

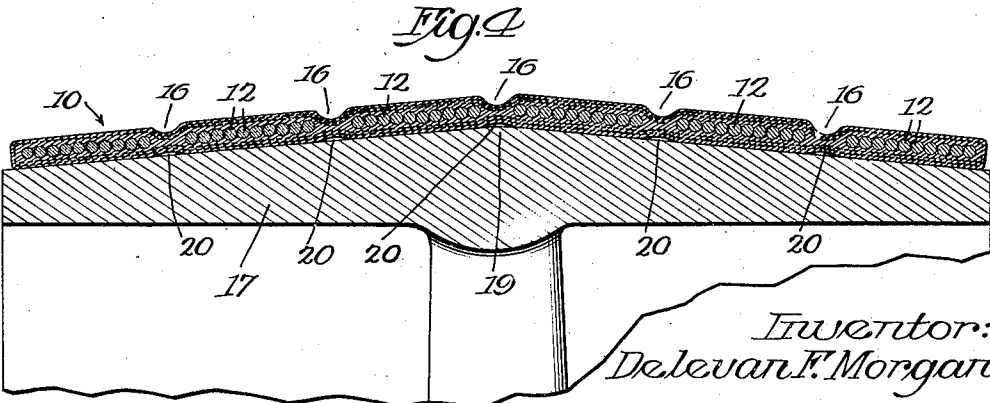
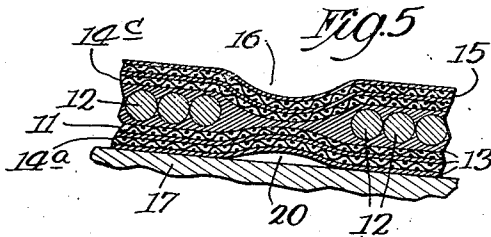
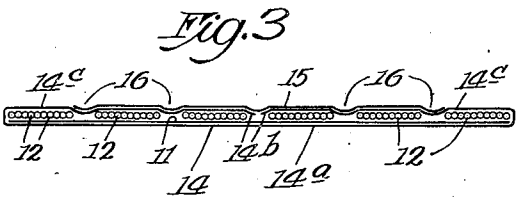
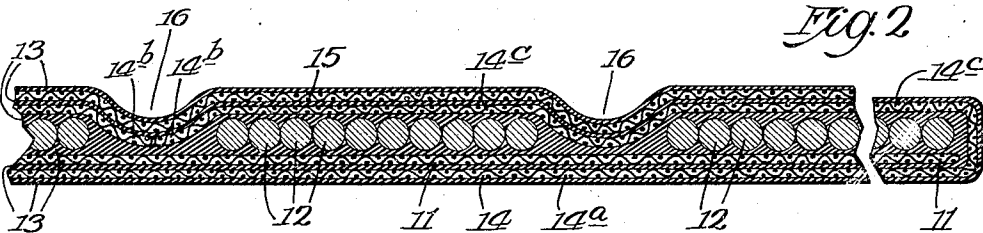
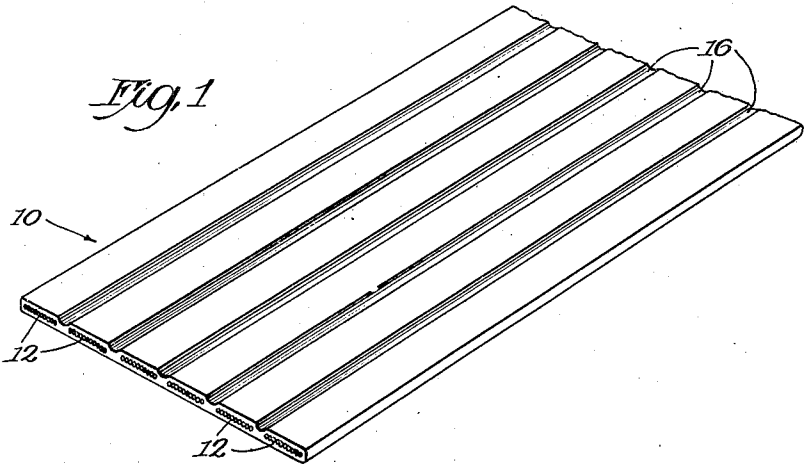
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BELT

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2,107,013

BELT

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Continuation of application Serial No. 40,275,
September 12, 1935. This application Febru-
ary 21, 1936, Serial No. 65,096

4 Claims. (Cl. 74-232)

This invention relates to belts and more particularly to a power transmission belt comprising rubberized fabric and cords of such a novel construction as to provide for an increased tractive effort and flexibility with a resulting increased driving efficiency and prolongation of belt life.

Heretofore, it was found that where flat belts are employed with crowned pulleys, the point of greatest tension on the belt is at the highest portion of the pulley crown, because of the greater diameter of the pulley at this point. The most effective driving is done at this high point and its adjacent surfaces while the traction is lower and the driving efficiency less at the outer portions of the belt and pulley. This uneven traction is due to the stiffness of the belt and its inability to adapt itself to the contour of the crowned pulley during the driving operation. This stiffness is increased as the speed of the belt progresses, the outer portions of the belt away from the high point of the crown tending to assume a raised position out of contact with the lower portions of the crown, thereby reducing the driving efficiency and putting the greater burden of the pulling load upon the central portion of the belt which is in contact with the surface of the high portion of the pulley crown.

Another factor reducing the tractive efficiency of the average belt on both crowned and straight pulleys is the formation of an air cushion between the pulley and belt. As the belt moves at normal operating speeds, a layer of air adjacent its pulley contacting surface is carried along and compressed between the pulley and the belt, forming an air cushion upon which the belt rides up out of contact with the pulley. As the speed of the driving pulley is increased, an increasing amount of air intervenes between the belt and the pulley, until a point is reached when the belt slips off. This latter disadvantage is a limitation on the amount of power that can be transmitted and also on the rate of speed at which such belts may be safely driven.

Therefore, it is an object of my invention to provide a belt having a superior quality of traction.

Another object is the provision of a belt having lateral and longitudinal flexibility enabling the belt to closely adapt itself to the contour of a crowned pulley.

A further object is the provision of a belt having the ability to prevent the formation of an intervening air cushion between the belt and

the pulley, thereby increasing the ability of the belt to cling to the pulley surfaces.

A still further object is the provision of a belt having a maximum flexibility and the ability to prevent the formation of an air cushion between the belt and the pulley so as to enable it to closely adhere to the pulley surface throughout its entire width.

Another object is to provide a belt of extreme lightness and maximum strength so as to insure a maximum life of operation.

Another object is the provision of a belt having its principal load carrying elements insulated and protected from foreign injurious substances encountered during manufacturing operations.

Other and further objects of the invention will appear as the description proceeds, reference being had to the accompanying drawing in which:

Figure 1 is a perspective view of a portion of a belt embodying my invention;

Fig. 2 is an enlarged lateral cross-section through a portion of the belt;

Fig. 3 is a diagrammatic sectional view of the belt;

Fig. 4 is a sectional view through the belt and a crowned pulley while in driving relationship;

Fig. 5 is an enlarged sectional view of a grooved portion of the belt in driving position on a portion of a crowned pulley.

This application is a continuation of my co-pending application for United States Letters Patent for "Belts", Serial Number 40,275, filed September 12, 1935.

Referring to the drawing, there is illustrated my improved belt 10 which is comprised of a plurality of fabric webs and cords held together by a coating of rubber material in which they are embedded. More particularly, the belt 10 has a ply or web of fabric 11 which is substantially the width of the completed belt end which is coated with an elastic bonding material or rubber solution 13. Extending lengthwise of the ply 11 and adhesively affixed thereto are a plurality of substantially inextensible cords 12 which are arranged in spaced groups transversely of the ply, the spaces between the groups being substantially less than the width of the groups. These groups are also maintained as units by the bonding material 13. An outer fabric ply or web 14, also coated with the bonding material, is provided in a dimension of slightly more than twice the width of the finished belt so that it can be wrapped around the web 11 and the cords 12 to enclose and protect the same from injurious con-

tacts and substances encountered in certain industrial fields. Another fabric web 15, also coated with the rubber material, is disposed as a seal upon the surfaces of the edge portions 14^b of the web 14 which have been folded into abutting relation over the cords 12. These above elements are vulcanized into a permanent union in a mold which depresses the web 11, the edges 14^a of the web 14, the web 15, and the bonding material to form a plurality of grooves 16 extending lengthwise of the belt and parallel to the cords in the portions of the upper surface 14^c between the spaced groups of cords. The lower surface 14^a of the ply 14, however, is formed flat.

In Fig. 4, there is illustrated my improved belt 10 in driving position on a crowned pulley 17, although it must be understood that the belt 10 is applicable with equal efficiency to other types of pulleys. As constructed, the belt possesses a limited amount of elasticity that is sufficient to allow the belt to be stretched into operable position over the driving and driven pulleys with a reserve amount of elasticity remaining in the same to allow for any further stretch encountered during operation. The aforescribed belt structure is designed for a maximum of tractive efficiency. In operation, it is preferably the lower surface 14^a of the belt which is in driving contact with the pulley 17.

Since a crowned pulley has its greatest diameter at the highest point 19 of the crown, it is obvious that the greatest stretch of the belt occurs at its central portion causing the two central groups of cords to stretch longitudinally to a greater extent than the outer cord groups adjacent the edges of the pulley. These outer cord groups away from the pulley crown remain substantially unaffected by the stretch of the central cord groups, and are able to closely adhere to those surfaces of the pulley where the diameter is reduced. This ability of the belt to readily adapt itself to the contour of the crowned pulley 17 is due to its great lateral and longitudinal flexibility. By providing laterally spaced groups of substantially inextensible cords and by providing grooves in the upper surface of the belt between the cord groups, the effect secured is that of a plurality of individual belts of different lengths adapted to the various diameters of a crowned pulley although the belt is a strong unitary structure. The portions of the belt between the cord groups being substantially more elastic and of lesser section allow the cord groups to move longitudinally relatively to each other and also permit great lateral flexing which would be reduced to a minimum were the cords extended throughout the width of the belt. Thus, the belt may be curved laterally to adapt itself to the crown contour so that the outer belt portions will closely adhere to the outer pulley surfaces without being raised out of engagement therefrom when the central portions of the belt are stretched to a greater degree because of the greater pulley diameter at their points of contact.

The tractive efficiency of the belt is further increased because of the ability of the belt to prevent the formation of an undesirable air layer or cushion which tends to form between the belt and the pulley. As the belt 10 is bent around the pulley under driving tension, a relatively shallow groove 20 is formed in the pulley contacting surface 14^a between each group of load-bearing cords and under each groove 16 of the upper sur-

face, the grooves 16 thus reversing themselves. The formation of these grooves 20 is due, perhaps, to the coaction of two forces. As the belt contacts the pulley under driving tension, the relatively inextensible cords 12 in groups squeeze down on the softer cushioned portions formed by the two plies 11 and 14^a embedded in the rubber solution 13, these plies expanding laterally in both directions to a limited extent, with the result that a buckling upwardly of the belt portions between the groups of cords occurs. The buckling is upwards because of the unyielding surface of the pulley and because the relatively elastic portions between the cord groups are under a relatively lesser degree of tension. A second factor which may also cause the formation of the grooves 20 is the stretching of the upper ply 14^c. In riding around the pulley, the upper ply 14^c is stretched to such an extent that the portions forming the grooves 16 are pulled up slightly, thereby reducing the depth of the grooves 16 and pulling up the other two plies which are adhesively united to the under surface of the ply 14^c at a plurality of points. It is to be understood that the two above factors are merely theories as to formation of the grooves, but the fact remains that whatever may be the cause for formation, are created as the belt comes into contact with the pulley and is curved about its surface. These shallow grooved portions are the only points of the pulley-contacting surface which maintain their original unworn appearance after a long period of operation.

The grooves 20 prevent the formation of the undesirable air layer apparently for the following reason: As the cords 12 squeeze down on the two underlying plies 11 and 14^a, the air carried by those portions of the surface 14^a under the cord groups is squeezed or pumped laterally into the newly formed grooves 20 which are filled up with this air and through which it may escape longitudinally of the belt. Another factor causing the air to be drawn into the grooves 20 is that when they are formed there is a tendency to create a vacuum at these groove points so that the unequal air pressure causes the air on the under surface to rush into the grooves. In a sense the air may be said to be sucked from the surfaces under the cord groups as the grooves 20 are formed.

The ability of the belt to adapt itself to the contour of the pulley and its ability to prevent the formation of an air cushion between itself and the pulley promotes and increases the tractive efficiency with beneficial results. More power will be transmitted with less loss. Also the life of the belt will be prolonged since the wear will be equalized with the outer belt portions bearing their share of the load along with those portions contacting the top of the crown.

Although the foregoing description has set forth one form of belt, it will be understood that changes and modifications may be resorted to without departing from the spirit and scope of the appended claims.

I claim:

1. A power transmission belt comprising a plurality of cords extending longitudinally of said belt and arranged in a series of spaced groups across substantially the full width of said belt, the space between said groups being of substantially less width than the width of said groups, a web supporting said groups of cords, and an elastic bonding material in said space and joining said cords and said supporting web together

while permitting limited relative longitudinal and transverse movement between said groups of cords, said bonding material being formed with a groove in one surface parallel to said cords and being flat on its other surface, whereby a normally flat pulley contacting surface is formed in which a longitudinal air relief groove is created under the first mentioned groove during operation of the belt over a pulley.

2. A power transmission belt comprising a plurality of cords extending longitudinally of said belt and arranged in a series of spaced groups across substantially the full width of said belt, the space between said groups being of substantially less width than the width of said groups, an elastic bonding material in said space and joining the cords together while permitting limited relative longitudinal and transverse movement between said groups of cords, said bonding material being formed with a groove in one surface parallel to the cords and being flat on its other surface, and a fabric cover enclosing and following the contour of the aforementioned elements, whereby a normally flat pulley contacting surface is formed in which a longitudinal air relief groove is created under the first mentioned groove during operation of the belt over a pulley.

3. A power transmission belt comprising a plurality of cords extending longitudinally of said belt and arranged in a series of spaced groups across substantially the full width of said belt, the space between said groups being of substantially less width than the width of said groups, a web supporting said groups of cords, an elastic

bonding material in said space and joining said cords and said supporting web together while permitting limited relative longitudinal and transverse movement between said groups of cords, said bonding material being formed with a groove in one surface parallel to said cords and being flat on its other surface, and a second web overlying and following the contour of the aforementioned elements, whereby a normally flat pulley contacting surface is formed in which a longitudinal air relief groove is created under the first mentioned groove during operation of the belt over a pulley.

4. A power transmission belt comprising a plurality of cords extending longitudinally of said belt and arranged in a series of spaced groups across substantially the full width of said belt, the space between said groups being of substantially less width than the width of said groups, a web supporting said groups of cords, an elastic bonding material in said space and joining said cords and said supporting web together while permitting limited relative longitudinal and transverse movement between said groups of cords, said bonding material being formed with a groove in one surface parallel to said cords and being flat on its other surface, and a fabric cover surrounding and following the contour of the aforementioned elements, whereby a normally flat contacting pulley surface is formed in which a longitudinal air relief groove is created under the first mentioned groove during operation of the belt over a pulley.

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