United States Patent

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[54] **DEFECTIVE STRAND DETECTOR MEANS FOR BRAIDING MACHINES**
4 Claims, 3 Drawing Figs.

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[51] Int. Cl. D04c 3/38
[50] Field of Search 57/19, 81; 87/19, 33, 38, 18, 37; 66/163

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3,408,894	11/1968	Kaufmann et al.	87/38

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ABSTRACT: Detector means for braiding machines adapted to braid multifilament wire strands in forming braided armored coverings for high-pressure hose and the like, the detector means including a ring member, positioned between the strand carriers of the machine and the braided covering, and ring member being adapted when contacted by both slack and broken filaments of the strands to open the electrical operating circuit for the motor of the machine.

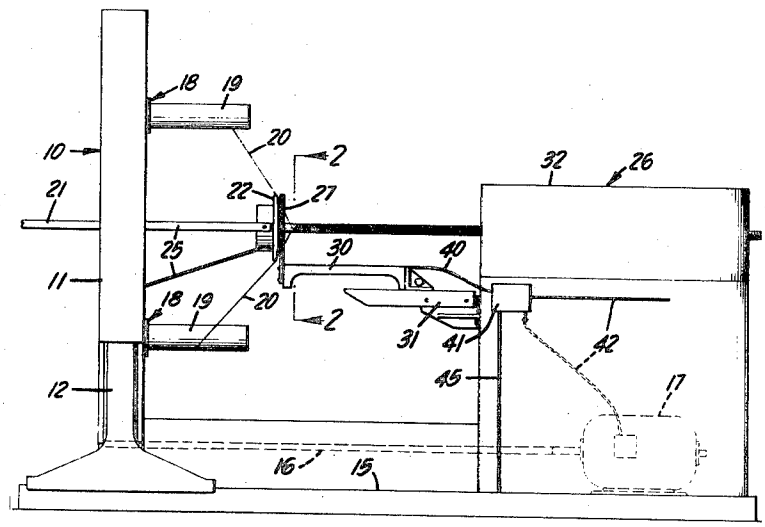


Fig. 1

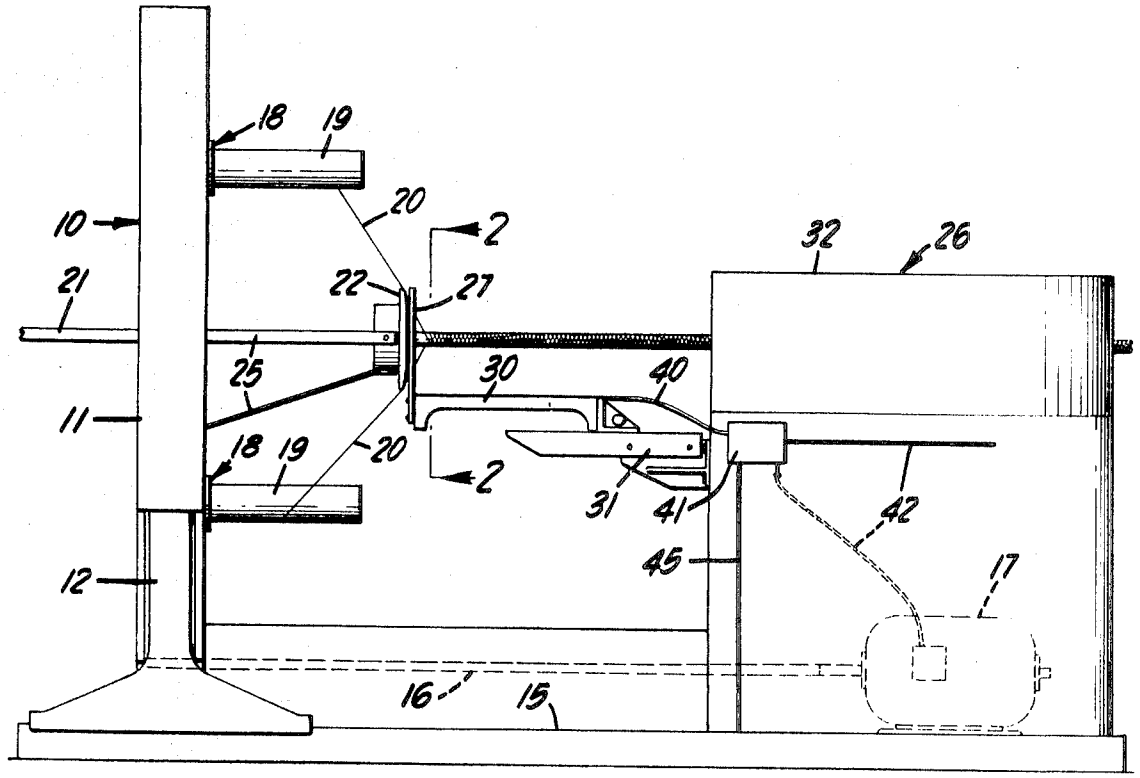


Fig. 2

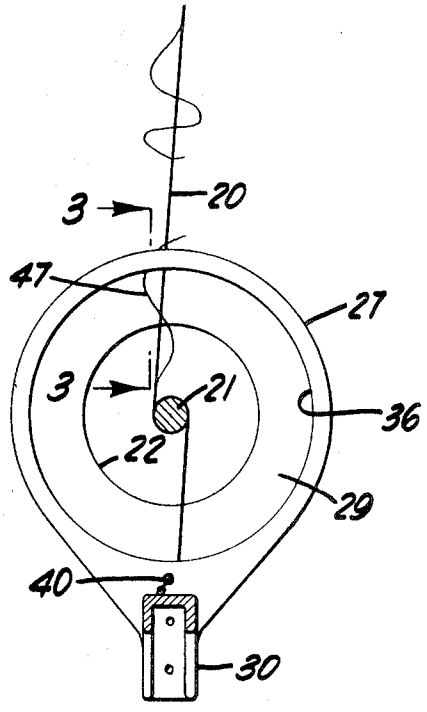
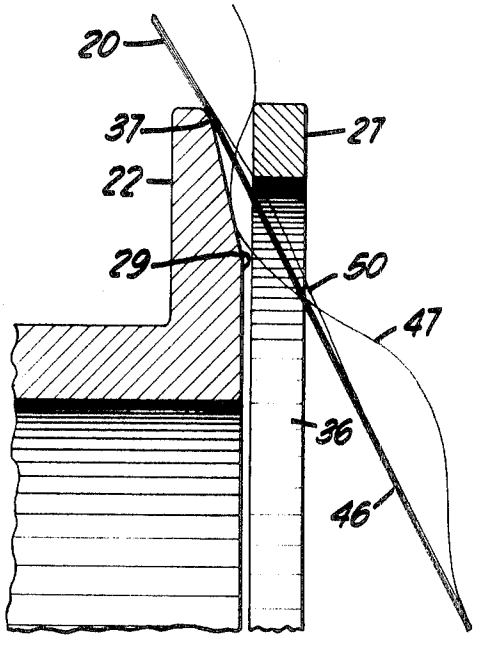


Fig. 3



DEFECTIVE STRAND DETECTOR MEANS FOR BRAIDING MACHINES

BACKGROUND OF THE INVENTION

Conventionally in braiding machines for braiding multifilament wire strands in forming tubular braid or tubular armored coverings on high-pressure hose and the like, the strands are withdrawn under tension from supply bobbins on the carriers of the machine and directed over a braiding ring to be formed into the braid or braided covering as the carriers follow oppositely directed paths about the braiding point of the machine. In preparing the strand supply bobbins of the carriers the individual filaments forming the strands are withdrawn from separate supplies under tension and assembled in substantially parallel relationship as they are wound on the supply bobbin of the carrier. While it is desirable that a uniform tension be applied to all of the individual filaments as they are withdrawn from the separate supplies this tension very often varies to an extent that causes some of the filaments to be wound more tightly on the bobbin than others. When it occurs that only a single filament is more tightly wound on the bobbin than the remaining filaments of the strand, the tensioning force applied by the carrier to the strand is centered on the single filament which usually causes it to break between the carrier and braiding ring. The end of the broken filament is then incorporated into the braided material causing a defect therein which is eventually detected by detector means surrounding the braided material to stop the machine but only after a considerable length of the defective braided material is formed.

Also, it sometimes occurs that the more loosely wound filaments of the strands on the supply bobbins of the carriers tend to deflect from their normal parallel relationship with respect to the other filaments of the strand thereby causing undesirable recurring surface defects throughout the braided covering which are not subject to detection by the detector means provided.

SUMMARY OF THE INVENTION

Briefly summarized the invention resides in the provision of means for detecting slack and broken filaments in braiding machines for braiding multifilament wire strands in forming coverings for high-pressure hose and the like, the detector means including a ring member which is adapted when engaged by the slack and broken filaments of the strands, in their path from the strand carriers of the machine to the braiding point at which the strands are incorporated in the covering, to close an electrical circuit arranged to deenergize and stop the operating motor of the machine.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a braiding machine for braiding multifilament wire strands having mechanism according to the invention incorporated therein;

FIG. 2 is a view on an enlarged scale taken in the direction of the arrows 2–2 of FIG. 1; and

FIG. 3 is a cross-sectional view on an enlarged scale taken on the line and in the direction of the arrows 3–3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing there is shown a portion of a horizontal braiding machine which, for purpose of illustration herein, is of the type shown in U.S. Pat. No. 3,408,894, issued Nov. 5, 1968, for forming braided covering on high-pressure hose and the like, the machine including a braiding head or deck 10 having an annular housing 11 secured to supporting legs 12 mounted on a base member 15. As disclosed in said U.S. Pat. No. 3,408,894 the deck 10 is provided with a circular series of rotors, pairs of which are driven in opposite directions by a shaft 16, corresponding to the shaft 70 in said patent, which is driven by a motor 17 and shuttle members

having strand carriers 18 secured thereto the shuttle members being adapted to be moved along oppositely directed sinuous paths by the rotors to braid multifilament wire strands 20 carried on supply bobbins 19 on the carriers 18 onto a mandrel or core member 21 such as a hose carcass carried on the mandrel. The strand material 20 is directed over a braiding ring 22 from the carriers 18 to the core member 21, the braiding ring being supported by straps or brackets 25 secured to the housing 11. The core member 21 is moved axially through the deck 10 and braiding ring 22 as the carriers 18 are operated to braid the strand material thereon by drawoff means, indicated diagrammatically at 26, which may be of any known type such as that shown in U.S. Pat. No. 3,391,525, the drawoff means being adapted to be operated in synchronism with the deck 10.

During preparation of the strand supply bobbins on the carriers 18 the individual filaments forming the strands 20 are withdrawn from separate supplies and tension is applied to the filaments as they are assembled in parallel relationship and wound on the supply bobbin of the carrier. While attempts are made to maintain a uniform tension on the individual filaments as they are assembled and wound on the supply bobbin the tension does vary so that some filaments are wound on the bobbins more tightly than others. Thereafter, as the strands are withdrawn from the carriers during formation of the braided material the force of the strand tensioning means provided on the carriers may be applied to a single filament of the strand which very often causes it to break between the carrier and braiding ring. While known braiding machines of the type shown herein are provided with means to detect such broken filaments and stop the machine, the detector means is only adapted to detect the broken filaments after being incorporated in the braided material. This results in the formation of a considerable length of defective hose between the time the break in the filament is detected to stop the machine and the end of the broken filament extending from the supply bobbin is again incorporated with the other filaments of the affected strand into the braided material. Furthermore, the more loosely wound filament or filaments of the strands wound on the supply bobbins sometimes tended to cross the other filaments of the strands resulting in undesirable surface defects in the braided material which were not detected by the detecting means previously provided.

In order to substantially reduce the amount of defective braided material resulting from both broken and loosely wound filaments as above noted in accordance with the instant invention such broken and loosely wound filaments are adapted to be detected before being incorporated in the braided covering on the core. The means for this purpose according to the instant invention includes an annular ring 27 which is supported in adjustable position adjacent a front face 29 of the braiding ring 22 by an arm 30 adjustably mounted on a bracket 31 secured to a housing member 32 of the drawoff means 26 (FIG. 1). As shown in FIGS. 2 and 3 the annular ring 27 has an inner bore 36 concentric with and having a diameter less than an outer peripheral edge 37 of the braiding ring over which the strands pass from the carriers 18 to the core member 21. The ring 27 which is insulated from the arm 30, is connected by a lead 40 to the operating circuit at one side of an operating coil of a control unit or relay 41 in the electrical operating circuit for the motor 17, indicated diagrammatically at 42 (FIG. 1). The operating circuit for the operating coil of the relay 41, which includes start and stop buttons (not shown), is connected at the other side of the operating coil through a low voltage grounding lead 45 to the base 15 or other part of the machine. The circuit for the operating coil of the relay 41 is energized through the starting button to close the relay and energize the motor to start the machine and the operating circuit for the coil is adapted to be shorted out by the ground lead 45 to permit the relay to open to deenergize and stop the motor in the manner hereinafter set forth.

During normal operation of the machine the multifilament strands 20 are withdrawn from the carriers 18 over the edge

37 of the braiding ring 22 and thence along a substantially straight line path, indicated at 46 in FIG. 3 between the face 29 of the braiding ring and annular ring 27 and through the bore 36 in the latter as the strands are braided on the core member 21. At this time the strands following the straight line path 46 are clear of the leading edge of the bore 36 in annular ring. When a filament of a strand 20 breaks it tends to kink or curl as indicated at 47 (FIGS. 2 and 3) and grounds on the control ring 27 to close the circuit through grounding lead 45 to permit the relay 41 to open to deenergize and stop the motor 17 and machine as above set forth. Likewise, when a loose or slack filament of a strand 20 indicated at 50, engages the ring member 27 the circuit through the ground lead 45 is closed to deenergize and stop the motor in the same manner.

It will be understood that the improvement specifically shown and described by which the above results are obtained can be changed and modified in various ways without departing from the invention disclosed.

I claim:

1. In a braiding machine having carriers adapted to be moved along intersecting sinuous paths in opposite directions to form multifilament wire strands into a braided covering on a core member moving axially through said machine, a braiding ring over which said strands are directed between said carriers and a braiding point at which said strands are braided on said core member, an electric motor for operating said machine, and an electrical operating circuit adapted when energized to operate said motor, the improvement comprising a ring member through which said filaments of said strands normally pass without engagement between said braiding ring and said core member but said ring member being adapted to be engaged by broken and slack filaments of said strands, and control means in said operating circuit for said motor, said control means being operative upon engagement of said broken and slack filaments of said strands with said ring member to deenergize said operating circuit to stop said motor.

2. In a machine according to claim 1 in which said control means includes said ring member, a first electrical connection between said ring member and said control means, and a second electrical connection between said machine and said control means, and said control means is operative to deenergize said circuit for said motor when said first and second connections are grounded by engagement of filaments of said strands with said ring member.

3. In a machine according to claim 1 in which there is means for supporting said ring member in a position adjacent said braiding ring, and there is means for insulating said ring member from said supporting means.

4. In a machine according to claim 1 in which there is means for supporting said ring member in a position adjacent said braiding ring, and there is means for adjustably mounting said support means in said machine to adjust said position of said ring member relatively to said braiding ring.