April 4, 1961 T. T. BUNCH 2,977,831

METHODS OF AND APPARATUS FOR STRIPPING A SHEATH OF PLASTIC MATERIAL FROM A CORE

Filed March 25, 1959 2 Sheets-Sheet 1

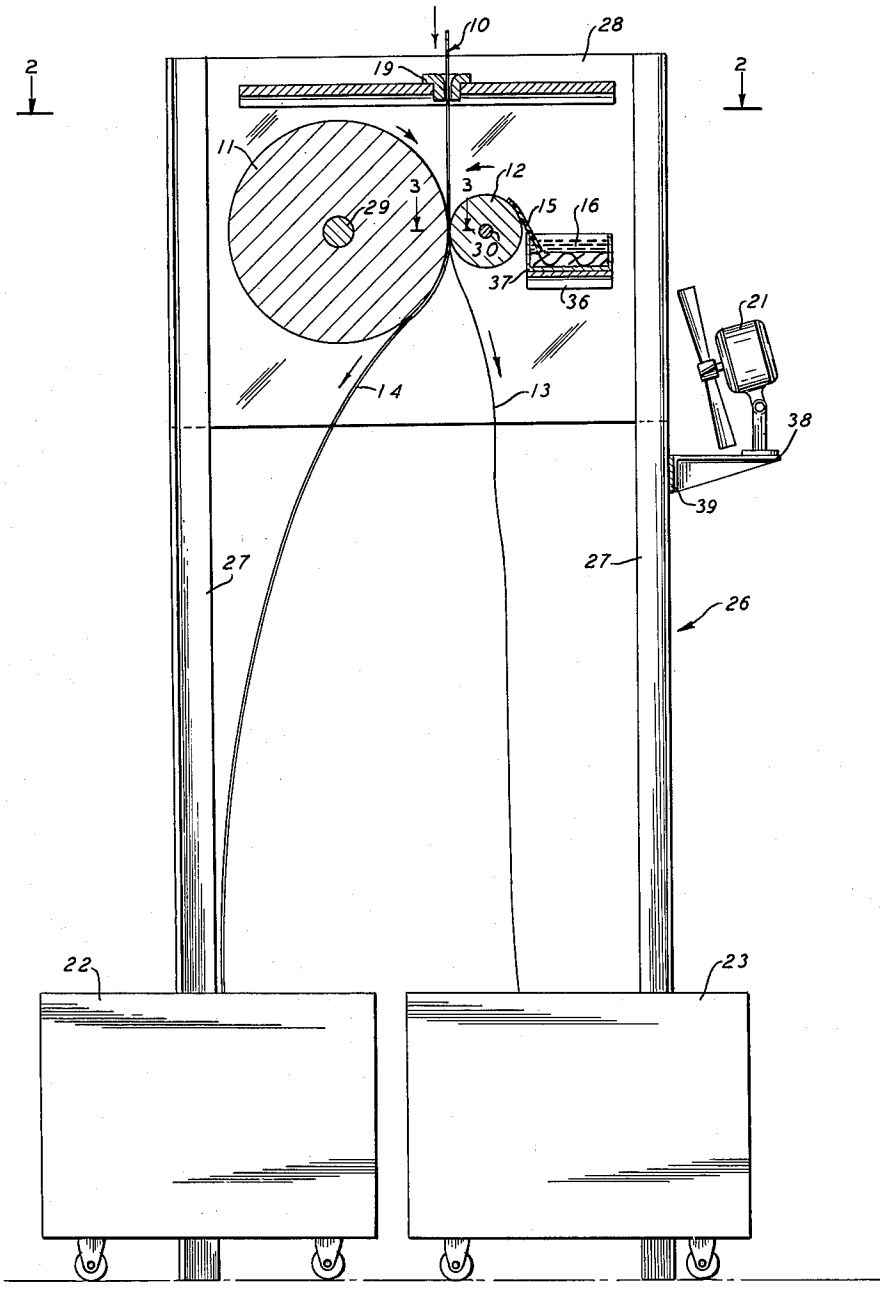


FIG. 1

INVENTOR
T. T. BUNCH

BY H. J. Winegar
ATTORNEY

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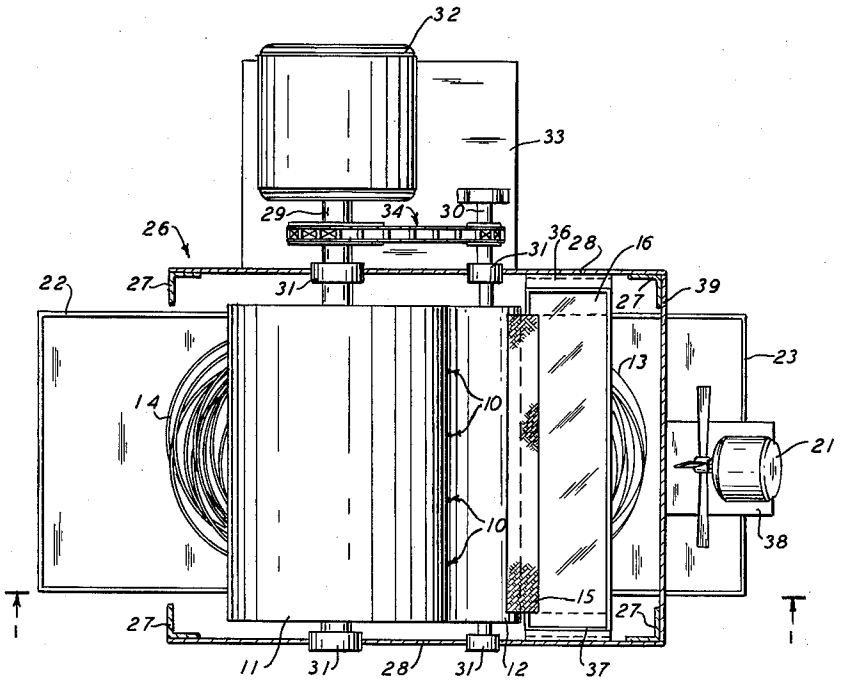


FIG. 2

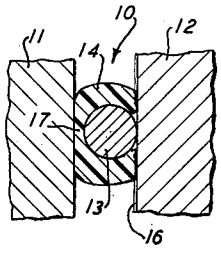


FIG. 3

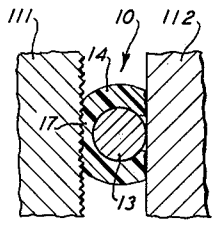


FIG. 4

INVENTOR
T. T. BUNCH

BY
H. J. Winegar
ATTORNEY

United States Patent Office 2,977,831
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2,977,831

METHODS OF AND APPARATUS FOR STRIPPING A SHEATH OF PLASTIC MATERIAL FROM A CORE

Tillman T. Bunch, near Ashland, Md., assignor to Western Electric Company, Incorporated, New York, N.Y., a corporation of New York

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8 Claims. (Cl. 81—9.51)

The present invention relates generally to methods of and apparatus for stripping a sheath of a plastic material from a relatively strong core. More particularly, the invention relates to methods of and apparatus for reclaiming sheathed wire by splitting the sheath longitudinally along one side without deforming the wire diametrically, and collecting the split sheath and the bare wire in separate receivers.

Accordingly, an object of the invention is to provide new and improved methods of and apparatus for stripping a sheath of plastic material from a relatively strong core.

Another object of the invention is to provide methods of and apparatus for reclaiming sheathed wire by splitting a sheath longitudinally along only one side, without deforming the wire diametrically.

Still another object of the invention is to provide methods of and apparatus for stripping a plastic sheath, such as polyethylene, polypropylene or polyvinyl chloride, from a copper wire to enable reclaiming of plastic-insulated wire.

The above and other objects are accomplished, according to certain features of the invention, by passing a sheathed core to be stripped between a pair of rolls spaced from each other a distance of the order of the diameter of the core, one of the rolls being provided with a different surface coefficient of friction with respect to the sheath than the other one of the rolls. At least the high-friction roll is rotated so that the sheathed core passes between the rolls and the sheath is split longitudinally.

Preferably, the rolls are spaced from each other a distance slightly greater than the diameter of the core, and one of the rolls is substantially smaller than the other and is provided with a substantially lower surface coefficient of friction. The rolls may be rotated at substantially the same peripheral speeds to advance the sheathed core therebetween, the sheath being split longitudinally along the side adjacent to the smaller roll without appreciable diametrical deformation of the core. When the core is a wire of a material having a low elastic limit, the wire is given a cast by the smaller roll to facilitate separation of the split sheath and the bare wire.

According to one embodiment of the invention, the smaller roll is continuously lubricated to provide a low surface coefficient of friction. In a second embodiment of the invention, the large roll has a rough surface while the small roll has a relative smooth surface.

Other objects, advantages and features of the invention will appear from the following detailed description of specific embodiments thereof, when read in conjunction with the appended drawings, in which:

Fig. 1 is a vertical sectional view of stripping apparatus illustrating a first embodiment of the invention, taken generally along the line 1—1 of Fig. 2 in the direction of the arrows;

Fig. 2 is a horizontal sectional view of the stripping apparatus illustrated in Fig. 1, taken generally along the line 2—2 of Fig. 1 in the direction of the arrows;

Fig. 3 is an enlarged, fragmentary, horizontal sectional view illustrating the splitting process according to the first embodiment of the invention, taken generally along the line 3—3 of Fig. 2 in the direction of the arrows, and

Fig. 4 is a view similar to Fig. 3, but illustrating a second embodiment of the invention.

Referring now in detail to the drawings and in particular to Figs. 1 and 2, a plurality of sheathed wires 10—10 to be stripped are passed from top to bottom, as viewed in Fig. 1, between an opposed pair of crushing rolls 11 and 12. Each of the sheathed wires 10—10 includes a central wire 13 or core of a relatively strong material, such as a copper conductor, surrounded by a jacket or sheath 14 of a plastic or pressure-deformable material, such as polyethylene or polyvinyl chloride. The sheathed wires 10—10 may be plastic-insulated wires, particularly polyethylene-insulated wires, which are not to be used as such for some reason and which are to be reclaimed by stripping the sheaths 14—14 from the wires 13—13 for reuse of the components or for salvage, separately, as high-grade scrap.

The rolls 11 and 12 are spaced from each other a distance generally of the order of the diameter of the bare wires 13—13 and are preferably rotated as indicated by the arrows in Fig. 1, so that the sheathed wires 10—10 are pulled therebetween. Since the rolls 11 and 12 are spaced from each other a distance of the order of the diameter of the wires 13—13, and since the sheaths 14—14 are of a plastic or pressure-deformable material, the rolls 11 and 12 compress the material of the sheaths 14—14 and force it to flow away from the wires 13—13 on opposite sides thereof, as illustrated in somewhat exaggerated fashion in Figs. 3 and 4, to split the sheaths 14—14 longitudinally, as the sheathed wires 10—10 pass between the rolls.

According to the principles of the present invention, it has been determined that by providing the rolls 11 and 12 with different surface coefficients of friction with respect to the sheaths 14—14, the splitting process is greatly facilitated and it is possible to split the sheaths 14—14 along only one side with substantially no diametrical deformation of the wires 13—13.

First embodiment

According to a first embodiment of the invention, illustrated in Figs. 1 to 3, inclusive, the periphery of the roll 12 is continuously lubricated to provide a low surface coefficient of friction between that roll and the sheaths 14—14 while the roll 11 is maintained dry, and may even be provided with a roughened periphery, to provide a relatively high surface coefficient of friction between that roll and the sheaths 14—14. To lubricate the roll 12, a wick 15 may be provided, a body portion of which is immersed in a bath of a suitable lubricant 16 and a terminal portion of which bears on the periphery of the roll 12 to transfer a film of the lubricant thereto. The lubricant 16 may be any suitable liquid, such as ethylene glycol, water, water emulsion, or the like, having the ability to reduce the surface coefficient of friction between the roll 12 and the sheaths 14—14 to a practical minimum and having no deleterious effects on the particular plastic material of which the sheaths 14—14 are composed.

As the sheathed wires 10—10 advance between the rolls 11 and 12 and the rolls 11 and 12 force the plastic material of the sheaths 14—14 to flow away from the wires 13—13, there is a tendency for the high-friction roll 11 to support and constrain the portions of the sheaths 14—14 adjacent thereto, with the sheaths 14—14 flattening out on that side against the surface of the roll 11. Conversely, the film of lubricant 16 on the surface of the

roll 12 does not constrain the position of the plastic material of the sheaths 14—14, which slides in either direction away from that side relatively easily and to a greater extent than on the high-friction side. Accordingly, the sheath 14—14 are rended apart and are forced away from the bare wires 13—13 predominantly on the lubricated side until the roll 12 has forced the sheaths 14—14 substantially completely away from the wires 13—13 on that side and the surface of the roll 12 contacts or substantially contacts the wires 18—18. The sheaths 14—14 are thus separated on the lubricated side by the opposing nipping action between the wires 13—13 and the surface of the roll 12.

On the high-friction side, the plastic material of the sheaths 14—14 is compressed, but not ruptured, between the wires 13—13 and the surface of the roll 11 within the space between the rolls 11 and 12 not occupied by the wires 13—13. In practice, as viewed in Fig. 3, it is preferred to adjust the spacing between the rolls 11 and 12 so that they are spaced apart a distance slightly greater than the diameter of the wires 13—13 so that a definite web 17 of plastic material remains on the high-friction side. With this arrangement, the sheaths 14—14 are split longitudinally along only the side adjacent to the lubricated roll 12 and there is substantially no diametrical deformation of the wires 13—13.

It has been determined also that the splitting operation and the separation of the platsic material from the wire is facilitated by making the high-friction roll 11 substantially larger in diameter than the lubricated or low-friction roll 12, preferably with the roll 11 having a diameter between two and four times the diameter of the roll 12. At least the high-friction roll 11 must be rotated to advance the sheathed wires 10—10 between the rolls 11 and 12 and, although it would be possible to maintain the lubricated roll 12 stationary, it is preferred for many operations to drive both of the rolls at substantially the same peripheral speeds.

Considering now the specific apparatus illustrated in Figs. 1 and 2, the rolls 11 and 12 are made relatively long so that as large a number of insulated wires 10—10 as is convenient may be processed simultaneously. The wires 10—10 are withdrawn by the rotation of the rolls 11 and 12 from a suitable source of supply, such as a series of reels (not shown). A suitable arrangement of supply reels is illustrated and described in my related copending application with M. G. Dinsmore, Jr. and G. E. Henning, Serial No. 801,888, filed on even date herewith. That application is specifically directed to a somewhat similar system for stripping sheathed wires, wherein a pair of crushing rolls are provided which are rotated at different peripheral speeds and wherein an air current is used to separate the split sheaths from the bare wires. The advancing sheathed wires 10—10 are directed more or less vertically downward between the rolls 11 and 12 by means of a plurality of guide bushings, only one of which, designated generally by the numeral 19, is illustrated in Fig. 1.

As the sheathed wires 10—10 engage the nip of the rolls 11 and 12, the sheaths 14—14 are continuously split longitudinally along the side adjacent to the lubricated roll 12. Each of the bare wires 13—13 is given a cast or continuous bend by the small roll 12, so that the bare wires 13—13 tend to follow a path to the right of a common tangential line between the rolls 11 and 12, as viewed in Fig. 1. A fan 21 is provided to direct an air current against the split sheaths 14—14 and the bare wires 13—13 emerging from the rolls 11 and 12 so as to blow the relatively light, wide split and easily affected sheaths 14—14 away from the less affected bare wires 13—13 in order to enable collection of the two materials in separate receivers 22 and 23. Conveniently, the receivers 22 and 23 are open-topped, wheeled trucks which may readily be inserted into and removed from receiving positions under the stripping apparatus.

The stripping apparatus is supported on a suitable frame, designated generally by the numeral 26, which includes four vertical angle irons 27—27, preferably extending about 8 to 10 feet above the floor level and having secured therebetween a pair of supporting plates 28—28. The rolls 11 and 12 are provided with shafts 29 and 30, respectively, which are suitably journalled in bearings 31—31 carried by the plates 28—28. A drive motor 32 is provided for rotating the large roll 11 and is mounted on a platform 33, which is carried by the plate 28 illustrated at the rear of Fig. 2. The shaft 30 of the small roll 12 is driven from the shaft 29 by means of a sprocket-and-chain transmission, designated generally by the numeral 34. In the specific example illustrated, the roll 11 is approximately three times as large as the roll 12; thus, the transmission 34 is designed so that the rotational speed of the roll 12 is three times faster than that of the roll 11 in order to achieve approximately equal peripheral speeds.

The frame 26 also includes a transverse supporting bar 36, which is secured between the plates 28—28 and which is designed for supporting a container 37 for the wick 15 and the lubricant 16. The frame 26 further includes a platform 38 for supporting the fan 21, the platform 33 being secured to a plate 39 which in turn is connected between the angle irons 27—27 appearing at the right of Figs. 1 and 2.

Second embodiment

According to a second embodiment of the invention, illustrated particularly in Fig. 4, the apparatus is exactly the same as described previously except that the periphery of the smaller roll is not lubricated by any external means. Instead, a similar effect is accomplished by providing a corresponding large roll 111 with a rough or high-friction peripheral surface and by providing a corresponding small roll 112 with a smooth, polished or self-lubricated, low-friction peripheral surface. With this arrangement, a decided surface-friction differential is established between the two rolls 111 and 112, which operates as previously described to split the sheaths 14—14 along only the side adjacent to the low-friction roll.

The surface of the rough roll 111 may be of metal with a matt finish, or it may be knurled metal. Further, the roll 111 might be constructed with a surface of a rubber compound having a Shore hardness of about 80, or of some suitable matrix material containing sharp, hard abrasive particles suited to engage the sheaths 14—14 fixedly. The surface of the smooth roll 112 may be polished metal, or the roll 112 might be fabricated of a material having a low coefficient of friction, such as Teflon, polytetrafluoroethylene, or Rulon, a mineral-filled polytetrafluoroethylene. Furthermore, the low-friction roll 112 might be of a wear-resistant ceramic material having a low coefficient of friction such as Heanium, a ceramic material of alumina and traces of metal oxides.

While certain specific embodiments of the invention have been described hereinabove, it will be obvious that various modifications may be made from the specific details described without departing from the spirit and scope of the invention.

What is claimed is:

1. Apparatus for stripping a sheath of plastic material from a wire, which comprises a pair of rolls spaced from each other a distance slightly greater than the diameter of the wire, one of said rolls having a substantially smaller diameter than the other and being provided with a substantially lower surface coefficient of friction with respect to the sheath than the larger roll, and means for rotating said rolls so that the sheathed wire passes between said rolls, whereby the sheath is split longitudinally as the sheathed wire passes between said rolls along the side adjacent to the smaller roll without appreciable diametrical deformation of the bare wire and whereby the bare wire is given a cast by the smaller roll so as to tend to

direct the bare wire away from the split sheath, thereby facilitating separation of the wire and the sheath.

2. Apparatus for stripping a sheath of plastic material from a core, which comprises a pair of rolls spaced from each other a distance of the order of the diameter of the core, means for lubricating the periphery of one of said rolls to provide a lower surface coefficient of friction between that roll and the sheath than between the other roll and the sheath, and means for rotating at least the nonlubricated roll so that the sheathed core passes between said rolls and the sheath is split longitudinally as the sheathed core passes between said rolls.

3. Apparatus for stripping a sheath of plastic material from a wire, which comprises a pair of rolls of substantially different diameters spaced from each other a distance slightly greater than the diameter of the wire, means for lubricating the periphery of the smaller roll to provide a lower surface coefficient of friction between that roll and the sheath than between the larger roll and the sheath, and means for rotating said rolls so that the sheathed wire passes between said rolls, whereby the sheath is split longitudinally as the sheathed wire passes between said rolls along the side adjacent to the lubricated roll without appreciable diametrical deformation of the bare wire and whereby the bare wire is given a cast by the smaller roll so as to tend to direct the bare wire away from the split sheath, thereby facilitating separation of the wire and the sheath.

4. Apparatus for stripping a sheath of plastic material from a wire, which comprises a pair of rolls spaced from each other a distance slightly greater than the diameter of the wire, one of said rolls having a diameter between two and four times the diameter of the other one of said rolls, the larger one of said rolls having a roughened periphery to provide a relatively high surface coefficient of friction between that roll and the sheath, the periphery of the smaller roll being relatively smooth; means for lubricating the periphery of the smaller roll to provide a low surface coefficient of friction between that roll and the sheath; and means for rotating said rolls in opposite directions and at substantially the same peripheral speeds so that the sheathed wire is advanced between said rolls, whereby the sheath is split longitudinally as the sheathed wire advances between said rolls along only the side adjacent to the lubricated roll without appreciable diametrical deformation of the bare wire and whereby the bare wire is given a cast by the smaller roll to facilitate separation of the split sheath from the bare wire.

5. Apparatus for stripping a sheath of plastic material from a wire, which comprises a pair of rolls of substantially different diameters spaced from each other a distance slightly greater than the diameter of the wire, the

larger roll being provided with a rough surface and the smaller roll being provided with a smooth surface, and means for rotating said rolls so that the sheathed wire passes between said rolls, whereby the sheath is split longitudinally as the sheathed wire passes between said rolls along the side adjacent to the smaller roll without appreciable diametrical deformation of the bare wire and whereby the bare wire is given a cast by the smaller roll so as to tend to direct the bare wire away from the split sheath, thereby facilitating separation of the wire and the sheath.

6. The method of stripping a sheath of plastic material from a core, which comprises the steps of passing the sheathed core between a pair of rolls spaced apart a distance of the order of the diameter of the core, lubricating the periphery of one of the rolls so as to provide a lower surface coefficient of friction between that roll and the sheath than between the other roll and the sheath, and rotating at least the nonlubricated roll so that the sheath is split longitudinally as the sheathed core passes between the rolls.

7. The method of stripping a sheath of plastic material from a wire, which comprises the steps of passing the sheathed wire between a pair of rolls spaced apart a distance slightly greater than the diameter of the wire, lubricating the periphery of one of the rolls so as to provide a lower surface coefficient of friction between that roll and the sheath than between the other roll and the sheath, and rotating the rolls so that the sheath is split longitudinally along the side adjacent to the lubricated roll as the sheathed wire passes between the rolls.

8. The method of stripping a sheath of plastic material from a wire, which comprises the steps of passing the sheathed wire between a pair of rolls of substantially different diameters spaced apart a distance slightly greater than the diameter of the wire, lubricating the periphery of the smaller roll so as to provide a lower surface coefficient of friction between that roll and the sheath than between the larger roll and the sheath, and rotating the rolls so that the sheath is split longitudinally along the side adjacent to the lubricated roll as the sheathed wire passes between the rolls and so that the bare wire is given a cast by the smaller roll to assist in separating the split sheath from the bare wire.

References Cited in the file of this patent

UNITED STATES PATENTS

417,056	Ludwig	Dec. 10, 1889
1,734,272	Pointer	Nov. 5, 1929
2,688,482	Boblit et al.	Sept. 7, 1954
2,882,188	Levin et al.	Apr. 14, 1959