June 19, 1962 A. V. PAPP 3,039,430

MACHINE FOR APPLYING HELICAL STRIPE TO WIRE

Filed Nov. 28, 1960 2 Sheets-Sheet 1

FIG. 1

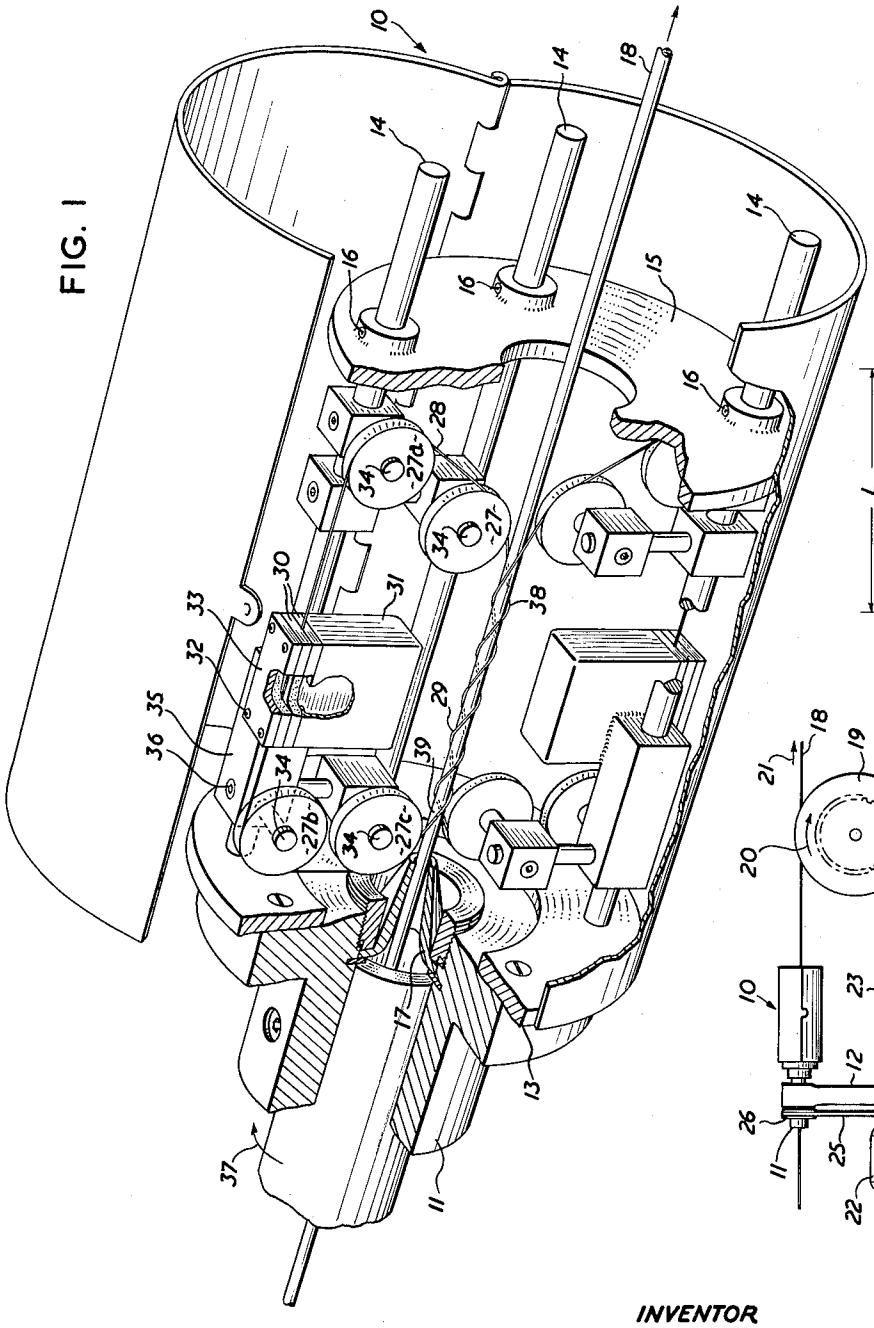


FIG. 6

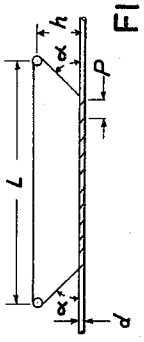


FIG. 2

INVENTOR
ANDRE VARGA PAPP

BY: Maybee & Legris
ATTORNEYS

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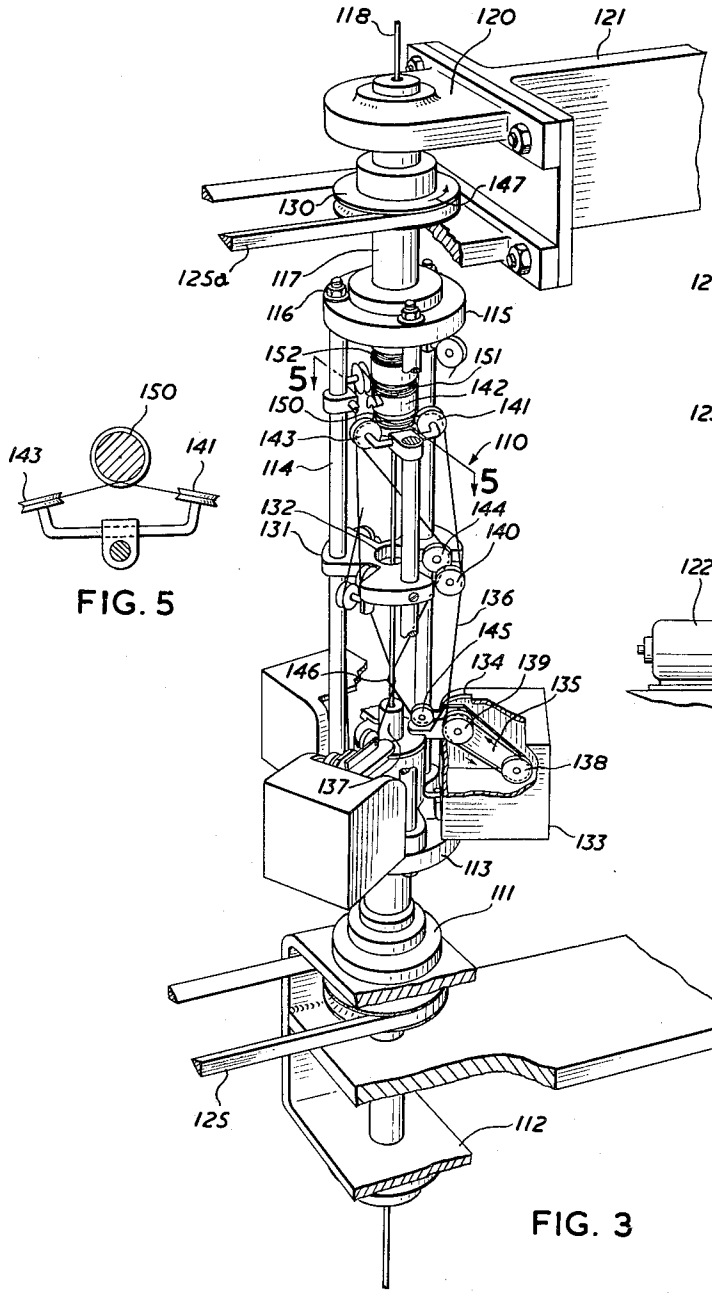


FIG. 3

FIG. 5

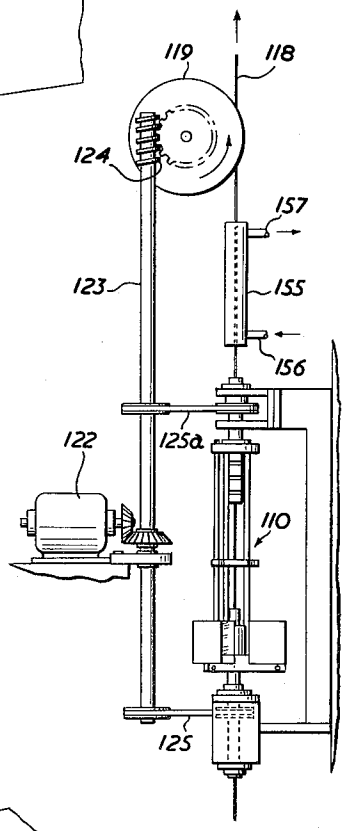


FIG. 4

INVENTOR
ANDRE VARGA PAPP

BY: Maybee & Legris
ATTORNEYS

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3,039,430

MACHINE FOR APPLYING HELICAL STRIPE TO WIRE

Andre Varga Papp, Toronto, Ontario, Canada, assignor to Canada Wire and Cable Company Limited, Toronto, Ontario, Canada, a corporation

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19 Claims. (Cl. 118—221)

This invention relates to a striping machine for applying a continuous helical stripe to an elongated article such as a wire or cable.

For purposes of identification, it is essential that electric wires carry different kinds of identifying marks, so that they may be readily distinguished from each other either in a cable or an apparatus in which they are used. One means used to identify different wires has been the use of a coloured thread in the braided covering of the wire insulation. The means of applying such identification is slow in operation and, of course, has utility only in such wires as have braided or woven fabric coverings.

Another means for identification has been the application of a helical stripe of paint to the exterior surface of the insulation by means of inking discs or pen points. This has been found to be unsatisfactory due to the fact that the discs and pen points may damage the insulation of the wire or cable during the application of the marking stripe and due also to the fact that these mechanisms may be difficult to adjust so that they can compensate for minor irregularities which may be present in the surface of the wire or cable passing through the striping machine.

It is an object of the present invention, therefore, to provide a new and improved apparatus for applying helical stripes to elongated articles such as wires or cables.

The invention will be described by way of example with reference to the accompanying drawings in which two embodiments are illustrated and in which:

FIGURE 1 is a partly cut away perspective view of one embodiment of the invention;

FIGURE 2 is a schematic diagram illustrating a system in which the device of FIGURE 1 may be used;

FIGURE 3 is a partly cut away perspective view of an alternative embodiment of the invention;

FIGURE 4 is a schematic diagram of a system showing the manner in which the device of FIGURE 3 may be employed;

FIGURE 5 is a fragmentary section view along line 5—5 of FIGURE 3, and

FIGURE 6 is a schematic diagram of a simplified system.

Referring now to FIGURE 1 the device will be seen to comprise a striping head indicated generally by the reference character 10 which is mounted for rotation about a horizontal axis by means of a collar 11 which may be carried in suitable bearings (not shown) and carried by a standard 12 (see FIGURE 2).

Secured to one end of the collar 11 is an annular plate 13 which carries, at equally spaced points about its periphery, a plurality of axially extending support rods 14. At the end of rods 14 remote from their end of attachment to the plate 13, they pass through an annular plate 15 and are secured therein by means of set screws 16 which are received in collars surrounding the aperture through which the rods 14 pass.

Located within the collar 11 and concentric therewith there is provided a conical guide member 17 which defines a small opening lying on the axis of the striping head 10 and through which the elongated article 18 to which the helical stripe is to be applied, may pass. The guide member 17 serves to locate the elongated article 18 along

the axis of rotation of the striping head 10 so that as it is advanced in the direction of its length along the axis it will remain accurately positioned coaxial therewith.

Referring now to FIGURE 2 it will be seen that a traction drum 19 is provided about which the elongated article 18 may be wrapped, rotation of the drum 19 in the direction of the arrow 20 causing movement of the elongated article 18 in the direction of the arrow 21 so as to draw the elongated article 18 through the striping head 10 along its axis of rotation. A motor 22 may drive the drum 19 by means of a shaft 23 and a gearing arrangement 24 and, at the same time, the motor 22 may drive the striping head 10 in its rotation about its horizontal axis by means of a belt 25 and a pulley 26 secured to the collar 11.

In addition to the striping head having an axis about which it may be rotated by the motor 22 and the means 19 to advance the elongated article 18 in the direction of its length along the said axis the striping head contains means to apply a helical stripe of paint to the elongated article 18 as it passes through the striping head. These means differ slightly in the embodiment shown in FIGURE 1 and the embodiment shown in FIGURE 3 but both essentially comprise an endless thread which moves through a closed path which closed path includes a paint reservoir rfom which the thread may pick up paint and a contact point between the elongated article and the endless thread where the paint is applied to the article to produce the helical strip. In the embodiment shown in FIGURE 1 it will be seen that, carried by the rods 14 there are a plurality of pulleys, 27, 27*a*, 27*b* and 27*c*, about which an endless thread 28 is passed, a portion of the thread 28 being wrapped helically about the elongated article 18 as, for example, at 29. The thread 28 may make several convolutions about the elongated article 18 and it has been found, in fact, that between two and four convolutions is a satisfactory arrangement. The endless thread 28, between two of the pulleys 27*a* and 27*b*, passes between a pair of felt pads 30 which are associated with a paint reservoir 31 which contains the paint which is to be applied to the elongated article 18. The paint within the reservoir 31 will contact the radially inward felt pad 30 and will saturate it so that as the endless thread 28 passes between this saturated felt pad 30 and the adjacent felt pad 30 it will pick up an amount of paint which can be controlled by the density of the felt pad and the amount of pressure which is exerted between the felt pads to provide a controlled wiping action. This pressure can be adjusted by a series of screws 32 which hold a plate 33 in covering relationship with the end of the paint reservoir 31. By tightening the screws the two felt pads 30 will be clamped together to provide a thorough wiping action on the endless thread 28 and thereby reduce the amount of paint picked up by the thread and carried by it along its path to its point of application to the elongated article 18.

Each of the pulleys is rotatably mounted on its own separate stub shaft 34 which, in turn, is fixed in a mounting block such as, for example, block 35 associated with pulley 27*b* which mounting block is carried by the axially extending rods 14. A set screw 36 serves to lock the mounting block 35 to the rod 14 in a preselected position and each of the pulleys is independently adjustable so as to enable the position of the endless thread 28 to be selected for the most advantageous application of paint to the elongated article.

The two pulleys 27 and 27*c* which are closest to the elongated article 18 are adjustable towards and away from each other. The remaining two pulleys 27*a* and 27*b* are adjustable towards and away from each other and

their distance from the elongated article remains constant.

It will be seen from a reference to FIGURE 1 that if the striping head **10** is rotated in the direction of the arrow **37** the endless thread **28** will tend, at point **38** to unwind from the elongated article **18** whereas, at point **39** it will tend to wind onto the elongated article. The frictional engagement between the endless thread **28** and the elongated article **18** will, due to this unwinding at one end and winding on at the other end of the helical convolutions about the elongated article **18**, cause the endless thread **28** to be driven about its closed path so that it will pass continuously through the felt seals **30** which communicate with the paint reservoir. Accordingly, no external drive means for the endless thread **28** is provided since the drive is automatically achieved. The pitch of the stripe which is applied to the elongated article **18** may be adjusted by varying the position of the various pulleys on their mountings and the tension of the endless thread **28** may also be adjusted in this manner. The drag on the thread **28** may be adjusted by varying the position of the screws **32** associated with the paint reservoir and this drag must be adjusted so that there is sufficient wiping action to prevent an excess of paint being picked up by the thread and also to prevent undue slippage of the thread **28** about the elongated article **18**.

In determining the pitch of the helical stripe which is applied to the cable the following formula may be used:

Pitch of spiral (in inches)=

$$\frac{\text{Cable speed (inches per minute)}}{\text{Head revolutions per minute}}$$

As can be seen from the formula above the pitch of the spiral in inches is related to the cable speed and head revolution speed. Usually, one of these is kept constant and only the other is variable. The pitch can also be varied by adjusting the position of the pulleys and also by changing the number of convolutions of the thread about the elongated article **18**. The general equation for controlling the pitch of the helical stripe may be written as follows:

$$P=\frac{L}{\frac{2h}{\pi}\cdot\frac{1}{d}+n-\frac{1}{2}}$$

where

P is the pitch of the helical stripe
h is a constant distance
d is the cable or wire diameter
n is the number of convolutions of the thread **28** about the elongated article **18**, and
L is an adjustable distance separating the two pulleys **27** adjacent the elongated article **18**.

The dimensions and symbols used in this equation may be readily understood by reference to FIGURE 6 of the drawings.

In operation the variable factor, either wire or cable speed or number of striping head revolutions per minute can be adjusted until it is observed that the input and output angles (α) are equal. (See FIGURE 6.)

Returning now to FIGURE 1 it will be seen that although one system of guide pulleys and one endless thread have been described in detail, a second system is illustrated which, in every respect, is identical to that described but which is located diametrically opposite the system which has been described with reference numerals. This second system may be employed simultaneously with the first system to apply two helical stripes to the elongated article **18** which may, of course, be the same colour or may be a different and contrasting colour. In addition, further systems such as that described in detail may be incorporated in the same marking head to apply three or even more helical stripes simultaneously, the only limitation on the number of stripes which can be simultaneously applied within the one marking head being the space limitation which may prevent more than three or four such systems from being included within the one striping head. If it is necessary to apply more helical stripes than may be applied with one marking head it is, of course, possible to use two striping heads in tandem in which event the helices may be either of the same hand or of opposite hand in order to produce any desired distinctive pattern for identification purposes.

Referring now to FIGURES 3, 4 and 5 an alternative embodiment of the device will be described in detail.

In this embodiment the striping head **110** is normally mounted in a vertical position for rotation about a centrally disposed vertical axis which axis is also the path along which the elongated article **118** is advanced in the direction of its length, the elongated article moving upwardly through the striping head **110** under the influence of the traction drum **119** which may be driven by a gear system **124** through a shaft **123** connected to a motor **122**. The motor **122** also drives, from the shaft **123**, the striping head itself through the belt **125** and, in addition, by means of a belt **125***a*, drives a spindle which will later be described.

Specifically, the striping head **110** as illustrated in FIGURE 3 is mounted in a bracket **112** by means of a collar **111** in whch it is journalled for rotation about a vertical central axis. An annular plate **113** carries axially extending support rods **114** which, at their ends remote from the plate **113** are secured to a second annular plate **115** by means such as the nuts **116** engaging the threaded ends of the rods **114**. At the upper end of the striping head **110** adjacent the plate **115** there is provided a sleeve **117** which is journalled for rotation in a mounting bracket **120** which is rigidly fixed to supporting structure **121**. The sleeve **117** is also rotatably received in the plate **115** and, at its lower end, constitutes a drive spindle for the endless threads which will be described later. The spindle **117** is rotatably driven by means of pulley **130** by means of belt **125***a* which, as shown in FIGURE 4, derives its power from the motor **122**.

Centrally disposed between the plates **113** and **115** and carried by the support rods **114** is a plate **131** having a central aperture **132** through which the elongated article which is to receive the painted stripe is passed. This plate **131** carries, spaced about its periphery, a plurality of guide pulleys which also will be described in detail below.

Mounted on plate **113** are a plurality of circumferentially spaced paint reservoirs **133** which have openings **134** in their upper surfaces and through which openings extend arms **135** which also carry pulleys to guide the endless thread **136** about its closed path. The elongated article to be striped, passes through the striping head **110** and is guided along its path coaxial with the axis of rotation of the striping head **110** by a guide member **137**. The endless thread **136** is looped about a first pulley **138** which is immersed in the paint contained within the paint reservoir **133** and from this pulley **138** passes over a second guide pulley **139**, from there over a third guide pulley **140**, over guide pulley **141**, thence around the spindle **142** for at least one and preferably two or three convolutions, thence off the spindle **142** and onto guide pulley **143**, over guide pulley **144**, and around and in contact with the elongated member **118**, over guide pulley **145**, back over the opposite side of pulley **139** and around pulley **138**.

As the spindle **142** is rotated by belt **125***a*, the thread **136** will be driven about its closed path and, since pulley **138** is immersed in paint, the paint will be picked up by the endless thread and applied to the elongated article **118** at its point of contact **146** in the form of a helical stripe due to the fact that the striping head **110** is rotating about the elongated article **118** simultaneously with the advancement of the article **118** in the direction of its length along

the axis of rotation. The direction of rotation of the spindle **142** will be in the direction of the arrow **147** superimposed upon pulley **130** so that the endless thread **136** will move in the direction of the arrows superimposed upon the thread between the pulleys **138** and **139**.

In FIGURE 3 there are shown three paint reservoirs each of which is associated with an independent system identical to that which has just been described by way of example. Each such system includes its own paint reservoir, its own set of guide pulleys, and its own area on spindle **142** about which the threads are wrapped so as to provide a frictional driving engagement therewith to move the individual threads about their respective closed paths. The threads will all contact the elongated article **118** at approximately the same point along its length, but spaced about the circumference of the elongated article so that as many as three independent helical stripes may be applied to the article simultaneously. Clearly, of course, the striping head may be operated with only one thread, or with two threads, or with all three threads operatively engaging the elongated article so as to apply one, two or three helical stripes simultaneously.

The pulleys **141** and **143** are located radially outwardly from one of three traction areas **150**, **151** and **152**, one of which is associated with each system in the striping head. Accordingly, the pulleys equivalent to pulleys **141** and **143** in the second system will lie radially outwardly from the traction area **151** and the pulleys equivalent to pulleys **141** and **143** in the third system will lie radially outwardly from the traction area **152**.

Conveniently, the entire striping head may be enclosed in a protective casing so that any paint which may be thrown radially outwardly due to the centrifugal forces set up by the rotation of the striping head will not splatter the surrounding areas.

It has been found necessary to drive the traction spindle at a speed of rotation slightly slower than the speed of the rotation of the striping head itself. The speed of rotation of the spindle may be derived from the following formula:

$$\text{R.p.m. spindle} = < \text{R.p.m. head} \left[\frac{1-\sqrt{P2+D2\pi 2}}{d\pi}\right]$$

where

P is the pitch of the helical stripe,
D is the diameter of the spindle, and
d is the diameter of the wire or cable.

The speed differential between the striping head and the traction spindle may be varied in accordance with the quality of the stripe which it is desired to produce.

In both the embodiments shown in FIGURE 1 and the embodiments shown in FIGURE 3 the width of the stripe may be varied by varying the thickness of the endless threads which are employed and the quality of the stripes may be controlled by permitting a certain amount of controlled slip to take place between the endless threads and the elongated article.

In both the embodiments shown in FIGURE 1 and FIGURE 3 it may be convenient to provide a drying chamber through which the elongated article may pass after receiving the painted helical stripe. Conveniently, this drying chamber will be located between the striping head and the traction device which advances the elongated article in the direction of its length along the axis of rotation of the striping head. Such a drying chamber is shown schematically at **155** in FIGURE 4. The drying chamber may constitute an area of elevated temperature through which heated air may be circulated, hot air entering the drying chamber through conduit **156** and leaving through conduit **157**. Alternatively, the drying may be effected by any other known means which may be found to be convenient. A drying chamber is not shown in FIGURE 2 although, in accordance with the teaching of FIGURE 4, if it is used it would normally be positioned between the traction drum **19** and the striping head **10** and would surround the elongated article **18** as it issues from the striping head **10**.

Although the invention has been described in detail with reference to two alternative embodiments it is to be understood that this description is by way of example only and that minor modifications may be made in the arrangement of parts without departing from the spirit of the invention which is defined in the appended claims.

What I claim as my invention is:

1. A machine for applying a helical stripe to an elongated article comprising: a striping head having an axis about which it may be rotated, means to rotate the striping head, means to advance the elongated article in the direction of its length through an axial aperture in the striping head, and paint applying means carried by the head and including a paint saturated endless thread lying in a closed path and supported by guide means, the endless thread contacting the elongated article and being advanced in its path by frictional engagement with the elongated article to apply paint thereto in a helical stripe as the elongated article is advanced through the head in the direction of its length simultaneously with the rotation of the head about the axis.

2. A machine as claimed in claim 1 in which there is more than one endless thread carried by the marking head, each such endless thread having its own independent paint supply system and support means to hold the thread in contact with the elongated article along its own helical path whereby more than one stripe may be simultaneously applied to an elongated article.

3. A machine for applying a helical stripe to an elongated article comprising: a striping head having an axis about which it may be rotated, means to rotate the head, means to advance the elongated article in the direction of its length along the said axis through an axial aperture in the striping head and paint applying means carried by the head and including a paint saturated endless thread lying in a closed path supported by guide means carried by the head, the guide means supporting the endless thread in frictional contact with the elongated article to apply paint thereto in a helical stripe as the elongated article is advanced through the head in the direction of its length simultaneously with the rotation of the head about its axis.

4. A machine as claimed in claim 3 in which the endless thread contacts the elongated article at an angle to the length of the article.

5. A machine for applying a helical stripe to an elongated article comprising: a striping head having an axis about which it may be rotated, means to rotate the striping head, means to advance the elongated article in the direction of its length through an axial aperture in the striping head, and paint applying means carried by the head and including an endless thread lying in a closed path supported in frictional contact with the elongated article by pulleys carried by the head, a paint supply in the path of the endless thread to continuously supply paint to the thread, so that the endless thread in contact with the elongated article will apply paint thereto in a helical stripe as the elongated article is advanced through the head in the direction of its length simultaneously with the rotation of the head about the axis.

6. A machine as claimed in claim 5 in which the paint supply in the path of the endless thread includes a paint reservoir and an absorbent wick in contact with the paint at one side and in rubbing contact with the endless thread on another side so that as the endless thread is driven through its closed path it will pick up paint from its contact with the wick.

7. A machine as claimed in claim 5 wherein the paint supply includes a paint reservoir and a pulley immersed in the paint, the endless thread passing over the pulley and therefore through the paint.

8. A machine as claimed in claim 5 in which the speed of rotation of the striping head and the speed of advancement of the elongated article are related to produce a helical stripe of the desired pitch.

9. A striping machine for applying a continuous helical stripe of striping material to an elongated article, comprising a marker head having an axis, means for advancing the article through an axial aperture in the marker head in the direction of its length along said axis, a reservoir for the striping material mounted on the marker head, an endless thread extending helically around the article and defining a continuous path from the article to the reservoir and back to the article, a guide system mounted on the marker head to guide the thread around said path, and means for rotating the marker head about said axis, so that as the marker head rotates and the article is advanced, the marker head rotating at a predetermined speed relative to the rate at which the article is advancing, the thread is drawn around said path, due to the friction between the thread and the article, picks up striping material from the reservoir, carries it to the article and applies a continuous helical stripe to the article.

10. A striping machine as claimed in claim 9, wherein said axis of the marker head is a central axis.

11. A striping machine as claimed in claim 9, including means mounted on the marker head, whereby said guide system can be adjusted to vary the pitch of the helical stripe applied to the article.

12. A striping machine for applying a continuous helical stripe of striping material to an elongated article, comprising a marker head having an axis, means for advancing the article through an axial aperture in the marker head in the direction of its length along said axis, a reservoir for the striping material mounted on the marker head, an endless thread, first and second guide means for the thread mounted on the marker head, the thread extending helically around the article and defining a continuous path from the article around said first guide means to the reservoir, through a portion of the reservoir, and from the reservoir around said second guide means back to the article, and means for rotating the marker head about said axis, so that as the marker head rotates and the article is advanced, the marker head rotating at a predetermined speed relative to the rate at which the article is advancing, the thread is drawn around said path, due to the force of friction between the thread and the article, picks up striping material from the reservoir, carries it to the article and applies a continuous helical stripe of striping material to the article.

13. A striping machine as claimed in claim 12 wherein said axis of the marker head is a central axis.

14. A striping machine as claimed in claim 12 wherein said first and second guide means are wheels which rotate as the thread is drawn around said path.

15. A striping machine as claimed in claim 14, including means mounted on the marker head whereby at least one of said wheels can be adjusted to vary the pitch of the helical stripe applied to the article.

16. A striping machine for applying a continuous helical identification stripe of striping material to an electric wire, comprising a marker head having an axis, means mounting said marker head for rotation about said axis, means for advancing the wire in the direction of its length along said axis, a reservoir for the striping material, means mounting said reservoir for rotation about said axis, said reservoir having an open end covered by two felt seals one on top of the other, an endless thread, first and second wheels mounted on the marker head to guide the thread, the thread extending spirally around the wire and defining a continuous path from the wire around said first wheel to the reservoir, between the felt seals and from the reservoir around said second wheel back to the wire, and means for rotating the marker head about said axis so that as the marker head rotates and the wire is advanced, the marker head rotating at a predetermined speed relative to the rate at which the cable is advancing, the thread is drawn around said path, due to the force of friction between the thread and the wire, picks up striping material from the seals, carries it to the wire and applies a continuous helical stripe of striping material to the wire.

17. A striping machine as claimed in claim 16, wherein said axis is a central axis.

18. A striping machine as claimed in claim 16, including means mounted on the marker head, whereby said first and second wheels can be adjusted to vary the pitch of the helical stripe applied to the wire.

19. A striping machine as claimed in claim 18, including means mounted on the marker head whereby the felt seals can be adjusted to vary the amount of striping material picked up by the thread as it is drawn between the felt seals.

References Cited in the file of this patent

UNITED STATES PATENTS

1,944,822	Church et al.	Jan. 23, 1934
2,840,036	Wynn	June 24, 1958