June 3, 1952 E. POLLARD 2,598,829

ENDLESS DRIVING BELT

Filed Aug. 21, 1946

FIG. 1.

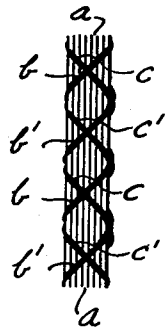


FIG. 2.

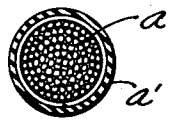


FIG. 3.

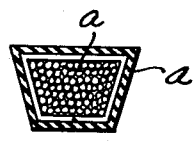


FIG. 4.

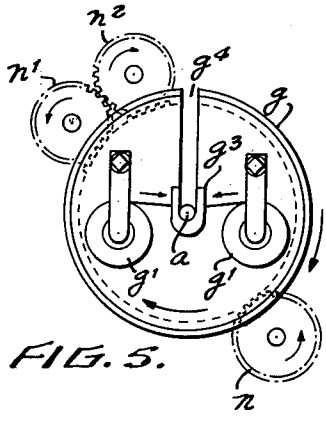
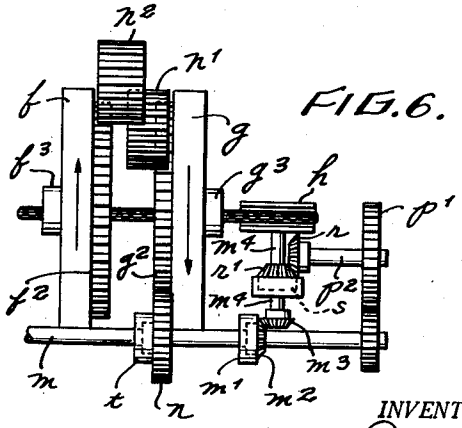


FIG. 5.

FIG. 6.



INVENTOR.
Ernest Pollard
BY
Mudael & Thomas
Agt

Patented June 3, 1952

2,598,829

UNITED STATES PATENT OFFICE

2,598,829

ENDLESS DRIVING BELT

Ernest Pollard, Bradford, England

Application August 21, 1946, Serial No. 692,015
In Great Britain September 1, 1945

1 Claim. (Cl. 57—141)

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The invention relates to endless circular-section driving belts and to means for producing them.

It is known to produce a driving belt or band by braiding a core, composed of rubber-coated cotton threads arranged in parallel longitudinal relation, with another rubber-coated thread or threads and subjecting the belt or band so produced to moulding pressure and heat-treatment.

A belt according to the present invention is composed of a core of cotton threads, which may or may not be rubber-coated, arranged in parallel relation and provided with an external covering of threads, but it is differentiated from the previously-known belts in that the threads used to form the external covering are wrapped spirally about the core, some in one direction and some in the opposite direction, in such a manner that each layer or series of the threads extending in one direction overlays and supports those in the preceding layer and which extend in the opposite direction.

An important feature of the invention resides in the means I employ to produce an endless belt of the form or construction just described.

In the accompanying drawings,

Fig. 1 shows a portion of belt in the process of manufacture;

Fig. 2 shows a portion of finished belt or circular section;

Fig. 3 shows a portion of a finished belt of V-section;

Fig. 4 is a diagrammatic plan view of the means I employ to produce a belt according to the invention;

Fig. 5 is a side view, looking in the direction of the arrow **5** in Fig. 4, of one of the spinners I employ to apply the covering of spirally-wrapped threads to the core; and

Fig. 6 is a partial front elevation looking in the direction of the arrow **6** in Fig. 4.

Referring to the drawings, *a* represents a core of cotton threads arranged in parallel relation, and *b*, *b'*, and *c*, *c'* (see Fig. 1) two sets of wrapping threads which are wrapped spirally about the core at the same pitch in opposite directions, each set composed of two parallel threads spaced from each other for half the pitch of the sets of wrapping threads, so that the threads of one series overlay those of the other series which extend in the opposite direction forming crossing points located along four equally spaced longitudinally extending lines. In Fig. 1 I have shown, for purposes of illustration, one layer only of each series of wrapping threads, but it will be

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understood that any number of layers of the wrapping threads may be provided and, as will appear later, the successive layers do not directly overlay one another but become spaced apart longitudinally, so that an even distribution over, and covering of, the core is effected.

The threads employed to form the core and to form the covering for the core may be rubber-coated and the belt, after its formation, be subjected in known manner to pressure or moulding and to heat-treatment, and if desired the completed belt may, before being moulded and heat-treated, be dipped into a rubber solution or have a covering of rubber or other material applied to it, say by wrapping it spirally with a tape of the covering material. Alternatively to the employment of rubber-coated threads in the formation of the belt I may employ rubber-coated threads for the core and apply spiral wrappings of uncoated thread, the completed belt being then provided with a coating of rubber or the like either by dipping it in a solution of the coating material or by wrapping it spirally with a tape composed of the coating material. In some cases it may suffice to employ uncoated threads both for the core and for the spiral wrapping and apply to the completed belt a coating of rubber or the like either by dipping or by wrapping with a tape of the coating material, or it may suffice to employ rubber-coated threads for the core and spiral wrapping and perform the moulding and heat-treatment without application of any rubber or like coating. In Fig. 2 I show a cross section of a round belt, and in Fig. 3 a cross section of a V-belt, with an outer covering *a'* in each case of rubber or the like.

Referring now to Figs. 4, 5 and 6, which illustrate the means I employ to form the belt, a^2, a^2, represent two rotatably-mounted bobbins or supply packages of core thread. From these bobbins the threads are led about a peg *d* and through a guide eye *e*, and thence through the hollow centres of two spinner members *f* and *g* mounted rotatably in axial alignment. After passing through the spinners *f* and *g* the threads are led about a driven draw pulley *h* and thence about a tension pulley *i* located a distance from the spinners determined by the length of the belt to be produced. From the tension pulley the threads are led around a guide pulley *j* and again through the spinners to the draw pulley *h*.

When drive is imparted to the draw pulley *h* in the direction of the arrow in Fig. 4, conveniently by the means to be described later, threads to form a core are drawn from the bobbins or

packages a^2 and about the pulleys h, i and j until the required number of coils have been formed to provide a core of the desired ultimate diameter. To facilitate production, the pulley j is shown as being connected by a cord or belt j' to a pulley j^2 on the spindle of a counter j^3 arranged to indicate the length of thread drawn off to form the core. Once the correct figure for a belt of given dimensions has been ascertained it is simply necessary, when forming a core, to continue the drawing-off of threads from the source of supply until the counter shows that figure.

Whilst I have shown two bobbins a^2 it will be obvious that a single bobbin, or more than two, might be provided.

When the core a has been formed, and the core-forming drive to the draw pulley h stopped, the ends leading from the supply packages a^2 are severed and secured to the core (if rubber-coated threads are employed, these being "sticky," it is simply necessary to press the severed end or ends of the threads to the core). The process of covering the core is then commenced as follows: On the outer side of each of the spinner members f and g there are mounted in this instance two flat bobbins f', f', and g', g', (though more may be employed) containing thread from which the covering of the core is to be formed. From these bobbins the threads are passed through guides f^3 and g^3 on the spinner members and are then wrapped about and secured to the portion of the core a which extends through the aligned bores of the spinners.

The spinners are now rotated, by means shortly to be described in opposite directions whilst the draw pulley h is again rotated in the same direction as before, that is to say whilst the core was being formed. The result of this rotation of the spinners and traverse of the core through the spinners is to cause threads, as indicated in Fig. 1, by b, b' and c, c', to be drawn from the bobbins on the respective spinners and wrapped spirally around the core, the threads b, b', delivered by the bobbins of one rotating spinner being wrapped at an opposite angle or "hand" to those delivered by the bobbins of the other spinner.

The operation of the spinners is continued until the required number of layers of wrapping thread have been laid about the core to afford, after moulding or pressing, a belt of required diameter or sectional area. As in the formation of the core, the counter j^3 is employed to indicate when the required length of wrapping threads has been applied.

As means for driving the draw pulley h and the spinners, I have shown a driven shaft m receiving power from a suitable source such as a reversing electric motor. This shaft carries a unidirectional clutch m' of suitable construction adapted to drive, through bevels m^2 and m^3, a short vertical shaft m^4 on which the draw pulley h is mounted. A unidirectional clutch t on the shaft m is adapted to drive in one direction a gear n which meshes with a gear g^2 carried by the spinner g and a gear n' connects, through a gear n^2, the gear g^2 with a gear f^2 on the spinner f. It will be apparent that as the spinner g is rotated, rotary motion in the opposite direction is imparted to the spinner f.

Also fast on the drive shaft m is a gear p which meshes with a gear p' on a short shaft p^2. A bevel r on this shaft p^2 meshes with a bevel r' fast with one member of a uni-directional clutch

s, the other member of which is fast with the vertical shaft m^4 carrying the draw pulley h.

The unidirectional clutches s and t are arranged to drive in one direction and the clutch m' in the opposite direction. Thus, as the shaft m is driven in one direction, drive is transmitted through the clutch m' to the shaft m^4 and thus to the draw pulley h, the clutches s and t meanwhile "free-wheeling." When the direction of rotation of the shaft m is reversed, drive is transmitted through gears p and p', shaft p^2, bevels r and r' and clutch s to the draw pulley h, and simultaneously through clutch t and gear n to the gear g^2, thus driving the spinner g. By means of gears n', n^2 and f^2 the drive is also transmitted to the spinner f, but in the opposite direction to that in which the spinner g is rotating. During this time the clutch m' is free-wheeling.

The application of successive layers of wrapping threads to the endless core results in a shortening, or rather a reduction in the effective diameter of the belt and the tension pulley i is therefore so mounted as to be adjustable towards and away from the spinners, so that as the wrapping of the core proceeds the said pulley can be gradually moved nearer to the spinners. This gradual shortening of the belt as the core is being wrapped causes successive layers of wrapping threads to be distributed over the length of the core. The adjustability of the pulley i also enables the length of belt produced to be varied.

To enable the core threads to be introduced into the bores of the spinners, and the completed belt to be removed, each spinner has a radial slot such as g^4 (Fig. 5) extending from the central bore to the periphery. By bringing the slots in the two spinners into alignment the core threads can be slipped into position or the completed belt removed.

It is generally desirable that a belt, when completed, shall be of determined weight, in addition to being of determined dimensions. The method I employ of applying the wrapping threads to the core is of advantage in this direction. If a belt should exceed the desired weight, the outer spirals of wrapping thread can be removed as necessary, and such removal has appreciable effect on the finished dimensions of the belt after moulding or pressing and heat treatment. This adjustment of weight, by removing surplus wrapping thread, is impossible in the case of a braided core.

Whilst I contemplate, and prefer to use, either rubber-coated threads in the formation of my belts, or the dipping of a formed belt into rubber solution or its wrapping with rubber or like tape before moulding or pressing and heat treatment, there may be cases such as where only a light drive is required, in which a core constructed in the manner I have described but composed of uncoated yarns can be used without any rubber or like covering and even without being subjected to any moulding or pressing operation.

Finally, I wish it to be understood that the invention may be applied to any suitable one of the materials generally known as plastics, and the term "coating" is intended to imply impregnation with a suitable solution.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

An endless driving belt, comprising in combination, a core composed of substantially parallel threads; and two sets of wrapping threads wound spirally about said core in opposite directions,

and at the same pitch, each set of wrapping threads composed of two parallel threads spaced from each other for half said pitch of said spirally wound sets of wrapping threads whereby in each full turn of said sets of wrapping threads two pairs of diametrically located crossing points are created, which crossing points are located in the finished driving belt along four equally spaced lines on the surface of said core extending substantially parallel to the threads forming said core and providing a symmetrical contour for the finished driving belt.

ERNEST POLLARD.

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