Dec. 17, 1968 B. P. COLLINS 3,416,727

SYNTHETIC PLASTIC RAILROAD TIE

Filed April 27, 1966 3 Sheets-Sheet 1

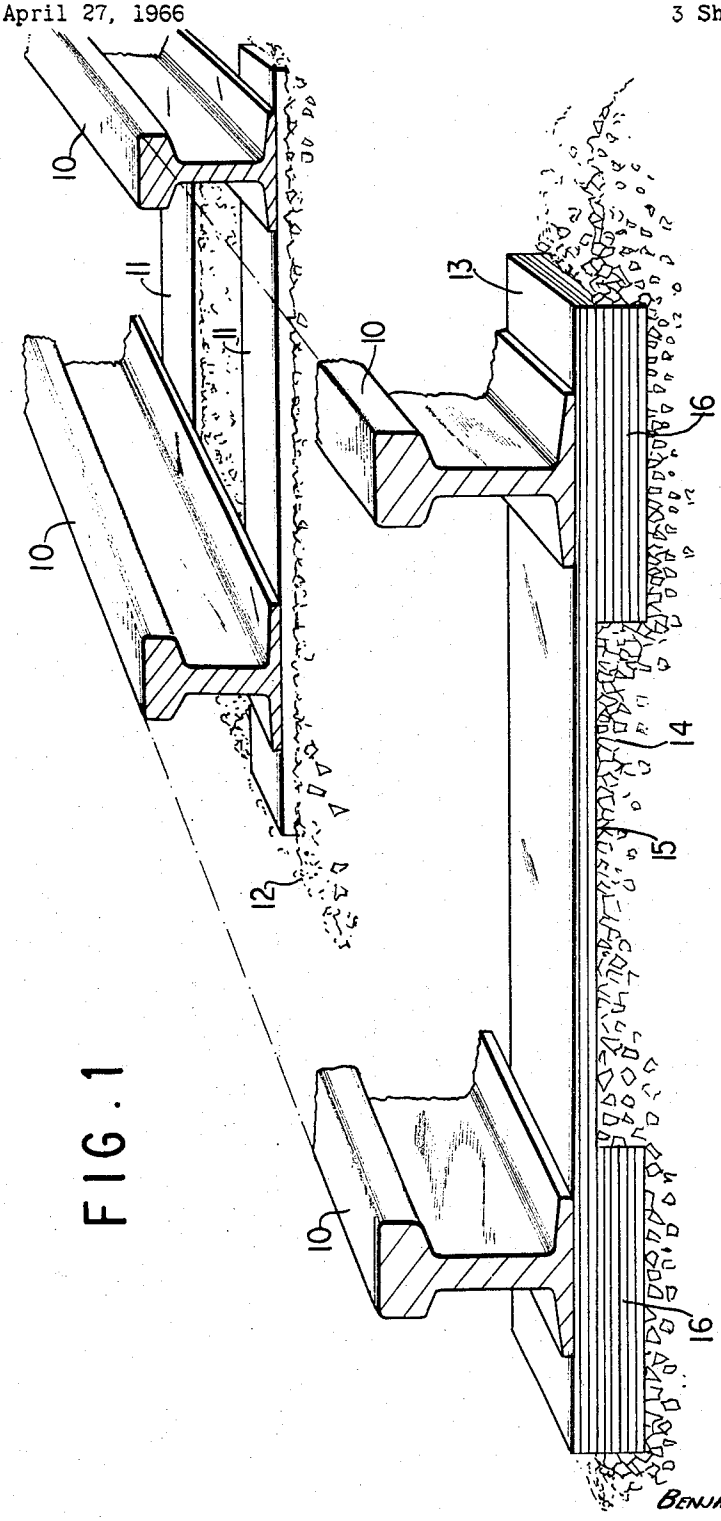

FIG. 1

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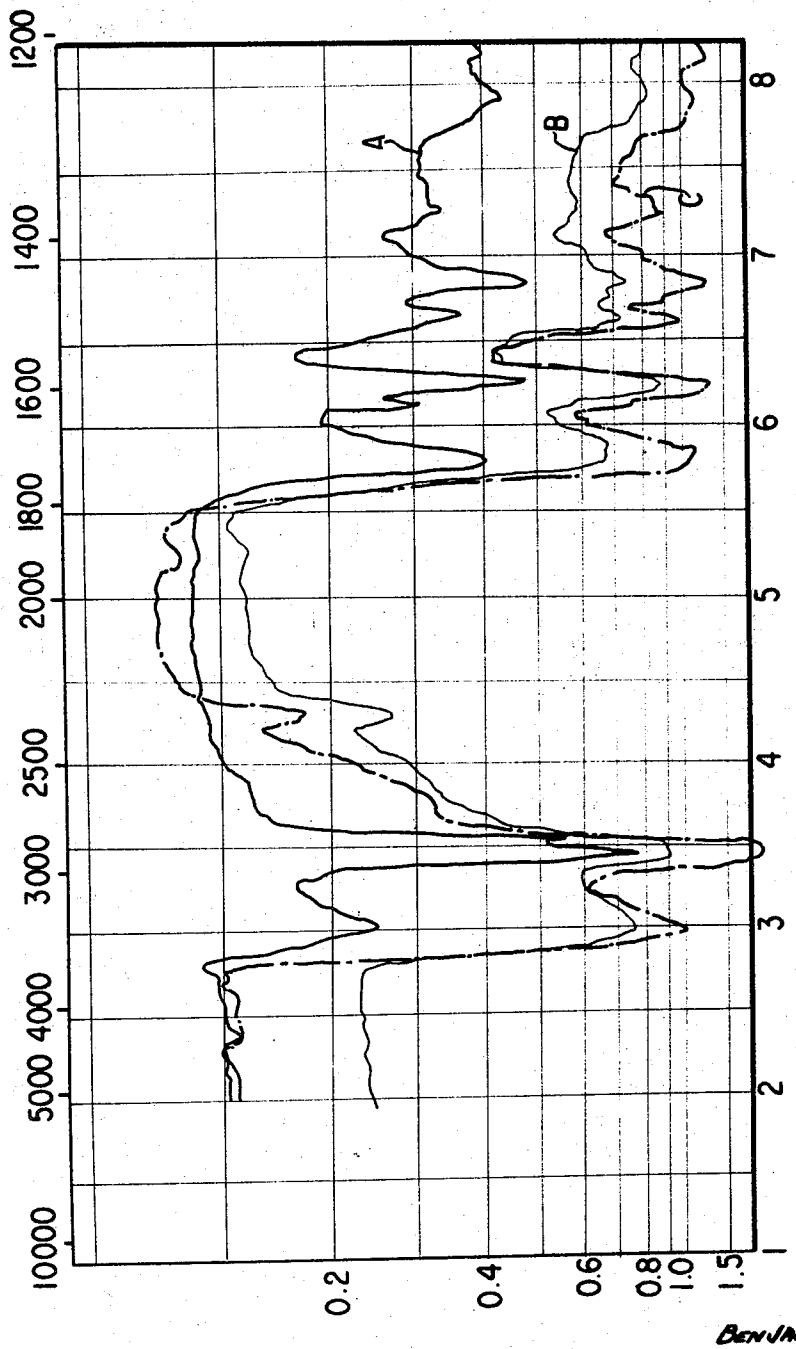

FIG. 2a

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SYNTHETIC PLASTIC RAILROAD TIE

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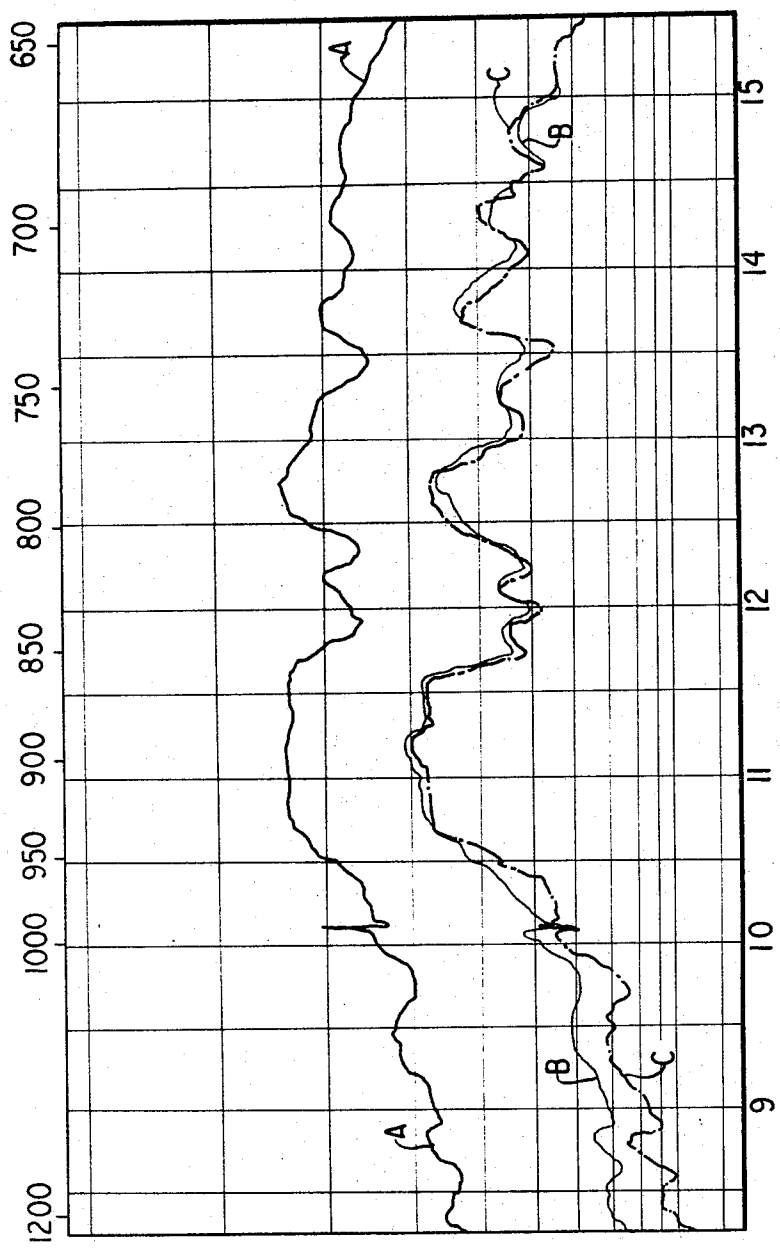

FIG. 2b

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SYNTHETIC PLASTIC RAILROAD TIE

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ABSTRACT OF THE DISCLOSURE

A synthetic railroad tie primarily constructed in laminations of molded shredded hardwood filler and a synthetic resin of phenol formaldehyde.

This invention relates to railroad ties and particularly to railroad ties made from a synthetic resin and filler.

In the prior art, wooden railroad ties have been used for many years, the ties being embedded in rock ballast roadbeds and having the rails placed on top thereof. The rails are fastened to the ties in various manners such as by spikes or the like. These ties have been subject to relatively rapid decay and rotting, a tie in some instances lasting only about fifteen years even if the tie has been properly impregnated with creosote or the like. If the creosoting operation is not complete, then the life of the tie may be much shorter.

The ties for a standard railroad gauge, for example, are 6" x 8" x 8'6" and 7" x 9" x 8'6", so that as a result, the wood must be obtained from trees of relatively large size in order to obtain good ties without splits and defects. Lumber of this size is becoming quite scarce at the present time.

When it is necessary to replace the ties, a rather difficult problem exists because either the track must be taken up in parts or the ballast bed dug out to permit removal of ties and placing of new ones therein, and such interferes with railroad traffic.

Other types of material for ties also have been suggested such as concrete, metal and the like. None of these has been satisfactory. In the case of a concrete tie, the concrete may crack in cold weather and any water therein will accentuate the cracks as it freezes. Also concrete is quite heavy, it being about ten times as heavy as a conventional wooden tie. The resiliency of a concrete tie also has not been completely satisfactory even though pads may be used therebetween. The same thing is true of steel ties which are extremely heavy and quite expensive.

In the case of wood ties, after the tree has been cut, the tie must be cut into a rectangular form and permitted to season for a long period of time before it can be subjected to the pressure-creosoting operation. This has resulted in a tremendous backlog in the demand for ties. Approximately 40 million are used annually in the United States. An an example, a standard mile of railroad track will have 3,200 ties therein.

One of the objects of the present invention is to provide a railroad tie which is relatively inexpensive, is readily made, and which will satisfactorily perform its service as a tie.

Another of the objects of the invention is to provide a tie which will not fail under normal railroad service in extreme conditions of use.

Another of the objects of the invention is to provide a tie which is relatively light-weight and which can be made in places close to the point of use.

Still another of the objects of the invention is to provide a tie which is waterproof and fire-resistant as compared with the standard wooden tie.

In one aspect of the invention, the railroad tie of the present invention may be formed in a mold and may be of one piece or may be laminated. Also, it could be made in a standard plastic extruding machine.

In the preferred form, the tie is made with shredded wood fiber as the filler and a phenol formaldehyde resin binder mixed with a resin derived from Southern pinewood and sold under the trademark "Vinsol" of Hercules Powder Company. The shredded wood and phenol formaldehyde with pinewood resin is mixed and put into molds following which it is subjected to heat and preferably pressure in order to cure the resin. It is possible to control the density and characteristics of the tie by differing the amount of pressure exerted on the mold as well as by proportion of materials. Similarly, if the tie is to be extruded, the conditions under which the extrusion takes place can be controlled.

These and other objects, advantages and features of the invention will become apparent from the following description and drawings which are merely exemplary.

In the drawings:

FIG. 1 schematically shows a tie made in accordance with the prior art and one in accordance with the present invention; and

FIGS. 2*a* and 2*b* show an infrared spectrum curve of the synthetic resin used in the present invention.

Refrering to FIG. 1, the prior art is illustrated in the upper portion thereof wherein steel rails **10** are placed on ordinary wooden ties **11** which may be of the creosote-impregnated hard-wood type. The ties are carried on a ballast bed **12** of rock, as is known in the art.

The lower portion of FIG. 1 shows rails **10** supported on a tie **13** made in accordance with the present invention. In the particular form shown, there is a cut-out portion **14** extending between the rails, said cut-out portion **14** resulting in a web **15** of reduced section relative to the end pieces **16, 16** of the tie. The rails are held in place on the ties by spikes or other holding devices.

In the case of the tie of the present invention, the apertures for receiving the holding spikes can be pre-bored or placed in the tie at the time of molding. This is for the reason that the synthetic resin is relatively hard and might be difficult to work in the field.

The cut-out portion **14** has an advantage in that it will permit the ballast to enter the area and hold the tie from side motion caused by a train passing thereover. Such side motion will result in the track becoming misaligned. Also, it is possible to make the tie without the cut-out portion.

In the form illustrated in FIG. 1, the tie is solid but it also could be made of laminated pieces. By use of the plastic, it is possible to make the tie with the cut-out portion with a minimum of loss inasmuch as the mold can be formed as compared with cutting such a tie from a wooden block.

In a preferred example, the tie is made using a shredded wood fiber as the filler and preferably hard-wood as the filler material. One constituent of the synthetic resin is phenol formaldehyde, the phenol formaldehyde being mixed with the shredded wood fiber and placed in the mold.

In a preferred form, the phenol formaldehyde resin is

mixed with a resin derived from Southern pinewood composed of a complex mixture of various chemical components. The constituents are believed to include acidic materials derived from rosin acids and oxidized rosin acids, neutral high-molecular-weight compounds, and acidic phenolic materials in the form of substituted phenolic ethers, poly phenols and other high-molecular-weight phenols. As an example, one such resin is that sold under the trademark "Vinsol" by Hercules Powder Company. A typical analytical value for such a "Vinsol" is as follows:

Softening point ____° C__	120
ASTM ring and ball softening point ____° C__	112
Acid No. ____percent__	94
Saponification No. ____do__	165
Unsaponifiable matter ____do__	7.7
Gasoline soluble ____do__	17
Acetone insoluble ____do__	0.05
Toluene insoluble ____do__	15
Gasoline insoluble ____do__	83
Petroleum ether insoluble ____do__	98
Coefficient of cubicle expansion per 1° C. (30–170° C.) ____	0.00056
Density at 25° C. ____	1.218
Specific heat, 20 (20–245° C.) ____	0.50
Bulking density (approximately):	
Flake ____lbs./cu. ft__	42
Pulverized ____lbs./cu. ft__	40

The mold into which the materials are placed can be subjected to heat and pressure in a conventional molding machine. It is also possible to provide probes or rods extending into the ends of the mold so as to leave apertures in the ends of the ties or appropriate places so as to accelerate curing of the resin. It is desirable to mix sufficient quantities of the wood fiber with the phenol formaldehyde so as to obtain, under the pressure and heat used, a tie which is of substantially the same density, or greater, as the standard hard-wood tie such as oak.

Merely as an example, a tie can be made between 75 and 90 percent by weight wood fiber, and the remainder is phenol formaldehyde resin modified by "Vinsol." As an example, 5% by weight of "Vinsol" can be mixed with 5% by weight of phenol formaldehyde resin and then 90% by weight shredded wood fiber mixed therewith and a tie formed therefrom. As mentioned, the resin mixture can be classified as a "Vinsol"-modified phenol formaldehyde resin.

Infrared spectra made of one resin are shown in FIGS.

2*a* and 2*b* wherein curve A is an acetone extract, curve B is a benzene extract, and curve C is a chloroform extract. These various extracts were subjected to an infrared analysis in a conventional infrared spectrometer.

It should be apparent that the ties can be made in various lengths and that they can be produced at various points inasmuch as the materials in their unreacted form can be readily transported thereto.

It should be evident from the foregoing that variations may be made in the details of the invention without departing from the spirit thereof except as defined in the appended claims.

What is claimed is:

1. A tie for supporting railroad track rails on a ballast roadbed comprising a main body portion composed of continuous molded laminations of shredded hardwood filler and a synthetic resin of pinewood resin modified phenol formaldehyde, said body portion having enlarged laminated end portions, said laminated body portion having a substantially flat recessed portion on the under side thereof extending between said end portions, said body portion having a substantially flat uninterrupted top surface for receiving and supporting said rails thereon, and said recessed portion flatly engaging the ballast whereby said rails are firmly and uniformly supported on said roadbed against side motion.

2. A railroad tie according to claim **1** wherein the pinewood modified resin phenol formaldehyde resin has an infrared spectrometer characteristic as depicted in FIGS. 2*a* and 2*b* of the drawings.

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U.S. Cl. X.R.

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