May 13, 1958 R. J. HOYLE, JR 2,834,073

FABRICATED POLE

Filed Sept. 28, 1953

Fig. 1.

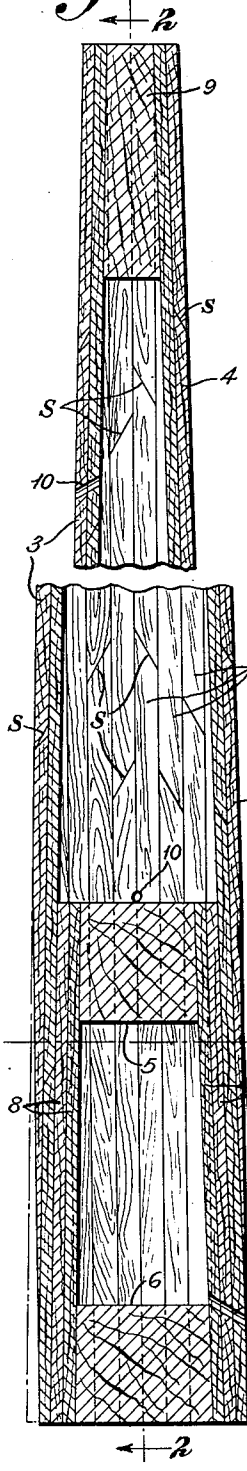


Fig. 2.

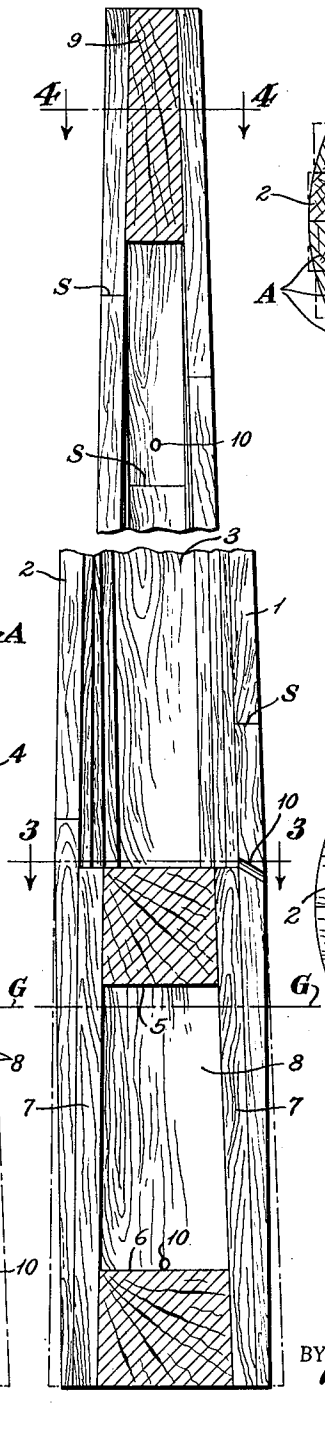


Fig. 3.

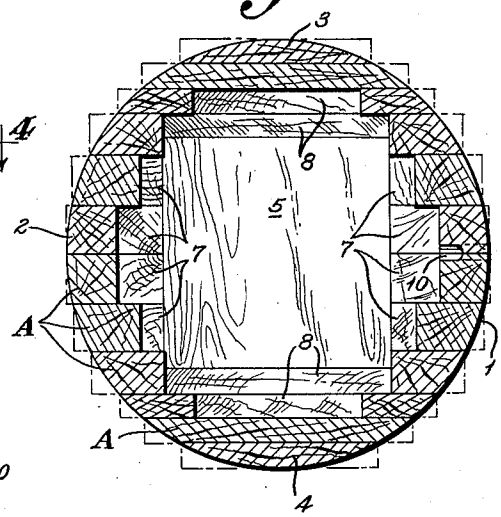
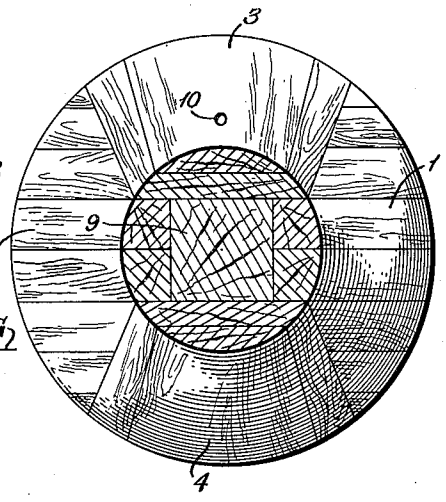


Fig. 4.



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United States Patent Office

2,834,073

Patented May 13, 1958

2,834,073

FABRICATED POLE

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Application September 28, 1953, Serial No. 382,563

2 Claims. (Cl. 20—99)

Generally this invention relates to a fabricated pole construction. More particularly, the invention relates to a fabricated wooden pole having a circular cross section suitable for use in supporting telegraph, telephone and electric service lines.

With the present demand for wood poles, the time is approaching when a critical shortage of pole stock suitable for such use may develop. Thus it becomes extremely important to have available a suitable substitute pole which will possess the strength and durability necessary for utility pole service. Such a pole must be simple in construction to enable its production at a reasonable cost and as light as possible to facilitate handling. Further, substitute poles should be strong and readily susceptible to preservative treatment.

It is a principal object of this invention to provide a fabricated wooden pole which may be used instead of or as a replacement for the conventional solid wood poles now used for telephone and electric service lines.

It is a further object of this invention to provide a fabricated pole which is lighter in weight than conventional solid poles while still possessing the required strength to withstand service encountered loads and stresses. Such a reduction in weight not only reduces the transportation costs for such poles, but also makes installation of such poles a simple procedure.

Another object of this invention is to provide a fabricated wood pole which may utilize small dimensioned cuts of lumber glued into a laminated structure to reduce production costs and secure a strong pole substitute for conventional solid poles.

It is another object of this invention to provide a fabricated wooden pole in which the base portion is constructed to contain sufficient wood material to compensate for the weakening effect of moisture in the wood at the ground level. Further, the fabricated wood pole of this invention, being uniformly tapered throughout substantially its entire length, contains sufficient wood material at each point in its length to withstand the bending moment stresses to which the pole may be subjected in use with a minimum weight for the pole.

An additional object of this invention is to provide a fabricated wood pole which may be effectively treated with preservative both on the interior and exterior thereof to resist rotting and insect attack.

These and other objects will become more apparent from the description of the specific embodiment illustrated on the drawings and specifically described hereinafter.

In the drawings:

Figure 1 is a longitudinal sectional view of the fabricated wood pole with portions broken away to more clearly illustrate the details of the invention.

Figure 2 is a longitudinal sectional view of the fabricated wood pole taken on line 2—2 of Figure 1.

Figure 3 is a cross-sectional view taken on line 3—3 of Figure 2.

Figure 4 is a cross-sectional view taken on line 4—4 of Figure 2.

The fabricated wooden pole of this invention is constructed of a plurality of strip laminations A with each of such laminations being made up of a plurality of random length boards joined in end to end relation by glued scarf joints S. The use of scarf joints in joining the abutting ends of the random length boards in each lamination insures that there is sufficient contact surface area betwen the ends of such boards to produce a strong joint when a waterproof glue such as a resorcinol or phenolresorcinol adhesive is used.

The strip laminations are assembled and face glued throughout their length by a suitable waterproof adhesive such as mentioned above to produce a hollow wooden pole of a form as described hereinafter. In forming this hollow pole the scarf joints S which join the ends of the boards making up the several laminations A are preferably staggered throughout the length of the pole so that no single cross section through the pole will contain an excess number of such scarf joints. The existence of several scarf joints in any horizontal plane of the pole might result in a weakened cross section at that point in the pole structure.

In assembling the laminations into the hollow pole form, two side panels 1 and 2 are made up by face gluing several laminations to have an exterior contour approximating the final contour of the pole to be constructed. The width of these side panels decreases from the lower end thereof toward the top of the pole so that the side panels are in effect substantially triangular and curved outwardly to approximate the exterior tapered surface of the final pole product. Referring to Figure 4, it will be noted that in the specific embodiment illustrated the two centermost laminations in the side panels 1 and 2 extend throughout the length of the pole, whereas the laminations outwardly of such centermost laminations terminate part way up the pole length.

In referring to Figure 4, it will be noted that the showing therein illustrates the pole cross section with the corners of the laminations removed. When the pole is initially constructed by face gluing the several laminations, the outer contour of the pole has an appearance as indicated by the broken line showing of the cross section shown in Figure 3. As a final step in the production of the pole, these protruding corners are removed by a turning operation so as to present on the final pole product a smooth surface exterior.

Cover plates 3 and 4 are glued across the edges of the side panels 1 and 2 to extend throughout the length of the pole construction. In the embodiment shown on the drawing, these cover plates 3 and 4 are each made up of two wide strip laminations face glued together so that when glued across the edges of the side panels 1 and 2 they will complete the pole surface to provide a cross section such as shown in Figures 3 and 4. These wide strip laminations preferably consist of narrow strips edge glued to obtain the required width for use in making the cover plates 3 and 4.

It will be noted that the glue lines between the adjacent faces of the laminations in panels 1 and 2 extend vertically along the length of the pole construction. The cover plates 3 and 4, however, by being glued to the edges of the side panels are inclined from the vertical so that their glue lines extend upwardly along the length of the pole parallel to the taper of the pole structure.

With the laminations assembled as above-described, it will be seen that a tapered pole construction is provided with a uniform taper throughout the entire length of the pole. As noted above, following the initial assembly, the exposed corners of the various laminations will extend outwardly of the surface of the pole to provide a cross section such as illustrated in broken lines in Figure 3. Since it is undesirable to have a pole surface characterized

by such protruding corners, the pole structure of this invention is then subjected to a turning operation wherein the protruding corners are removed, thus leaving a smooth tapered surface for the pole.

Attention is also called to the fact that since as a practical matter it may be undesirable to have the base portion of the pole larger at the bottom than at the ground line, the turning operation may also be used to remove the taper from the base portion and thus provide a true cylindrical base portion for the pole. Figures 1 and 2 on the drawing illustrate the pole in its final form subsequent to the turning operation and the broken line portion adjacent the lower end of the pole indicates the wood material that may be removed by the turning operation to produce the cylindrical base portion for the pole.

Plugs 5 and 6 are inserted at the top and bottom respectively of the base portion of the pole to act as stiffeners for the pole and thus are particularly important in poles of larger diameter. These plugs also serve to restrict the entrance of moisture and dirt into the base portion and likewise protect the interior from insect attack.

The base portion of the pole of this invention is constructed with the intention that in use the major part thereof will be embedded in the ground. Thus, as shown in Figure 1, only a small part of the base portion extends above the ground line G when the pole is in use. Since the area of a pole most commonly affected by decay is at the ground line, or within about one foot above or below this point, the structure of the base portion becomes extremely important in producing a fabricated wooden pole possessing the required strength and durability for telephone and electric service line use.

The strength properties of wood vary with respect to the moisture content, with the greatest strength being obtained at very low moisture content and the lowest strength occurring at the fiber saturation moisture content. At a moisture content exceeding fiber saturation, the strength of wood remains reasonably constant for any given species. Although the fiber saturation point varies with the species of wood, it generally lies in the range of between 20 and 30 percent of the weight of completely dry wood.

Conventional solid round poles are classified on the basis of strength properties of green wood because (1) their moisture content is above the fiber saturation point at the ground line and (2) defects in the upper part of the pole prevent realization of the higher strength properties of the dry wood even though it may be well below the fiber saturation moisture content. Even if these defects did not exist, nature provides a pole of more or less uniformly tapered shape and there is no practical reason to reduce the cross-sectional area of the upper part of the pole to the size actually needed, since the material so removed cannot be utilized and the process of removal would be costly.

The fabricated pole of this invention is constructed to take advantage of the superior strength properties of dry wood in the above-ground portion of the pole, while the portion at and below the ground is constructed on the basis of the strength properties of green wood. Aside from the problem of overcoming moisture weakening in this fabricated wood pole construction, defects normally found in the upper parts of conventional poles which reduce the strength of such poles can be limited in the manufacture of fabricated wood poles by proper selection of the wood used in the laminations. Thus it is possible to construct the fabricated pole with the use of less wood than contained in solid round poles of equal strength.

Since the strength of wood diminishes as the moisture content rises, increased wall thickness in the base portion is provided to supply the necessary strength requirements for the fabricated wood pole. It has been found that the high moisture content of the wood embedded in the ground extends for a distance above the ground line. Thus the moisture content in the base of a pole is rather high for a distance two or three feet above the ground line. In view of this fact, the base portion with its thickened walls is of such a length that only a part is embedded in the ground and the remainder extends above the ground line. This remainder, also having thickened walls, provides adequate strength to compensate for the lower strength inherent to the moist wood present in the pole up to a point two or three feet above the ground line.

In the specific embodiment illustrated on the drawing, the increased wall thickness in the base portion of the pole is obtained by applying separate wooden members along the inner surfaces of the hollow interior to build up the quantity of wood material for this portion of the pole length. Thus separate members 7 are glued along the inner edges of the lower ends of the side panels 1 and 2 and similar members 8 are glued inwardly of the cover plates 3 and 4 to build up this portion of the pole wall. Referring to Figures 1 and 2, it will be seen that the separate members 7 and 8 glued along the interior of the base portion of the pole provide the added wall thickness necessary for this portion of the pole to resist the weakening caused by high moisture content in the wood which is embedded in the ground during use.

It will also be noted that, as more clearly shown in Figure 3, the added members 7 and 8 reduce the interior of the pole in the base portion to a substantially square area. Thus the plugs 5 and 6 inserted to seal and stiffen the base portion of the pole may be made square for ready insertion and gluing in position in the base portion of the pole.

The main portion of the pole structure is a continuation of the laminations in the base portion of the pole, with such main portion being uniformly tapered throughout its length toward the uppermost end of the pole. The walls of this main portion, made up of the several glued laminations, are constructed to have a minimum thickness in the finished pole to save in weight and cost but still provide adequate strength for telephone and electric service line use. Such a strength must be sufficient to withstand static loads to which the pole may be subjected, and also any bending or buckling loads which may occur during pole service.

The upper open end of the main portion of the pole is sealed by a plug 9 which acts as a load block and stiffener for the pole structure and prevents the entrance of rain and moisture thereinto. It will be readily seen that the plugs 5, 6 and 9 inserted and glued into the hollow interior of the pole not only seal the interior against the free entry of moisture and insects, but also materially strengthen the overall fabricated structure.

In producing conventional solid round poles, there exists the continuous problem of seasoning and preserving so that such poles may be satisfactory for telephone and electric service line use. Thus, with solid poles as with any heavy structural timbers, the possibility of raising the strength properties of the wood therein by adequate drying is offset by the fact that such drying produces objectionable seasoning defects which cause a weakening of the solid wood pole. In the fabricated pole of this invention, adequately kiln dried lumber may be utilized, since the lumber used for fabricating is of relatively small dimensions and therefore not subject to seasoning defects as is true of heavy structural timbers.

In addition to the seasoning problem, solid wood poles generally contain knots of various sizes which of course serve to weaken the pole. Under the standards set up by the industry, the largest size knots permitted in solid round poles effects a 25 percent reduction in pole strength. In selecting lumber for fabricating the pole of this invention, material containing large knots and other defects which would reduce the strength of the material may be eliminated. Accordingly, the fabricated wood pole may contain a substantially smaller quantity of wood, while

still possessing greater strength qualities than are present in conventional solid round poles.

In preserving solid round poles by the use of a creosote or other suitable preservative, thorough penetration of the preservative throughout the entire volume of the solid wood pole is frequently a problem. Surface penetration of preservative may be effective to a certain extent. However, any hole extending through the preserved outer surface wood which exposes untreated wood in the central portion of the pole, reduces the effectiveness of the preservative-treated wood in protecting the interior wood of the pole from attack by wood-destroying fungi and insects. Therefore, in solid wood poles, holes drilled for attaching the crossbars, climbing spikes of the lineman's shoes and nails driven into the surface of the pole may penetrate through the preserved volume of the pole and give rise to disintegration of the pole interior by providing access for insects and wood-destroying fungi.

The preserving problem inherent in solid wood poles is not present in the fabricated pole construction of this invention. In view of the interior cavity in the fabricated pole of this invention, suitable holes 10 are provided at random along the length of the pole to permit preservative to be introduced into the interior cavity of the pole, both in the main portion and base portion thereof. Thus after the entire pole has been fabricated with the plugs 5, 6 and 9 securely glued in place, the entire interior and exterior of the pole may be treated by a suitable preservative compound. The feasibility of introducing preservative into the hollow interior of the pole enables the preservative to impregnate the walls of the pole, both from the inside and outside thereof. Such preservative treatment by virtue of its access to a small volume of wood through a large surface area, results in a finished pole product wherein a high degree of preservative penetration is obtained. Therefore, substantially all of the treatable wood utilized in the construction is effectively impregnated with the preservative fluid.

Since the base portion is embedded in the ground for the most part, this portion is subject to the greatest danger of insect attack and decay. Accordingly, it may be desirable in assembling the pole to initially subject the individual laminations and separate members used in the base portion to preservative treatment prior to the assembly of such laminations into the cylindrical face glued assembly of the base portion. Such prior treatment will insure the best possible degree of impregnation with preservative of the wood in the thicker walls present in the base portion of the pole.

It will be clear that the fabricated pole of this invention

may be constructed with any suitable species of wood if adequate study of the strength properties of the particular species are taken into consideration. The use of Southern yellow pine lumber is considered to be adequately suited for fabricating such poles in view of its high strength, availability and adaptability to preservative treatment. Likewise, Douglas fir and Western larch would also be entirely suitable for use in fabricating the wood pole of this invention if adequate preservative treatment of such latter woods is attained.

Having thus described my invention, what I claim is:

1. A fabricated pole comprising a pair of elongated side panels formed of a series of wood laminations glued in face to face relation along the wide dimension thereof and with the width of each panel decreasing from its lower end toward the top thereof, said laminations in each of said side panels being disposed relative to one another so that the outer edges thereof collectively provide a generally conically contoured outer surface, a pair of laminated wood cover plates having the outer edge portions thereof overlying and glued to the faces of the outermost laminations of said side panels respectively to form a pole having a substantially annular wall cross-section with the overall diameter of the pole decreasing from the lower end thereof toward the top, wood members glued to said side panels and said cover plates along the interior of said pole for a portion of the length adjacent the lower end thereof to provide thickened walls in the base portion of the pole, and plug seal members secured within the open top and bottom ends of the pole to seal against the entrance of moisture and foreign material into the hollow pole interior.

2. A fabricated pole, as recited in claim 1, wherein each of the laminations in said side panels and cover plates is made up of a plurality of random length strips with glued scarf joints interconnecting the strips in end to end relation.

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