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WIRE DEREELING EQUIPMENT

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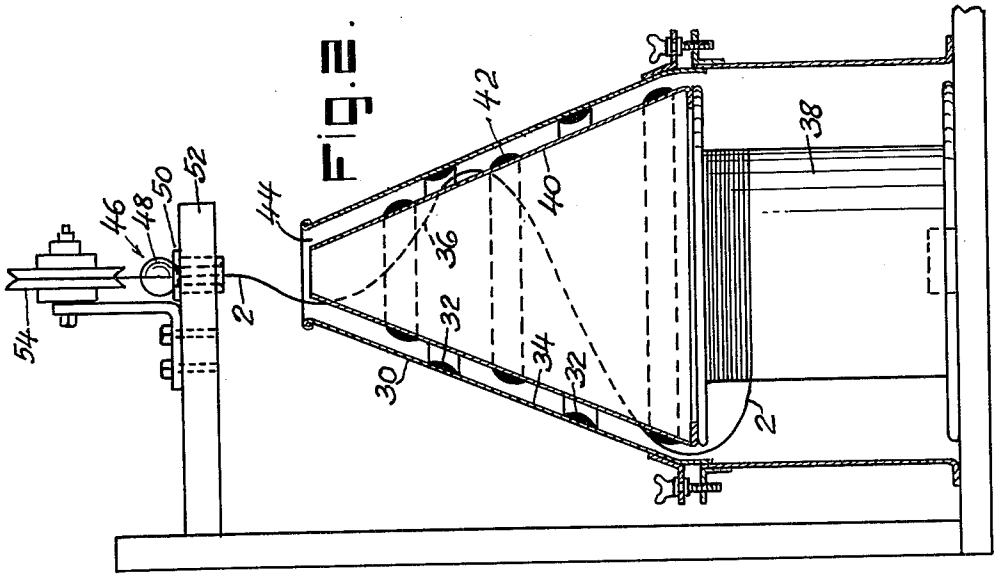


Fig. 2.

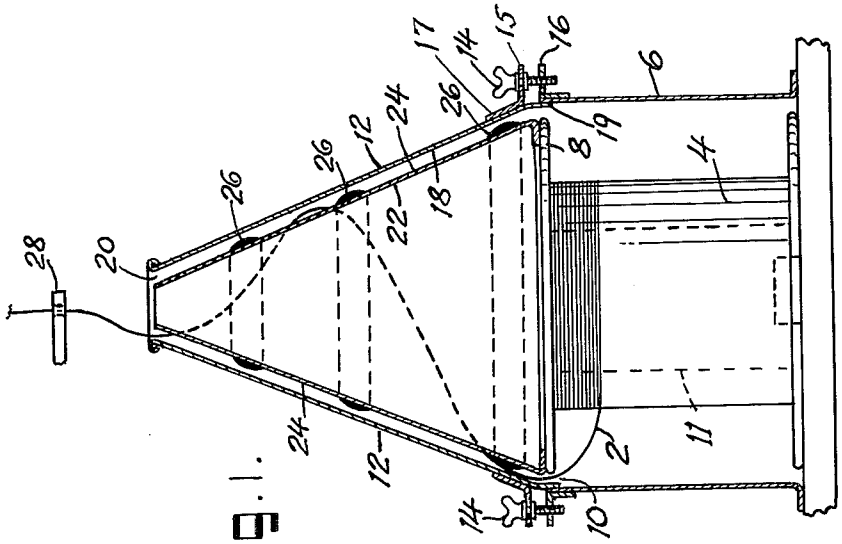


Fig. 1.

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WIRE DEREELING EQUIPMENT

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This invention relates to means for use in removing wire from a reel; and, although it has significant advantages when used for dereeling any type of wire from a reel, it is of particular importance in dereeling relatively hard wire in that it further serves as a decaster for eliminating or reducing the curvature or "cast" which hard wires tend to retain as they are withdrawn from a reel.

It has been common practice heretofore to employ tensioning means or the like for the wire being drawn from a reel for the purpose of reducing the ballooning of the wire during high speed dereeling operations. However, when the wire being drawn from the reel is relatively hard, heavy or stiff, such as "tire bead wire," high carbon hose wire, wire formed of stainless steel, cadmium copper, hard copper or aluminum wire of, say, .0126 to .010 diameter, the wire tends to retain a cast and may sometimes kink as it is drawn off a reel. The tension, resistance, or drag applied to the wire in any case also will remain substantially the same over a wide range of dereeling speeds whereby high speed dereeling of relatively hard or soft wire can be maintained.

Furthermore, when a dereeling operation is stopped or if the wire should break for any reason, it tends to recoil or to slip downward over other turns of wire on the reel or spool within a container whereby it may become entangled with such other turns or bind thereon when dereeling of the wire is restarted. It is also found in practice that excessive resistance is presented in starting to dereel the wire unless the diameter of the upper flange of the reel bears a proper ratio or relation to the diameter of the body of the reel on which the wire is wound.

Moreover, the tensioning means or other elements employed heretofore for use in controlling wire being drawn from a reel have generally not been adapted for use with both hard and soft wire and with relatively large and relatively small diameter wires. As a result, it has usually been necessary to provide numerous different types of wire tensioning or control means in order to handle different types and sizes of wire with any equipment; and, in some cases, additional means are required to eliminate the cast, curvature, or kinks which otherwise tend to develop in dereeling hard wires.

In accordance with the present invention, these objections and limitations in wire dereeling and decasting means are overcome; and means are provided which control the movement of wire being withdrawn from a spool or reel whereby either relatively hard or soft wire and wires varying considerably in size can be handled by the same equipment.

The tension on the wire also is maintained substantially constant while any case in the wire may be eliminated or reduced to such an extent as to permit ready dereeling thereof. The constructions of the present invention further serve to permit ready starting or stopping of the dereeling operation without allowing the wire to fall downward on the reel and over other turns of the wire thereon.

These results are preferably attained by providing dereeling means adapted to be applied to a container having a reel therein and presenting substantially parallel inner wire engaging surfaces which are inclined or conical in shape. Such surfaces serve to control movement of the wire from the reel and through the device to a conventional wire guide means or to a point of use. The construction preferably further includes means located on the parallel conical surfaces of the device for exerting a frictional or other retarding force on the wire as it passes between the parallel conical surfaces and engages the same. Moreover, the dereeling means of the present invention are particularly adapted for use in dereeling wire from reels having a predetermined relation in the diameter of the upper flange of the reel with respect to the diameter of the barrel of the reel.

Accordingly, the principal objects of the present invention are to provide novel means for controlling the movement of wire as it is being withdrawn from a reel and when such operation is interrupted or terminated, to provide dereeling means adapted for use with either relatively hard or relatively soft wire and with wires differing substantially in diameter, and to provide a novel combination of dereeling means with a wire reel having an upper flange and a barrel of predetermined relative diameters.

A further object of the present invention is to maintain substantially constant tension on wire as it is being withdrawn from a reel.

These and other objects and features of the present invention will appear from the following description thereof wherein reference is made to the figures in the accompanying drawings.

In the drawings:

FIG. 1 is a vertical sectional view illustrating a typical embodiment of the present invention; and

FIG. 2 is a vertical view through an alternative form of dereeling and decasting means embodying the present invention.

In the form of the invention chosen for purposes of illustration in the drawing, FIG. 1 shows a spool or reel of uninsulated wire. The wire **2** may be either hard or soft wire and of any desired diameter such as those known in the trade as "ultra fine," "fine," "intermediate" and "heavy" wire. In most instances, it is desirable for the wire to be applied to the body of the reel **4** in the manner known in the art as "Basketweave." The reel **4** is positioned within a generally cylindrical container **6** which has an inside diameter somewhat greater than the diameter of the upper flange **8** of the reel **4**. The reel and container may, if desired, be of the type shown and described in U.S. Patent No. 3,000,493 which permits the wire as it is dereeled to be drawn upward past the flange **8** of the reel **4** through the annular opening **10** between the periphery of flange **8** and the inner surface of the upper end of the container. However, it is not necessary that the barrel of the reel be tapered. Nevertheless, it has been found that the most satisfactory operation of the dereeling means of the present invention is attained when the upper flange **8** of the reel **4** is a predetermined diameter as compared with the diameter of the barrell **11** of the reel. Thus, for most purposes, the upper flange **8** should be about 3 inches greater than the diameter of the barrel and in a typical assembly when dereeling No. 40 AWG wire from a spool having a barrel 7 inches in diameter, the flange **8** should be about 10 inches in diameter.

The dereeling means illustrated embodies a hood **12** of frustroconical configuration mounted on the upper end of the container **6** and is secured thereto by means of bolts **14** or the like carried by an outwardly extending rim **15** secured to the hood **12** by brackets **17**. The bolts **14** engage rim **16** which projects outward about the upper end of the container **6** whereas the lower edge **19** of the hood extends downward within the upper end of the container **6**. The bolts **14** engage the rim **16** and serve to permit vertical adjustment of the hood **12** with respect to the upper end of the container and the reel therein. The inclined inner wire engaging surface **18** of the hood **12** converges inwardly and upwardly, forming an angle of about thirty degrees with respect to the vertical axis of the hood **12** whereas the height of the hood **12** is preferably approximately equal to the diameter of the reel.

The upper end of the hood 12 is provided with an opening 20 which is substantially smaller in diameter than the diameter of the upper flange 8 of the reel of wire 4. The hood 12 may be formed of any suitable material, such as spun aluminum or other metal, plastic, rubber, wood or the like and when applied to the container 6 is concentric with the axis of the reel 4 and container 6.

Within the hood 12, a cap 22 of conical shape is mounted on the upper flange 8 of the reel 4 concentric with the vertical axis of the reel. The cap 22 preferably has a base approximately equal in diameter to the upper diameter of the flange 8 of the reel. The inclined outer wire engaging surface 24 of the cap 22 extends upwardly and inwardly approximately parallel to the inner wire engaging surface 18 of the hood 12. The space between the inclined and approximately parallel wire engaging surfaces 18 and 24 of the hood and cap respectively is sufficient to permit ready ballooning or outward movement of the wire between the surfaces 18 and 24; and in typical constructions, such surfaces may be spaced about one or two inches apart. However, the spacing of the wire engaging surfaces may be varied if desired by adjustment of the hood relative to the cap 22 by means of the bolts 14.

The cap 22 may be formed of wood, plastic, rubber, aluminum or other suitable material or may be covered with such material and preferably has a plurality of circumferentially extending ribs 26 mounted on the surface 24 thereof at axially spaced positions. The ribs 26 may be formed of rubber, neoprene or other suitable resilient or non-abrading material adapted to impose a limited drag or resistance to the movement of the wire 2 during starting and stopping of the dereeling operation or when the wire is relatively hard or has a pronounced cast therein.

In operation, the wire 2 is drawn from the reel 4 and passed upward between the wire engaging surfaces 18 and 24 of the hood 12 and the cap 22 so as to extend through the opening 20 in the upper end of the hood 12 to a suitable guide member 28 or the like to a winding device or other wire utilizing equipment, not shown. It has been found with this arrangement, that, as the wire 2 when dereeled from the reel 4 is contacted and retarded by the wire engaging surfaces 18 and 24 of the hood and cap and by the ribs 26 of the cap 22, a constant but limited drag or tension is imposed on the wire 2. Such tension is sufficient to reduce or eliminate the cast in the wire and to reduce vibrations or harmonics which might otherwise develop in the wire as it moves from the reel to the winding or other utilizing equipment. Moreover, when the dereeling operation is interrupted or stopped, the retarding action of the ribs 26 and the wire engaging surfaces of the hood 12 and cap 22 engaged by the wire serves to hold the wire so that it will not slip back or fall down over other turns of the wire on the reel 4 to become tangled therewith. Consequently, the wire remains in position to permit ready and immediate dereeling thereof when the operation is restarted. As a result, jerking and breakage of the wire is reduced or eliminated altogether. On the other hand, during high speed dereeling of wire the wire being drawn from the reel swings outwardly so as to engage the inner wire engaging surafce 24 of the hood 22 to limit the ballooning action thereof and impose a constant drag or tension thereon.

In order to permit instant starting and stopping of the dereeling operation without resorting to the usual slowing down or controlling of the dereeling operation, it is highly desirable to employ reels of wire which have a predetermined ratio of the upper flange and barrel diameters such that the wire may be drawn smoothly and easily from the reel and through the central opening 26 in the hood 12. For this purpose, the diameter of the upper flange of the reel should be approximately 3 inches larger in diameter than the barrel of the reel on which the wire is wound.

It should be noted that the apparatus of the present invention has no moving parts and, hence, requires virtually no maintenance. At the same time, it has been found in practice that with the highly uniform back tension provided by the apparatus of the present invention renders it possible to use the equipment when the wire is to be dereeled from the reel 4 at much higher rates of speed than have been possible heretofore. Dereeling speeds of the order of 3000 feet per minute have been attained with the apparatus of the present invention whereas it is equally useful when the dereeling operation is to be performed at relatively low speeds. Moreover, the apparatus of the present invention is capable of use when the starting and stopping of the operation occurs frequently and substantially instantaneously. It is found that this ratio or relation in the diameter of the upper flange and barrel of the reel is most effective whether this barrel of the reel is three inches or 20 inches in diameter and whether the barrel is cylindrical or tapered. When the barrel is tapered, the upper flange should be 3 inches larger than the upper end of the barrel.

In any event, the dereeling device of the present invention is adapted for use when dereeling either hard or soft wire and wire which may be very fine or of relatively large diameter. In any event, when the wire is relatively hard and has a pronounced cast, it will tend to recoil about the ribbed cap 20 so that it will be held in engagement therewith ready to be lifted off the cap 22 when the winding or other wire utilizing operation is renewed.

As shown in FIG. 2 of the drawings, the hood 30 may also be formed with inwardly projecting ribs 32 located on the inner surfaces 34 thereof in position to be engaged by the wire 36 when the wire swings outwardly upon high speed dereeling thereof from the reels 38. At the same time, the cap 40 used in combination with the hood 30 may or may not be provided with ribs as shown at 42 which cooperate with the hood to impose the desired resistance to movement of the wire being dereeled through the space between the cap and hood of the assembly. In this way, any cast in the wire will be reduced or removed by the correspondingly increased drag thereon when hard wire is dereeled at high speed. On the other hand, when soft or fine wire is being dereeled, the force with which the wire bears against the inner and outer surface of the cap 40 and hood 30 is limited due to the absence or limited cast in the wire and the limited weight of and the reduced centrifugal force of fine wire as it balloons outwardly in being dereeled.

Further as shown in FIG. 2, the wire 2 passing upward between the wire engaging surfaces of the cap and hood may pass upward through the central opening 44 of the hood to a conventional wire tensioning device 46 which may include a weighted ball 48 located within a cup 50 on the support 52. A capstan or wheel 54 mounted on the support 52 is arranged to receive the wire 2 as it is drawn upward past the tensioning device 46; and in a typical operation, the wire may be passed one or more times about the capstan so as to aid in holding and tensioning the wire during idle and operating conditions of the equipment.

The wire leaving the capstan passes on to any suitable wire winding or utilizing equipment (not shown). However, in many operations and particularly when the wire being dereeled is very soft or fine, the wire may pass from the central opening 44 through a conventional eyelet or other means to the winding or other equipment utilizing the wire.

The ribs 26 carried by the cap of FIG. 1 and/or the ribs 32 and 42 carried by the cap and hood of the equipment of FIG. 2 may be variously spaced or arranged. While such ribs are preferably annular in form, they can be spirally or otherwise positioned. However, in most instances, the ribs should present a smooth rounded or arcuate exposed surface transverse to the direction of

movement of the wire as it passes from the reel and between the wire engaging surfaces of the cap and hood.

It will, thus, be apparent that the particular embodiments of the invention shown in the drawings and described above are intended to be illustrative only and are not intended to limit the scope of the invention.

I claim:

The combination for dereeling wire from a reel at high speeds while permitting subtsantially instantaneous starting and stopping of the dereeling operation comprising a container having substantially cylindrical side walls, a reel of wire located in said container having an upper flange which is larger in diameter than the barrel of the reel with said upper flange substantially level with the upper edge of the container and spaced therefrom to provide a space through which the wire may pass freely, a conical cap mounted on the upper flange of the reel and provided on its outer wire engaging surface with a plurality of elastic annular outwardly projecting ribs formed with smooth rounded surfaces, and a hood centered with

respect to said cap and presenting an inwardly facing wire engaging surface substantially parallel with the outer wire engaging surface of said cap, the container and the hood being provided with outwardly projecting annular rims, means carried by one of said rims and engageable with the other to adjust the position of the hood with respect to the cap, reel and container, the hood having an opening in the top thereof concentric with said cap, reel and container, and means positioned above and centered with respect to said opening for guiding wire being dereeled from said reel.

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MERVIN STEIN, *Primary Examiner.*