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Complete Specification Left, 25th June, 1913—Accepted, 7th Jan., 1914

PROVISIONAL SPECIFICATION.

Improvements in or relating to Pneumatic Tyres.

We, CHRISTIAN HAMILTON GRAY, India-rubber Manufacturer, of the India Rubber, Gutta Percha and Telegraph Works Company Limited, Silvertown, Essex, and THOMAS SLOPER, Engineer, of Southgate Villas, Devizes, Wiltshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to certain improvements in pneumatic tyres and one of the objects of our invention is to produce tyres which are less liable to transmit shocks to the car or other vehicle on which they are used than the tyres at present in use.

We prefer to employ for the restraining material of our improved tyre flexible and approximately inextensible cord such for instance as is used in the well-known Palmer cord tyres, but not to place the cords across the tyre in the strongly oblique position in which it is used in those tyres.

For the purpose of the present invention we arrange this cord so that it crosses and recrosses the tyre transversely the cords taking a strictly radial or almost radial position in relation to the wheel.

We are aware that it is not new to employ cord arranged in this manner but tyres hitherto made with radial cords have had the serious defect that they "roll" and are insufficiently stable for practical use, and the object of our present invention is to provide means to prevent such rolling while at the same time retaining the advantage to be gained by the employment of radially disposed restraining material.

Tyres made of woven canvas cut on the bias transmit road shocks to a much greater extent than the tyres made in accordance with this invention in which the restraining material built up of the cords is inextensible in a radial or lateral direction, but is extensible in a circumferential direction at the side walls of the tyre.

According to the present invention, we employ at the tread position of the tyre cover composed of the cord arranged as described and between the air chamber and the restraining material what we will call a "girder belt" composed of flexible inextensible material, so arranged that it limits the movement of the restraining material of the tyre in a lateral direction. This may be secured to the restraining material or only held against the same by the air pressure in the inner tube.

According to one method of carrying out this invention this belt may be constructed of "straight thread" fabric, woven canvas cut on the bias, or both, and so arranged that the threads cross diagonally from one edge of the girder belt to the other edge.

When the tyre is not deformed a belt so constructed and arranged inside the transversely disposed cords forming the restraining material of the tyre cover may have its threads or other material of which the girder belt is composed,

[*Price 8d.*]

comparatively slack, but when the tyre is flattened by contact with the road the curvature of the restraining material of the tyre or tyre fabric is reduced, and as the girder belt is on the inside of the curved fabric it is put under tension just when and where it is required to prevent undue lateral movement of the restraining material of the tyre cover.

In order to increase this tightening up of the threads of the girder belt we may separate the latter from the restraining material of the tyre cover by a layer of rubber.

If it is desired that the girder belt should be flat in cross-section we may employ a strip of rubber thicker in the centre and tapering off at each edge to fill the space between the girder belt and the tyre cover.

We do not confine ourselves to any particular construction of the girder belt and it will be understood that the above-described arrangement is given as an example only.

In addition to preventing undue lateral movement of the tyre cover our girder belt also prevents the radially-disposed restraining fabric from being unduly displaced when the tyre is used as a driving wheel.

It will be understood that if we placed the girder belt at the tread position of the tyre cover outside the curved transversely disposed restraining material, we should not get the desired result, because the distortion or flattening of the tyre where in contact with the road would then have the effect of slackening the restraining material of the girder belt instead of tightening it as above described.

We prefer to anchor the loops of cord at the edge of the restraining material of the tyre cover to metallic anchors combined with the canvas of the bead of the tyre cover. Such anchors may be substantially of the form already used in the Palmer cord tyres.

The side walls of the tyre cover between the canvas of the beads and the girder belt should be restrained in a radial or approximately radial direction only.

The restraining fabric may be built of one or more layers of cord, and if more than one layer is employed, the cords of each may be slightly out of the strictly radial position relatively to the wheel, those of one layer sloping in the opposite direction to those of the other.

It will be obvious that very considerable modifications may be made without departing from the spirit of the invention, for instance, wires may be used instead of, or in conjunction with, cord or canvas or fine wires may be woven into canvas to strengthen the latter or make it less extensible.

Where we refer to inextensible material we mean "approximately" inextensible, for instance, woven canvas is approximately inextensible in two directions following the warp and weft threads respectively, but fabric made of parallel cords or threads is approximately inextensible in one direction only.

Dated this 6th day of January, 1913.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.,
Chartered Patent Agents.

COMPLETE SPECIFICATION.

Improvements in or relating to Pneumatic Tyres.

We, CHRISTIAN HAMILTON GRAY, India-rubber Manufacturer, of the India Rubber, Gutta Percha and Telegraph Works Company Limited, Silvertown, Essex, and THOMAS SLOPER, Engineer, of Southgate Villas, Devizes, Wiltshire, do hereby declare the nature of this invention and in what manner the same

is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is for improvements in or relating to pneumatic tyres and has for its object to provide a tyre which shall combine in it certain advantages found separately in other tyres but not heretofore combined in one and the same tyre.

It is well-known that tyres in which the restraining fabric is built up of cords disposed radially to the wheel have considerable flexibility but have the serious defect that they roll and are insufficiently stable for practical use, and the object of the present invention is to combine with such a tyre, means which will prevent the said rolling without destroying the flexibility of the restraining material.

According to the present invention, the tyre-cover comprises in combination radially disposed flexible inextensible cords which constitute the sole restraining means at the sides of the tyre, and a girder-belt of flexible material inextensible in directions oblique to the circumferential direction of the tyre securely attached to the tread portion of the cover on the air-chamber side of the cord fabric to prevent rolling.

The girder-belt may be constructed of "straight-thread" fabric (*i.e.* fabric in which each layer is composed of parallel threads lying all in the one plane), woven canvas cut on the bias, or both, provided such material is always arranged that the threads cross diagonally from one edge of the girder-belt to the other to render the belt inextensible in directions oblique to the circumferential direction of the tyre as stated.

It will be appreciated that the cords may be placed slightly out of the strict radial position relatively to the wheel and so long as such displacement is not sufficiently great to lose the known flexibility found with tyres of what may be called the radial cord type, such arrangement will be understood to fall within the term "radial" used throughout this specification.

The effect of this girder-belt is different from what is obtainable by lining a tyre, whose restraining material is comprised of cords set radially to the wheel, with canvas over the whole inner face. Tyres of the radial type have been so lined, but this does not produce the same result as a girder belt, by which is intended to be understood a belt which only extends part way down the sides from the tread portion, for example rather less than half-way, and leaves spaces between it and the canvas of the edges of the tyres.

The cords of which the restraining fabric is built may be the same as those used in the well-known Palmer cord tyres but placed radially as described instead of in the strongly oblique position in which they are used in the Palmer cord tyres.

In the accompanying drawings which illustrate one method of carrying out this invention:—

Figure 1 is a section through the tyre, and

Figure 2 is a side elevation of a portion of a partly finished tyre showing the radial arrangement of the cords.

Like letters indicate like parts in the drawings.

The cords A may be anchored to wire staples A^1 in the manner well-known in Palmer tyres, but are arranged radially to the wheel. The usual rubber tread B may be built up on the restraining fabric, and on the inner side of the restraining fabric at the tread portion is placed the girder-belt C. This is shown as built up of several layers of fabric, that next to the restraining fabric being of such width as to extend about half-way down the side walls of the tyre and each successive layer being narrower, although this arrangement can obviously be reversed.

Some or all of the threads of each of these layers of the girder-belt lie diagonally to the length of the belt, that is, obliquely to the circumferential direction of the tyre.

The thread-fabric or canvas of which the beads D are made is conveniently extended up on both faces of the restraining fabric as shown at D^1, which also assists in preventing rolling, although such extension of the bead material up the sides is not in itself new and *per se* forms no part of the present invention.

When the tyre is flattened by contact with the road and the curvature of the restraining fabric is thereby reduced, the threads of the girder-belt are put under tension just when and where it is required to prevent undue lateral movement of the restraining fabric.

In the drawing the girder-belt is shown as placed direct on to the cords composing the restraining fabric, but if desired rubber may be interposed between it and the cords to increase the tightening up of the threads when the tyre is deformed.

It will be appreciated that if the girder-belt were placed on the tread side of the restraining fabric, the effect it is intended to produce would not be obtained because the distortion or flattening of the tyre would then have the effect of slackening the threads of the girder-belt instead of tightening them.

The side walls of the tyre-cover between the canvas of the beads and the girder-belt should be restrained in a radial direction only and this is effected by the cords A of the restraining fabric and thus the resiliency which belongs to tyres of the radial type is retained whilst the girder belt gives the requisite support against rolling.

More than one layer of cords may be employed if desired, and if there is a slight departure from the strictly radial position the cords of one layer would slope in the opposite direction to those of the other, it being of course understood that this slope is never such as to destroy the effect peculiar to what we have termed tyres of the radial type.

The "threads" of the girder-belt may be of wire or some of them may be of wire if desired, or wires may be woven into the fabric of which the belt is composed.

It will be understood that where the cords and girder-belt are spoken of as inextensible, this term is only used in an approximate sense as all such materials are somewhat extensible, but when used so that the pull on the material is in the direction of the length of the threads, the degree of extensibility is very small.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In a pneumatic tyre cover the combination of radially disposed flexible inextensible cords which constitute the sole restraining means at the sides of the tyre and a "girder belt" of flexible material inextensible in directions oblique to the circumferential direction of the tyre securely attached to the tread portion of the cover on the air-chamber side of the cord fabric to prevent rolling.

2. A pneumatic tyre cover constructed as described and illustrated in the accompanying drawings.

Dated this 25th day of June, 1913.

BOULT, WADE & TENNANT,
111 & 112, Hatton Garden, London, E.C.,
Chartered Patent Agents.

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Fig. 1.

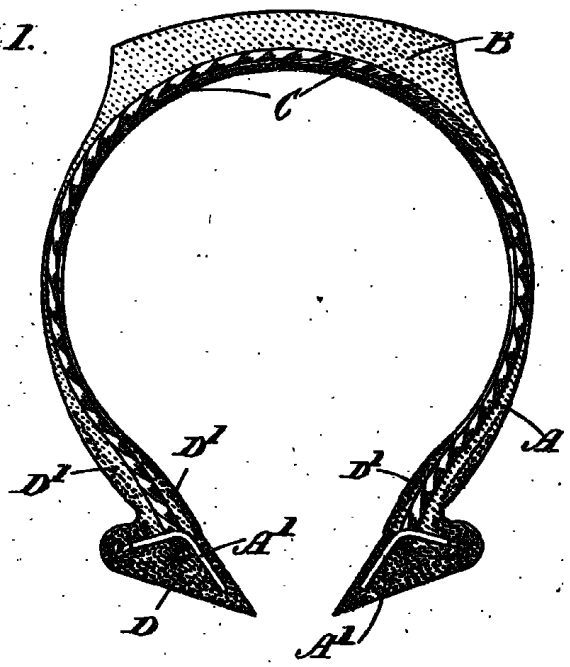
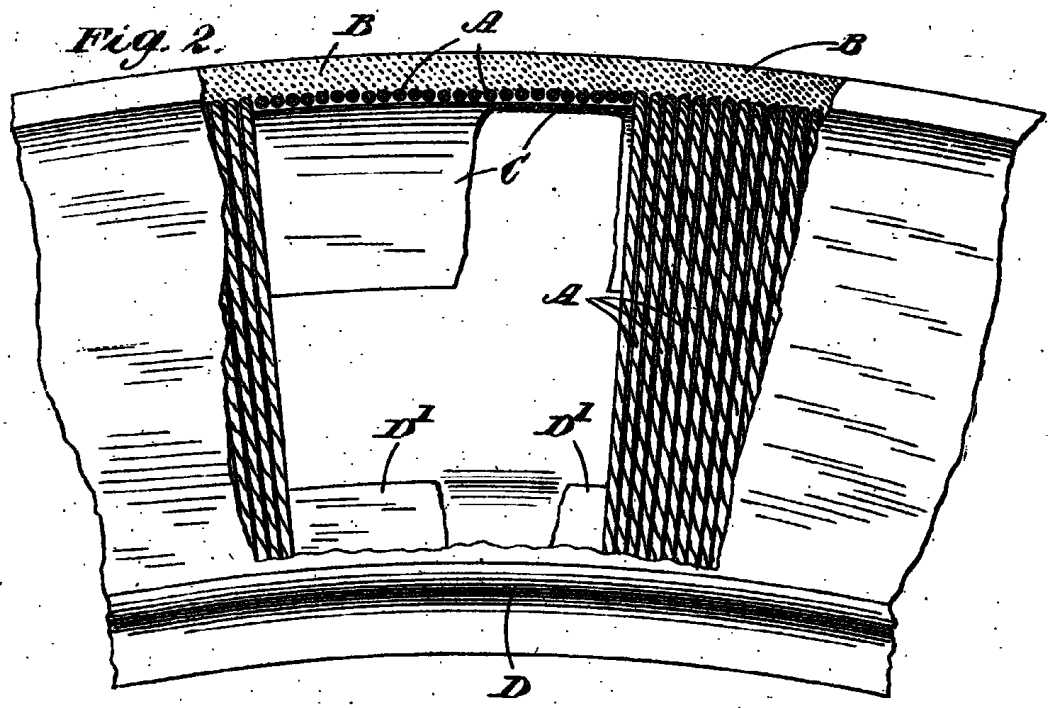


Fig. 2.



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