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RAILROAD TIE PAD AND METHOD OF MAKING SAME

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The invention relates to a novel composition railroad tie pad of a type adapted to be disposed in face-to-face engaging relation between an associated tie and the plate which anchors the rail to the tie.

Railroad tie pads generally assume a rectangular shape and configuration that corresponds to the tie plates which they are adapted to directly underlie, and it is an essential feature that such tie plates be relatively thin. Being of fabric or fiber material in contrast to the heavy metallic tie plates themselves, railroad tie pads are usually relatively light in weight, and several different varieties of such pads have heretofore been available for use. However, it has been observed that some such prior pads tend to become unduly elongated as well as permanently distorted during prolonged use so that such pads undergo fatigue and often rupture or split. Still other such pads become frayed at the edges and tend to weaken internally to such an extent that their effectiveness is short-lived and replacements are prematurely required.

When considered from the standpoint of work to which subjected, it will be appreciated that a railroad tie pad must have sufficient strength to withstand the heaviest types of internal stresses such as those shearing stresses which will naturally occur at curved sections of the road, and yet should be as thin as possible and possess the correct resistance to compression in order to reduce to a minimum the possibility of any "give" which, when repeated under naturally occuring conditions, such as loads of different weight and loads at time intervals, will tend to produce "loose" pads and plates and in any event might tend to adversely effect the level of the road. Moreover, the nature of the pad should also be such that any tendency for the tie plate to move axially of the tie as the result of a shearing loading is reduced to the point where only the very slightest movement will be thus experienced, a movement just sufficient to prevent that which in effect, in the absence of no plate movement whatever, would amount to a blow or direct impact on the edge of the plate and pad.

In view of the fact that most of the critical considerations and limits in a tie pad are dictated by forces occuring at curved sections of the road, the tie pad, on the other hand, must be capable of yielding or bending slightly in the direction of the applied force, that is, longitudinally of the tie and transversely of the rail, for otherwise, as a practical matter, the pad might rupture or break. Yet, the same pad, it will be appreciated, must be capable of recovering its natural shape and condition without any permanent "set" occurring after such shearing loading has been removed.

It has also been observed that sand and other hard, fine mineral matter that may be found along the road bed tends to work itself in under the pad, and it follows that any slight movement of the pad will cause either an abrading of the pad or tie, or both, and in this same connection it is also desirable that a waterproof seal be effected between the pad and the associated parts in

order to prevent any tendency toward decay or rot as may be occasioned by the presence of water.

It is therefor an object of the present invention to construct and compound a railroad tie pad of sufficient internal strength to withstand the heaviest types of shearing loading and one which does not undergo any appreciable or deleterious permanent set or distortion as might be caused either by compressive or shearing loading. A related object is to have the pad of a softness that is commensurate with the prevention of the tie being abraded or worn by the pad itself.

A further object is to so compound and arrange the internal structure of the railroad tie pad that a minimum elongation occurs in the direction of the normally applied loads.

Another object of this invention is to have a tie pad capable of yielding and bending very slightly in a resilient fashion and one which moves only very slightly even under the most severe type of shearing loading.

An additional object of the present invention is to so compound the tie pad that break-up, fraying, decay and other like undesirable effects that may be inherent in the nature of the pad itself are effectively counter-acted while at the same time assuring that the plate, pad and tie assembly is sealed against weather and infiltration of sand and grit.

Other objects will be apparent from the description to follow.

In accordance with the present invention, the above objects and other desirable attributes and features herein to be mentioned, are embodied in a railroad tie pad that is characterized structurally by a relatively thin, tough, composition structure compounded of pieces of fabric and short length cords. Thus, for conventional applications the pad is roughly 7¾" x 13¾" x 5/32", both the top and bottom sides being provided with a coating of asphalt about 1/32" thick. Both the fabric and cords are frictioned as by being coated with uncured rubber or latex, and the cords are arranged parallel to the longest edge of the pad. As thus compounded and constructed, it has been found that the fabric and cord combination, bonded together by a rubber bond as will be afforded by the aforesaid friction coating, produces a pad structure that possesses such properties and characteristics as satisfy the foregoing objects. During manufacture, the moldable stock material, comprising the fabric and cord, may be extruded or sheeted after which the thus molded material is subjected to a cure. The extruding or sheeting operation, arranges the cords parallel to the path of stock material, and this arrangement, as will be pointed out hereinbelow, is of particular significance.

Insofar as the moldable stock material is concerned, it will be appreciated that somewhat of a range of selection is presented in respect of the particular type of fabric material as well as the particular type of cord material. However, it is necessary that these two ingredients be capable of being bonded together by a bonding agent that will afford a tough and very slightly yieldable or resilient pad structure. I have found that scraps of canvas which has been coated with unvulcanized rubber, such as the type of canvas used in the manufacture of tires and belting for instance, and similarly-treated unvulcanized rubberized tire cord are quite satisfactory as a source not only of the body materials but also of the bonding agent. Thus, while the particular analysis of the frictioned fabric may vary according to the type of canvas and rubber-like bonding coating, a typical analysis for purposes of disclosure is as follows:

Ingredient	Per cent by weight
Rubber hydrocarbon	26
Acetone extract	5.5
Chloroform extract	15
Ash	5
Sulfur	1
Free carbon	10
Free sulfur	0.7
Moisture	2
Cotton canvas	48

Also, the tire cords are of any well-known type, consisting either of cotton material, surface coated with uncured rubber, or rayon having a prime coating of a synthetic resin and then an overcoat of uncured latex. In this same connection, it may be pointed out that the canvas is preferably of a square-woven type having a thickness of about 1/32", and where scrap canvas is used care must be taken to assure that the strands are not broken or the woven structure otherwise lost. As for the cords, a diameter of approximately 1/32" has also been found to be satisfactory. Thus, since the finished pad must necessarily be as thin as possible, the thinnest type fabric and cord commensurate with strength requirements must be selected.

A suitable formula for the composition to be formed into pads in accordance with the present invention is as follows:

Component:	Parts by weight
Scrap-rubber-frictioned fabric uncured (1" squares)	1.8
Tire cords—latexed, uncured (2" lengths)	0.45
Asphalt waterproofer (M. P. 135° F.,—10 penetration)	0.15
Tetraethylthiuram disulphide (accelerator for rubber cure)	0.006
Acetone diphenyl amine reaction product (antioxidant)	0.006
Pentachlor phenol (fungicide)	0.022

On a weight basis, the amount of fabric and cord is about 50%, the remainder, for all practical purposes, being represented by the bonding agents and the asphalt water-proofer. Since the asphalt in the above example is normally a solid at room temperature, it may be easily dispersed as such in a mixture of the remainder of the other ingredients prior to the heating and mixing operation which results in a melting of the asphalt and a uniform dispersion thereof throughout the final mix. Thus, stock material represented by the above formula and comprising solid chunks of dispersed asphalt may be mixed and heated in a Banbury for about three minutes to produce a homogeneous mixture adaptable to an extruding or sheeting operation, and during this period the temperature of the stock preferably does not exceed 300° F. Also, care should be taken not to Banbury to such an extent or for such a period of time as to destroy the fabric structure of the canvas to a point where the stock cannot be properly extruded or calendered or the strength of the fabric destroyed. Immediately after removal from the Banbury, the hot, viscous stock, of which the rubber-like bonding content has been partially vulcanized, is extruded, and during the latter operation, the tire cords, originally of random arrangement after mixing in the Banbury, align themselves generally in a direction parallel to the path of movement. This so-called parallel arrangement of the cords greatly enhances the internal strength in the direction of the cords as will be shown below. Following the extruding or equivalent molding process, relatively long lengths of strips of the composition are subjected to press cure of three minutes at 500 p. s. i. and 300° F., during which time the desired thickness for the pads is obtained and the bond of the structure becomes complete as a result of the final vulcanization of the curable rubber content. After this final curing, individual pads may be cut out and re-heated to 450° F., and then coated with a thin coating of an oxidized asphalt catalytically oxidized by phosphorous pentachloride, for instance. Not only does such a coating as the latter afford a waterproof over-coat, but it has also been found that such a coating on the pad will embed itself into the cracks of the tie thus further anchoring the pad thereto and resulting in reduced plate movement, less tire wearing, and less loosening of the spikes. Care should be taken to assure that such asphalt coats on either side of the tie do not exceed 1/16", 1/32" being the preferred thickness. If such a coating exceeds 1/16", 1/8" for instance, the pad exhibits a great tendency to slip when finally inserted between the tie and tie plate. A further advantage to the exterior asphalt coating lies in the fact that when the pad is placed in position at the end of the tie with the tie plate overlying the same, and the spikes driven through the assemblage into the tie to hold the rail down, the asphalt is squeezed out along the edges of the pad to afford a sort of edge seal along the abutting edges of the plate, pad, and tie, and the spike itself becomes partly coated with asphalt, so to speak, as it is driven down through the pad and is thereby partly protected against corrosion such as might be caused by brine seeping into the pad or around the spike.

It is not essential that the stock material be extruded during processing, since a sheeting operation with a rubber calendar may also be employed as a molding procedure.

It will be noted in the above description that the relatively long lengths of extruded stock material may be subjected to a press cure, and it will be appreciated that the extruded material, prior to the press cure, will have a thickness somewhat greater than the finished product. As an alternative procedure, and one which is to be preferred other factors being equal, approximate pad-lengths or so-called billets may be cut directly as the material is extruded (or sheeted as the case may be) and such billets may then be subjected to a press cure embodying conditions identical to those described in connection with the relatively long lengths of extruded material. For instance, billets having the same mass or weight as the finished pad may be extruded about one inch narrower and shorter than the finished pad. It will also be recalled that during the extruding or sheeting operation, the cords align themselves generally parallel to the path of flow of the stock material. When the billets, narrower and shorter than the finished pads, are pressed out during the final cure the cords at the corners of the billet gradually curve around the corners so that in the finished pad the cord lengths at the corners run parallel to the long edge, then curve about 90° and run parallel to the short edge, many such cords being thus arranged at the corners of course. In this manner, that is by cutting out narrow billets of extruded or sheeted material, the strength of the pad is greatly enhanced at those very portions through which the spikes are to be driven, and thus the pads are reinforced at those points where the greatest stresses will occur.

The presence, as well as arrangement, of the cords parallel to the longest edge of the pad is of primary importance. For instance, a comparison of certain physical properties of a pad with and without cords shows that there is no compressive setting at 5000 p. s. i. and 80° F. in a pad compounded with cords arranged parallel as aforesaid whereas, on the other hand, a pad similar in all other respects except having no cords undergoes a permanent set of nearly 3% when loaded with 5000 p. s. i. at 80° F. A further manifestation of results obtained from the pad construction of the present invention is evidenced by the fact that lengthwise such pads have better than double the resistance to elongation of pads similar in all respects except having no cords therein. In this latter connection it is interesting to note that, strangely enough, there is no difference in tensile strength between the two types of pads. Perhaps the

most useful advantage of the pads of the present invention is illustrated by a so-called "pull-test." In this test, two pads each having a parallel cord arrangement (that is, parallel to the longest edge and therefore longitudinally of the tie) and compounded in accordance with the present invention, were anchored to a support by means of a nail driven through identical locations in the two pads so that each was anchored similarly. The first pad was subjected to a pull gradually increasing in the direction of the longer edge and this pad was not torn through, so to speak, until a pull value of 1200 p. s. i. was reached. On the other hand, when the other pad was similarly loaded parallel to the shorter edge, a break-through occurred at 1000 p. s. i., and this latter value did not exceed significantly that for a pad having no cords. The pads of the present invention also possess excellent Shore hardness. Thus, Shore hardness remains uniform at 96 throughout the temperature range of 80° F. to 170° F. and decreases to 95 at a temperature of 200° F.

By the term bonding agent I mean an ingredient such as an uncured rubber, elastomer, resin, latex, or the like elastic material well known in the art which can be cured to effect an operative bonding of adjacent parts, and while I have specified and described the present invention from the standpoint of a typical composition and method it will be appreciated that alterations, modifications, and substitutions may be made as desired while utilizing the principles of the present invention. Therefore, I do not wish to be limited to the precise details set forth.

I claim:

1. A railroad tie pad adapted to be placed between a railroad tie and the tie plate therefor comprising, as the essential components thereof, short length frictioned cords and small pieces of frictioned fabric coated with uncured rubber subjected to a vulcanizing cure during formation of the pad by heat and pressure to bind said cords and fabric pieces together into a tough and durable body capable of withstanding severe loading and stressing during use, and sufficient asphalt uniformly dispersed throughout the body of the pad during the formation thereof to seal the pad against weather, decay, and infiltration by foreign bodies, said cords being aligned generally parallel to the edge of the pad that will be transverse to the direction of travel of the locomotive over the pad so that the pad will have its greatest strength in said direction.

2. A railroad tie pad according to claim 1 in which at least the face that is to be next to the tie is coated with asphalt to penetrate the crevices and cracks in the tie and thereby assist in holding the pad in place between the tie and tie plate.

3. A railroad tie pad of the kind adapted to be placed between a railroad tie and the tie plate comprising as the essential components thereof, short length cords and small fabric pieces bonded together into a unitary body by means of cured rubber as afforded by friction coatings of uncured rubber originally on the surface of said cords and fabric pieces and cured by heat and pressure during formation of the pad, and asphalt dispersed throughout the body of the pad for sealing the pad against deterioration by weather and decay and penetration by abrasive foreign matter, said cords being aligned generally parallel to the edge of the pad that will be transverse to the direction of travel of the locomotive over the pad so that the pad will have its greatest strength in said direction.

4. A railroad tie pad according to claim 3 in which at least the face that is to be next to the tie is coated with asphalt to penetrate the crevices and cracks in the tie and thereby assist in holding the pad in place between the tie and tie plate.

5. A railroad tie pad of rectangular dimensions adapted to be placed between the upper face of the tie and the lower face of the tie plate to prevent rotting of the tie beneath the tie plate, said pad being formed and molded under heat and pressure from stock material comprising as the essential components thereof pieces of scrap canvas and tire cords each surface-frictioned with uncured rubber serving to provide a vulcanizable rubber bond between the canvas pieces and tire cords during formation of the pad as aforesaid, and asphalt present in sufficient amount in the body of the pad to seal the same against decay and penetration by water or gritty material which would adversely affect the life of the pad in use, said cords being aligned generally parallel to the edge of the pad that will be transverse to the direction of travel of the locomotive over the pad so that the pad will have its greatest strength in said direction.

6. A railroad tie pad of rectangular dimensions adapted to be placed between the upper face of the tie and the lower face of the tie plate to prevent rotting of the tie beneath the tie plate, said pad being formed and molded under heat and pressure from stock material comprising as the essential components thereof pieces of woven fabric and cords each surface-frictioned with uncured rubber serving to provide a vulcanizable rubber bond between the fabric and cord during formation of the pad as aforesaid, and asphalt present in the body of the pad to seal the same against decay and penetration by water or gritty material which would adversely affect the life of the pad in use, said cords being aligned generally parallel to the edge of the pad that will be transverse to the direction of travel of the locomotive over the pad so that the pad will have its greatest strength in said direction.

7. A railroad tie pad according to claim 6 in which the face thereof that is to lie next to the tie is provided with a surface coating of asphalt to penetrate the cracks and crevices in the tie and thereby assist in anchoring the pad in its position of use.

8. A method for making a railroad tie pad comprising mixing together pieces of woven fabric and short length cords that have been surface-frictioned with uncured rubber, adding thereto asphalt to provide an asphalt seal in the body of the pad, heating and agitating the mixture thus formed until the components are dispersed sufficiently to provide a homogeneous mixture, feeding out the stock material to arrange the cords substantially parallel to the direction of feed, and subjecting selected lengths of the stock material thus provided to a press cure sufficient to vulcanize and cure said rubber to bond the fabric and cords together.

9. A method according to claim 8 in which the woven fabric is in the form of canvas and the cords are tire cords.

10. A method according to claim 8 in which a surface coating of asphalt is applied to the face of the pad subsequent to said press cure.

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