and disposed on the shaft in axial spaced apart relation thereto is a collar 30 of the size and shape shown in Fig. 5. The collar and flange are connected together by a plurality of bolts 32 but as shown in Fig. 1 are normally spaced apart from one another to receive and support the inner ends of a plurality of supporting frame members 34 projecting radially from the shaft 22. Preferably four such frame members 34 are employed and as shown in Fig. 5 are arranged 90° apart around the shaft. The frame members 34 are preferably of square cross section as shown in Figs. 6 and 8 and when properly mounted upon the structure the inner ends of the members are clamped between the adjacent flat faces of the collar 30 and the flange 28.

Cooperating with the frame members 34 to form a support for a coil or roll of wire are a plurality of bars 36 arranged in circularly spaced relation around the center shaft 22. Preferably four such bars are employed, one associated with each frame member, and as shown in Fig. 1, they are arranged to extend perpendicular to the frame members and parallel to the shaft 22. Each bar 36 is preferably square shaped in cross section and has its lower or base end shaped for slidable adjustment on the frame member 34 with which it is associated. As shown in Fig. 8, the lower end of each bar is widened to form a bifurcated or channel shaped base 38 which slidably encloses three sides of the frame member. The outer ends of the side walls of the channel shaped base are bridged by a removable plate 40. The latter is secured to each side wall by bolts 42 and nuts 44 threaded thereon. The mounting formed by the channel shaped base 38 and the plate 40 is such that each bar is capable of bodily translational movement along the frame member with which it is associated either toward or away from the center shaft 22.

A coil or roll of a continuous length of wire is shown in Fig. 1 at 46 resting on the frame members 34 and encircling the bars 36. Initially, before the coil is placed thereon the bars 36 are collapsed slightly toward one another in order that they may fit through the central hole of the coil. To assist in slipping the coil into operating position it is preferred to incline the outer or upper end sections of the bars inwardly toward the shaft 22 as shown at 48 in Fig. 1. After the coil is in place in the reel structure, the bars 36 are shifted radially outward to firmly hold the coil and prevent its rotation. For this purpose there is provided a ring shaped member 50 concentrically mounted on the shaft within the bars 36 by means of a spider 52 (Fig. 4) and hub 54, the latter being capable of slidable adjustment along the shaft and of being held in any adjusted position by set screw 56. Carried by the ring member 50 are spreading means each engageable with a bar 36 and being capaple of bodily thrusting the same outwardly relative to the center shaft. Such means are preferably relatively large bolts 58 threaded into the ring member and having their heads located outwardly thereof for engagement with the bars. Four such bolts are provided, equal in number to the bars 36, and they are circularly spaced apart on the ring member for engagement therewith as shown in Fig. 4. A suitable tool for engaging the heads of the bolts, such as a wrench, will rotate the bolts to thread them outwardly of the ring member and radially shift the bars outwardly into tight engagement with the inner peripheral portions of the coil 46. A lock nut 60 may be provided on the inner end of each bolt to hold the same in adjusted position. In this manner, after the coil is placed in the reel, it may be adjusted to the most satisfactory position about the shaft 22 for unwinding wire therefrom and for firmly holding the same against rotation.

Carried by the reel structure in axial spaced relation to the plane of the coil of wire is a series of guiding elements over and under which successive sections of wire drawn from the coil are passed. In the illustrated embodiment of the invention three such elements are employed although the number of these elements may be more or less depending upon the size of the reel and the character of the wire. Referring to Figs. 1 and 2, the guiding elements are indicated respectively at 62, 64 and 66 in order of their distance from the plane of the coil 46. The guiding elements as shown in Fig. 2 are circular in formation and are hereinafter referred to as rings. Moreover, they are preferably cylindrical in cross section in order to provide a rounded exterior with which the wire is engageable. The rings are mounted in the reel structure coaxial with the center shaft 22 and in axial spaced apart relation. The rings are of different diameters being arranged in the structure in progressive order of their size from one end of the series to the other. The largest diameter ring, indicated at 62, is located nearest to the coil 46; the smallest diameter ring 66 being located the most remote from the coil. The largest ring preferably has a diameter approximating that of the outside diameter of the coil in wound condition. In normal usage the

largest ring is spaced from the nearest edge of the coil approximately the axial width thereof as shown in Fig. 1, although the distance may be varied in a manner hereinafter described in order to meet any conditions presented by wires of different characteristics.

The largest guiding ring 66 is supported from the center shaft 22 by a plurality of radial extending arms 68 as shown in Fig. 3. Preferably four such arms are employed being equally spaced apart around the shaft. The inner ends of the arms are secured to a hub member 70 which is both rotatably and axially movable on the shaft 22. The hub is maintained in axial adjusted position on the shaft 22 by means of a collar 72 secured thereto by set screw 74. Due to the inclination of the shaft 22 the hub 70 slides down the shaft and freely rides on the collar 72. As a result of its mounting the hub is capable of sliding up the shaft away from the collar and of rotating a limited angular distance about the shaft. The arms 68 extend past the bars 36 and the latter form stops limiting the angular movement of the hub to the full and dotted line position of the arms in Fig. 3. Since the largest ring 62 is secured by the arms 68 to the hub it also is capable of the same relative movements as the hub, and as will be explained hereinafter these movements, either separately or together, assist materially in preventing underside kinks and loops from forming in the unwound wire sections.

The smallest wire guiding ring 66 is secured to the largest ring assembly and partakes of the same relative movements thereof. Extending perpendicularly to the plane of the ring 66 and connected at one end thereto are a plurality of arms 76, being four in number in the illustrated embodiment of the invention. The arms extend parallel to the center shaft 22 and past the inbent ends 48 of the bars 36 and are secured at their opposite ends to the radially extending arms 68 of the largest ring assembly. The largest and smallest rings are thus integrally connected together into a unitary assembly capable of shiftable movement on the shaft 22 and of limited angular movement thereabout. In addition, the internal location of the supporting arms 68 and 76 with respect to the rings 62 and 66 provides an uninterrupted external rounded surface on each ring extending completely therearound over which the wire sections are successively guided.

Forming part of the reel structure and supported thereby on the side of the series of guiding rings opposite to the coil 46 is a frame member 78 in the form of a narrow elongated plate which perpendicularly intersects the common axis of the coil and shaft 22. The plane of the plate 78 extends parallel to the rings and is spaced beyond the smallest ring 66 as shown in Fig. 1. The plate is reinforced on its underside by a pair of angle bars 80—80, shown in Fig. 8, which extend the length thereof. One end of the plate is removably supported on the outer extremity of a cylindrical shaped frame member or rod 82. The latter extends in spaced parallel relation to the center shaft 22 and its lower end is bifurcated for connection to the outer end of one of the frame members 34 in the manner shown in Fig. 6. The connection between the plate 78 and the rod 82 is such that the former may be readily detached therefrom. As shown in Fig. 1, the plate is provided with an oversize aperture 84 in order to be received over the outer end of the rod 82. The latter is externally threaded for receiving an inside adjustable stop nut 86 and a removable outside nut 88. It is readily apparent that threaded adjustment of the nuts on the rod 82 will vary the position of the plate member 78 and that removal of the nut 88 will render the plate detachable from the rod.

The opposite end of the frame member 78 is pivotally connected to the outer end support which extends parallel to the center shaft 22 and is secured at its lower extremity to the outer end of the frame member 34 which is diametrically opposite to the frame member to which the rod 82 is secured. The support, as shown in Figs. 5 and 7, is preferably formed of two cylindrically shaped rods 90—90 arranged in juxtaposed parallel relationship. The upper or outer ends of these rods carry an inverted T-shaped block 92 which forms a journal mounting for a pivot pin 94. Secured to the outer face of the frame member 78, as by screws 96, is a hinge plate 98 having two spaced ears 100—100 which straddle the leg of the block 92 and encircle the pivot pin. The connection is such that the frame member 78 may be swung from its full line position in Fig. 1 upwardly approximately 180° to the dotted position shown in Fig. 1. The dotted position of the frame member is that assumed when the reel is loaded with a coil.

The middle wire guiding ring 64 is secured to the swingable frame member 78 and is carried therewith as shown in the dotted position thereof in Fig. 1 when the frame member is swung to the coil loading position. Two correspondingly shaped rods 102—102 are connected to the frame member on opposite sides of its center and extend perpendicularly therefrom for securement to the ring 64. Preferably the rods are adjustably connected to the frame member in order to vary the position of the ring 64 relative thereto. This is accomplished by externally threading the rods and passing the same through apertures in the member 78 as shown in Fig. 1 where they are adjustably connected thereto by inside and outside nuts 104 and 106 respectively. In the operating position of the frame member and ring, the adjustment provided by the nuts enables the ring to be shifted axially relative to the other two rings 62 and 64 which adjustment may be desirable under certain circumstances in order to improve the feed of the wire from the coil. It is to be noted that the supporting arms 102—102 for the middle ring 64 provide a free and uninterrupted rounded surface on the inside of the ring under which the wire sections drawn from the coil may slidably pass.

As heretofore mentioned the largest and smallest rings 62 and 66 are slidable on the center shaft 22. When it is desired to load the reel with a roll or coil of wire, the assembly consisting of these two rings is slid off the outer end of the center shaft and removed to one side of the structure. This removal operation occurs after the frame member 78 has been swung to its out-of-way position. With these two parts out of the way, a coil of wire may be slipped over the inwardly bent ends 48 of the bars 36 and guided down the bars to the operating position shown in Fig. 1 where the lower end of the coil bears against the cross members 34. Thereafter the ring assembly consisting of the largest and smallest ring is slidably fitted on the center shaft and dropped into position on the collar 72. The frame member 78 carrying the middle ring 64 is swung to its operating position bringing the ring between the largest and smallest ring. Following this, the axial position of the rings relative to the center

shaft may be adjutsed by shifting the collar 72 and threadedly extending or retracting the arms 102—102.

The frame member 78 contains a wire feeding aperture or eye on substantially the projection of the axis of the shaft 22. Mounted in the aperture is a guiding ferrule or bushing 108 of wear resistant metal. The wire after leaving the series of rings is passed through the bushing and may be fed directly to a processing or fabricating machine alongside of which the reel is located.

An unwound portion of the wire paid off of the coil 46 is indicated at 118. The wire as it is drawn from the coil assumes a spiral or helical formation. It is then guided through the series of rings in this formation as shown in Fig. 2 slidably passing over the largest ring 62, under the middle ring 64 and over the smallest ring 66. In order to clearly show the passage of the wire through the ring assembly, the wire 110 is shown in a single plane in Fig. 1 passing alternately over and under the guiding rings, but it is understood that its path is spiral in formation through the ring assembly as shown in Fig. 2. The wire 110 initially guided off of the coil 46 in a relatively large helical loop which is slidably passed over the largest ring 62. Thereafter in a helical convolution it is guided under the middle ring 64 which by virtue of the fact that it is smaller than the ring 62 condenses or reduces the diameter of the helical loop to that of the middle ring. Following this the helical looping wire is slidably guided over the smallest ring 66 and fed in a reducing spiralling path to the eye 108 on the axis of the coil. The guiding rings permit the wire to naturally assume the spiral convolutions but guide the same in progressively lesser helical loops to the discharge end of the reel.

During the passage of the wire through the series of rings the helical loops slip circularly around the rings. The supports for the rings are so located with respect to the path of the wire that they form no obstruction to its passage. For example, both the largest and smallest rings 62 and 66 present a free and uninterrupted rounded exterior completely encircling the axis of the center shaft 22 over which the helical loops of wire may slide not only in an axial direction but circumferentially thereabout. Similarly, the supports for the middle ring 64 are so disposed that the ring presents a free and uninterrupted internal rounded surface extending completely around the axis of the center shaft under which the helical loops of wire slide both axially and circularly relative thereto.

If any kinks are formed in the wire as it leaves the coil, the largest ring 62 is capable when engaged thereby to travel a limited angular distance about the shaft 22 and loosen the kink sufficiently to straighten out the wire. At the same time, or as a separate action, the largest ring is capable of sliding outwardly on the shaft 22, the two movements together or alone being sufficient to straighten out any kinks in the wire. If any kinks should occur or carry into the ring series, the smallest ring 66 will be engaged thereby and its axial and angular movement will assist in straightening out the kink before it reaches the eye 108. The same action of the rings 62 and 66 will also apply if there are any imperfections in the wire which would increase the frictional engagement of the wire with these rings.

As a result of this invention it is possible to unwind or draw-off wire sections from a stationary coil of wire at high rates of speed, equalling

or exceeding one thousand feet per minute. The rings through which the wire is drawn allow the wire to assume its natural helical or spiral formation yet progressively condenses the spiral loops until after passage through the eye the wire has no tendency to curve or bend out of a straight line. At least two of the guiding rings are capable of yielding both angularly and axially relative to the center shaft to forces imposed thereon by the wire thereby enabling any kinks or other irregularities in the wire formation to be straightened out before reaching the outermost part of the reel structure. The inclination of the reel to the vertical predisposes the wire in alignment with the wire receiving portions of a processing or fabricating machine and allows the wire to be fed directly thereto. The supporting arms of the rings are so disposed with respect to the feed of the wire therethrough that the loops of the wire can slip and slide circumferentially on the rings without any interference. This last feature enables the wire to be uncoiled and drawn off in spiral loops at high rates of speed and yet be guided in a short distance to a straight line movement.

While there has been illustrated and described a preferred form of the invention, it will be understood that various changes and modifications therein may be made by those skilled in the art without departing from the spirit and scope of the invention. It will therefore be understood that the claims appended hereto are intended to cover all changes and modifications which fall within the true spirit and scope of the invention.

What we claim is:

1. A wire unwinding reel comprising, in combination, a frame having means for receiving and supporting a coil of continuous length of wire, a member forming part of the frame and provided with an eye through which successive sections of the wire unwound from the coil are fed, said member in operating position being spaced from the plane of the coil with the eye thereof on substantially the axis of the coil, a series of ring-shaped elements of progressively different diameters from one end of the series to the other end thereof, means mounting the elements in the frame between the member and the coil in coaxial relation to the latter and in axially spaced apart relation to one another, said means disposing the end of the series having the largest element adjacent to the coil and the smallest element adjacent to said member, and means for providing movement of said member relative to the balance of the frame from said operating position to a position to one side of the frame.

2. A wire unwinding reel comprising, in combination, a frame having a central shaft over which a coil of a continuous length of wire is placed, a member forming part of the frame spaced from one extremity of the shaft and provided with an eye on substantially the axis of the shaft through which successive sections of wire unwound from the coil are fed, a series of ring-shaped elements of progressively different diameters from one of the series to the other end thereof, means forming a part of the frame and supporting the ring-shaped elements in coaxial relation to the shaft and between the member and the coil, said means disposing the end of the series having the largest element adjacent to the coil and the smallest element adjacent to the member, and means for providing angular movement of at least one of such ring-shaped elements about the axis of the shaft.

3. In a wire unwinding reel having a support for a coil of a continuous length of wire and including a shaft adapted to extend through the central opening of the coil and project beyond one side thereof, a member spaced from the plane of the coil and the projecting end of the shaft and perpendicularly intersecting the axis of the shaft, said member provided with an eye on apprxoimately the axis of the shaft through which successive sections of the wire unwound from the coil are fed, a series of ring-shaped elements of progressively different diameters from one end of the series to the other end thereof located between the member and the coil in coaxial relation to the shaft and in axially spaced apart relation to one another, the largest diameter element of the series being the nearest of the elements to the coil, and means for providing limited angular movement of the largest ring-shaped element.

4. In a wire unwinding reel, a shaft having a support adjacent to one end thereof for receiving and supporting a coil of a continuous length of wire, a member spaced from the opposite end of the shaft and perpendicularly intersecting the axis thereof, said member provided with an eye on approximately the axis of the shaft through which successive sections of the wire unwound from the coil are fed, a series of ring-shaped elements of progressively different diameters from one end of the series to the other end thereof located between the member and the coil in coaxial relation to the shaft and in axial spaced apart relationship to one another, the largest diameter element of said series being the nearest of the elements to the coil support, means mounting at least one of said ring-shaped elements on the shaft for support therefrom, said ring-shaped elements adapted to progressively reduce the convolutions of wire unwound from the coil as it alternately passes over and under the ring-shaped elements prior to being fed through said eye.

5. A wire unwinding reel comprising, in combination, a frame including a central shaft around which a continuous coil of wire is placed and from one side of which the shaft projects, a member carried by the frame spaced from the projecting end of the shaft and perpendicularly intersecting the axis thereof, said member provided with an opening on approximately the axis of the shaft through which successive sections of the wire drawn from the coil are fed, and means between the coil of wire and the member for guiding the wire in progressively decreasing convolutions from the coil to said opening, said

means consisting of a plurality of ring-shaped elements coaxially related to the shaft and being of progressively decreasing diameters in the direction of the member, said elements forming guides alternately over and under which helical sections of wire drawn from the coil are slidably guided before being passed through said opening of the member, and means alternately connecting said ring-shaped elements to said shaft and to said member for support therefrom.

6. A wire unwinding reel comprising, in combination, a base, a frame swiveled on said base for swinging movement thereabout having means for receiving and supporting a coil of a continuous length of wire, a shaft projecting upwardly from said base and adapted to extend through the central opening of a coil of wire supported thereon and project thereabove, a member provided with an eye through which successive sections of wire unwound from the coil are fed, means pivotally connecting said member to the frame for movement from an operative position in which said eye is disposed in spaced relationship to the projecting end of the shaft and on the axis thereof to an inoperative position on one side of the frame, a series of axially spaced apart ring-shaped elements of progressively different diameters from one end of the series to the other end thereof, said ring-shaped elements forming guides alternately over and under which successive sections of wire unwound from the coil slide before being fed through said eye, and means alternately connecting said ring-shaped elements to the shaft and to the member and supporting the same in coaxial relation to the shaft between the coil of wire and the member and disposing the largest diameter element of the series adjacent to the coil, said last means for providing withdrawal movement of any one or more of the elements connected to the member from the series when the member is swung to its inoperative position.

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