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METHOD OF MAKING LEATHER BELTINGS

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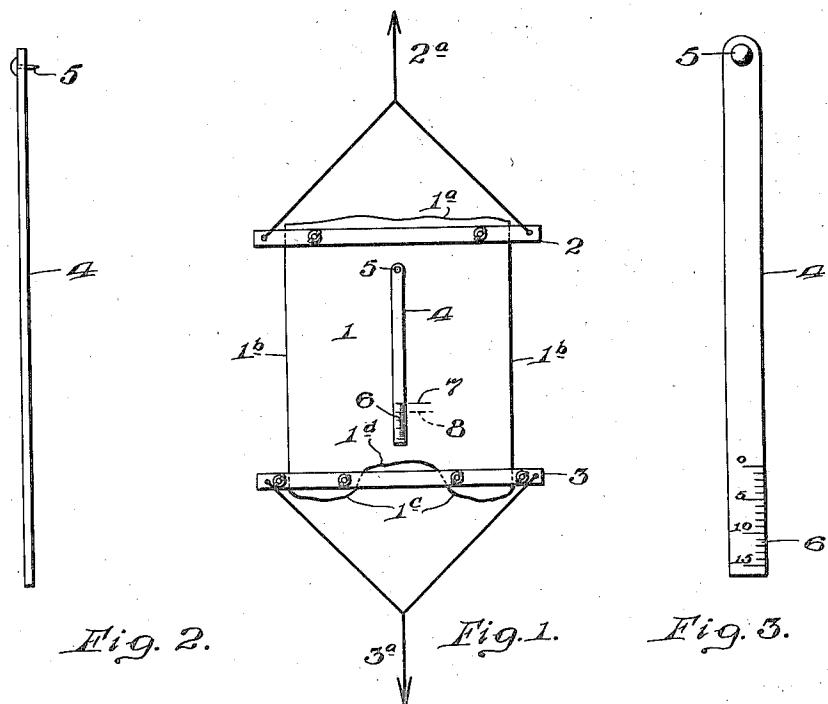


Fig. 2.

Fig. 1.

Fig. 3.

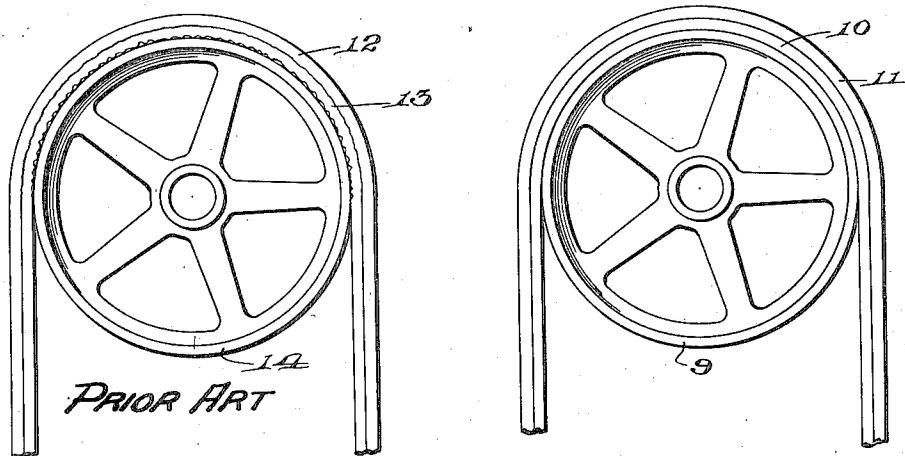


Fig. 4.

Fig. 5.

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## UNITED STATES PATENT OFFICE

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METHOD OF MAKING LEATHER  
BELTINGSJohn L. de Rabot, Philadelphia, Pa., assignor to  
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2 Claims. (Cl. 154—4)

The object of the invention is broadly to provide improvements in belting, but more especially in single or multi-ply belting, which is stretched to a substantially predetermined degree, as hereinafter described.

In considering the present invention, it is to be understood that while it has been practiced with respect to leather, it is conceivable that the invention would be equally applicable to other materials, which may possess similar characteristics to leather in that they can be initially stretched, and can then be set, dried, or otherwise treated, so as to permanently retain substantially only a predetermined residual degree of elasticity, wherefore the term leather is hereinafter used to embody any and all materials to which the invention is adapted.

An object of the invention, therefore, is to provide a belt of leather or equivalent material, comprising one, two or even more, plies unitarily cemented or otherwise secured together, so that the resulting structure is to all intents and purposes for commercial use exactly the same as tho the belt were formed of but a continuous single thickness of material in the first instance, but differing therefrom in that from each such ply, there has been previously removed as nearly as possible a definite portion of the elasticity, which is characteristic of the original leather or other material. In the case of multi-ply belting, the portions of initial elasticity removed from the two or more plies are unequal, so that under the influence of the corresponding different degrees or portions of elasticity still remaining in the said plies, they will stretch or yield inversely to different extents, as for instance when a given section of belting passes around a drum or pulley, there being no tendency in such case of the innermost ply becoming so compressed as to cause it to crinkle or crumple, and thereby present only spaced regions for frictional engagement or adhesion between the belt as a unit and said drum or pulley, instead of a continuous and unbroken frictional contact therewith.

At this point it should be mentioned that any two hides may not be exactly alike, due to such factors as differences in the sex, food, exercise, watering, feeding, health, etc. of the animal while yet alive and growing. Consequently, the exact amount of total stretch, of which a section of leather taken from a given hide is capable, may not be determined accurately without destructive tests, altho it can be very closely calculated from extensive experience, and so in removing a given portion of its initial elasticity from a section of

leather, in order to leave in such section as nearly as possible a pre-determined residual portion of its elasticity, it is to be understood that the latter value is substantially approximated, and the meaning and scope of the claims are to be understood accordingly, especially as experienced operators can very closely approach the desired degree of uniformity, or definite degrees of difference required, in the resulting product. 5

Another object is to provide a novel method by which this improved type of belting is made, the said method briefly comprising the stretching as definitely as possible to a predetermined degree the material for single-ply belting, or to different predetermined degrees the material for the two 15 or more layers, comprising the plies for the finished multi-ply belting, then, drying, setting, or otherwise treating such ply or plies in order to preserve the particular degrees of stretch to thereby as definitely fix in such plies corresponding but inversely related as definite degrees as possible of residual elasticity (in the multi-ply form), and then assembling such plies into unitary relation to form the finished belting, in which that ply possessing the greatest degree of residual 25 elasticity will be upon the side, which with the cutting and joining of the ends to form a continuous multi-ply belt, will be farthest removed from the surface of the pulleys around which such belt is to be used for power transmission or similar 30 purposes, and the ply possessing the least degree of residual elasticity thereby being placed against such pulleys, or as might be stated upon the radially inner side of the belt when passing around each such pulley. 35

Formerly, belts were employed in most instances for the transmission of power over relatively large diameter pulleys operating at relatively slow speeds, so that the frictional contact of the belt with the pulley was relatively large, and the 40 curvature of the belt was relatively slight. Under present day usage conditions by contrast are in general reversed. Electric motors, generators and all high-speed machinery require small diameter pulleys, running at high speeds, with the result that not only the area of contact between the belt and pulley is considerably reduced, but the belt is subjected to relatively abrupt and frequent flexing, which causes an almost continuous condition of internal friction, resulting in heat and 45 mechanical resistance which contribute to a materially shortened life of the belt.

The improved belt thus provides for all three of the desired characteristics of the most desirable type of belt, namely, increase of adhesion or co- 50 55

efficient of friction, to compensate for the frequently small area of contact with pulleys; reduction of stretch, to compensate for excessive elongation as the result of the belt being abruptly curved over small pulleys at high speed an almost infinite number of times in quick succession; and reduction of internal friction, in order to minimize the mechanical resistance and the destructive internal molecular action, while producing a higher tractive effort, resulting horsepower and longer life of the belt.

With these objects in view, the invention comprises further details of construction and the operation of the improved method, which are hereinafter fully brought out in conjunction with the accompanying drawing, in which

Fig. 1 is a diagrammatic plan view illustrating the general method of stretching a section of leather for use in the improved belting;

Fig. 2 is an enlarged side elevation of the gauge shown in Fig. 1;

Fig. 3 is a top plan view of the same;

Fig. 4 represents the side elevation of that portion of a multi-ply belt of the construction hereinafter used, as it passes around a pulley, and showing the inner ply crumpling over and in poor contact with the pulley surface; and

Fig. 5 is a similar view of the improved belting under the same conditions and providing an even and uniform engagement with the pulley.

Referring to the drawing, there is here shown a section of leather 1, to the longitudinally opposite end portions of which are connected in any suitable manner, any convenient type of clamps 2 and 3. Either of these clamps may be fixed, and the other moved relative thereto, wherefore Fig. 1 diagrammatically indicates by means of the arrows 2<sup>a</sup> and 3<sup>a</sup> relative movement upon the part of the two clamps in the opposite directions.

It will be noted that the leather section is preferably removed from such area of an original tanned hide, that the ends 1<sup>a</sup> and the sides 1<sup>b</sup> are relatively straight, while the opposite end is characterized by laterally spaced extensions 1<sup>c</sup>, gripped by the clamp 3, and an intermediate receding portion 1<sup>d</sup> which is purposely not held by said clamp. This permits the two clamps in cooperation to place a direct and greater stretch upon the laterally opposite portions of the leather section than upon the central or axial portion, which originally overlay the backbone or spine of the animal, thereby allowing for the relatively less elastic nature of said last-mentioned central or axial portion. The leather section illustrated represents substantially the outline and shape of a butt bend, but the improved method is not to be so limited as various other sections and relative widths can be used if and when desired.

When the clamps are fixed to the leather section, the latter is in moistened condition, being moistened at least to such an extent that the leather is capable of evidencing substantially its full degree of elasticity, and the clamps therefore are initially drawn apart or separated only far enough to hold the leather in relatively flat condition, but without any actual tension upon the same. With the said leather section and clamps thus arranged, the gauge 4 is laid upon the same with the sharpened pin 5 pressed thereto, in order to fix one end of said gauge with respect to a given portion of the section adjacent to one of the ends, of the latter, since the amount of elasticity to be removed, before the latter is dried and set, is gauged by the percentage of

elongation of the butt bend, or other section, as compared with its original length.

This gauge is provided adjacent to one end with a graduated scale 6, which may comprise any desired arrangement of graduations together with suitable indicia. For the purposes of illustration and in fact following the practice at present employed, there is a unit distance of one meter (39.37 inches) between the centre of the pin 5 and the "0" point on the scale. With this construction, and the gauge resting upon and attached at one end to the leather, as hereinbefore described, a suitable mark 7 is placed upon the latter in alignment with the "0" on the scale. Tension is then placed upon the clamps 2 and 3, so as to move said clamps in relatively opposite directions, the mark 7 being thereby drawn away from the pin 5 and along the graduated scale 6, until the desired degree of stretching is applied to the leather, the correct relative stretching of the central and lateral portions of the same being substantially assured, as hereinbefore described.

For instance, if the mark 7 moves along said gauge until it reaches the dotted line position 8 abreast of the graduation "5" upon the scale, it will show that the leather section beneath the gauge has been stretched five percent (5%), or other arbitrary portion, of its original length, with the obvious result that the remaining elasticity is inversely proportional to the amount of initial elasticity first removed in the stretching process herein described, it being understood that the graduations of said scale are computed more systematically and accurately than in the drawing herewith, which is intended merely to illustrate the broad principles involved. In any case after the leather has been stretched to the proper degree, it is held in that condition until it has dried sufficiently to maintain it in such stretched or partially elongated condition.

Following this same method, another leather section will be stretched, we will say eight (8) or nine (9) percent, and then dried or otherwise treated, in order to preserve such degree of stretch or artificial elongation. Having sufficient number of sections in each of the two or more groups, defined by their respective degrees of stretching, they are duly trimmed and so assembled in well-known manner as to make the desired length of belting, from which belts of various lengths may be cut, each such resulting belt thereby comprising two or more plies of leather (or equivalent material) properly cemented or otherwise secured together, and with the least stretched or elongated group of sections comprising the outer ply.

Having thus prepared a length of belting, and having connected its opposite ends to provide a transmitting belt of the desired length, said belt is so arranged that the ply, which has been stretched to the least degree is as before specified positioned upon the outer side, while the ply, which has been stretched to a greater degree lies upon the inner side of such belt.

In order to illustrate the relation of such improved belt to an ordinary pulley, reference is made to Fig. 5 which shows a representative pulley 9 around which extends a belt formed of an inner ply 10 and an outer ply 11, it being noted that said plies pass around and in contact with the surface of said pulley in uniform and regular arrangement, since the improved belt is characterized by such pliability, that it readily conforms to the relatively abrupt curvature of a pulley of relatively small radius, as a result of the outermost ply being capable of stretching suf-

ficiently to prevent an otherwise abnormal longitudinal compression of the innermost ply, which is in direct contact with the surface of the pulley. This condition is in direct contrast with that shown in Fig. 4, which illustrates an outer ply 12, and an inner ply 13 extending about the pulley 14, the outer ply having reached the full extent of its elasticity and then, being unable to stretch further, remains taut and bears the entire operating tension, with the result that the innermost ply is crumpled and is characterized by an immeasurable arrangement of internal molecular stresses, which tend to rapidly shorten the life of the belt, as well as permitting only spaced regions of the belt surface to frictionally engage the pulley about which it passes, since as has been customary heretofore, both or all of the plies of this belt have been treated alike, at least to the extent that no greater degree of the initial elasticity has been removed from the inner ply, than that which characterizes the outer ply of the finished belt.

In the construction of this improved belting, aside from the fact that its plies are all stretched to a greater or less degree, there is preferably employed only specially curried leather having a high adhesion characteristic, to insure a relatively much higher coefficient of friction between the finished and fitted belt and the surface of the pulleys over which it is designed to pass for the transmission of power. The stretch of the finished belt is accurately regulated or predetermined. Thus, while leather possessing only a minimum of residual stretch is used in single-ply belt, in multi-ply belts that ply which is adjacent to and adapted to directly contact with the pulley is made of the same leather as that of the single-ply belt, while the outer ply is of more elastic leather, or leather in which there is a greater degree of residual stretch, with the compound result that the internal friction is very much reduced, and the inner ply is not required to compress or contract under the greater tension otherwise applied to the outer ply, as the belt passes around a pulley, since the outer ply as before implied is capable of sufficient stretch

or elasticity, to permit it to extend thru the path of greater length about the arc of pulley-and-belt contact. For these reasons, this improved belt is not adapted nor is it intended for use for drives in which the belt is subjected to a reverse bend, as in the case of serpentine drives, or where idler or tension-take-up pulleys are present.

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

1. The method of making a multi-ply leather belt, which consists in soaking and softening the leather with water, then pre-stretching the plies going to make up the belting to respectively different degrees, to remove from such plies corresponding predetermined portions of their initial elasticity, then drying said plies while individually stretched, in order to preserve in them the corresponding but inversely related portions of residual elasticity, assembling said plies into a unitary laminated leather structure, comprising one ply having the greatest degree of residual elasticity, adapted to comprise the radially outer ply of a finished leather belt, as related to the pulleys over which such belt is intended to pass.

2. The method of making a multi-ply leather belt, which consists in first thoroughly soaking and softening the leather for each ply individually, then pre-stretching the leather for said plies individually, and substantially only longitudinally to respectively different degrees, to remove from such pieces of leather corresponding pre-determined portions of their respective initial elasticity, and then drying said pieces of leather, while individually stretched, in order to set and preserve in them, independently of any extraneous stretching means, the corresponding, but inversely related portions of residual elasticity, and finally assembling said pieces of leather as plies in a unitary laminated leather structure, comprising one ply having the greatest degree of residual elasticity, adapted to comprise the radially outer ply of a finished leather belt, as related to the pulleys over which such belt is intended to pass.

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