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METHOD OF REMOVING DEFECTS IN WOOD

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FIG. 1

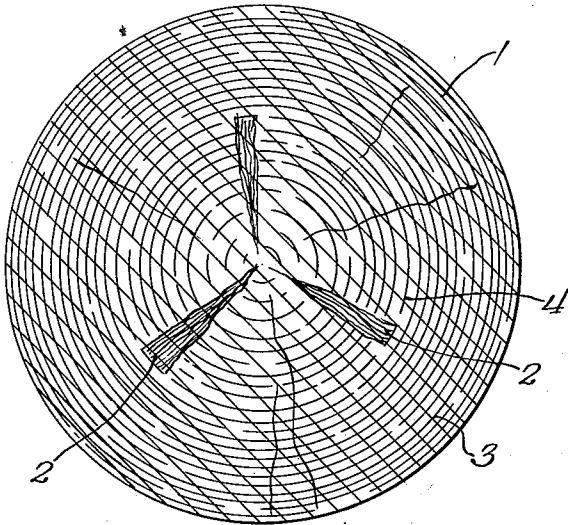


FIG. 2

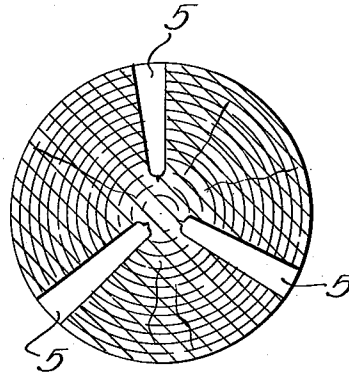


FIG. 3.

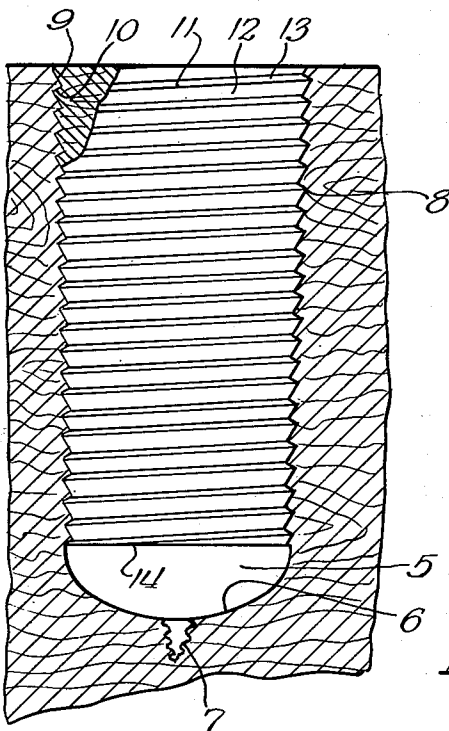


FIG. 4.

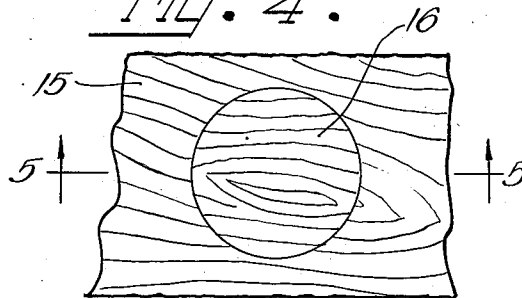
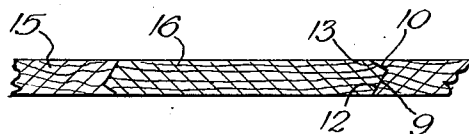


FIG. 5



UNITED STATES PATENT OFFICE

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METHOD OF REMOVING DEFECTS IN WOOD

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9 Claims. (Cl. 144—309)

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This invention relates, in general, to the treatment of wood, and has particular reference to the removal of defects such as knots and the like by boring out material including the defects and inserting wooden plugs having a grain structure in conformity with the main body of the wood.

The invention may be applied to wood and lumber of all kinds, and such general application will be apparent to persons skilled in the art in the light of the present disclosure of one particular application of the invention relating to the repair of peeler logs in making wood veneers.

In the conventional manufacture of plywood, selected logs which are apparently free of the usual blemishes and defects are placed in a lathe and a long, continuous sheet of veneer is cut therefrom as the log is "unrolled." Even though the logs may have appeared perfect when first put in the lathe, they usually reveal various hidden defects as they are turned down to smaller diameters. One very common defect is the occurrence of small knots from branches which died and became broken off in early stages of the growth of the tree. Such knots are usually found near the center of the log after the lathe has removed the growth of later years. The character of the material in these knots is very different from the surrounding wood in that it is very hard and dense and contains a grain running at right angles to the grain of the log.

Knots of this type are objectionable both in the lathe operation and in the cut veneer. In the lathe the logs rotate at such a speed that damage is caused to the knives when they encounter the hard pitchy wood of the knots. In the veneer the knots either fall out or loosen, or by their color or pitch content render the veneer of a low grade so that they must be removed before the veneer can be used for face sheets in high grade plywood panels. It has heretofore been the practice to repair such veneer by cutting out each knot and inserting a patch to preserve the continuity of the sheet. A knot extending radially into the log several inches would, therefore, necessitate a considerable number of patches in the cut veneer, and in the cutting thereof the lathe knife may have become seriously damaged.

An object of the present invention is, therefore, to remove such knots from the peeler log as soon as they are exposed in the lathe and to effect a repair before the lathe knife is damaged thereby and before the knot appears in

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the cut veneer as a recurrent defect spaced at short intervals therealong.

A further object is to effect the removal of the whole knot or defect in one operation and to repair and restore the wood the whole depth of the knot also in one operation to avoid damage to the lathe knife and the necessity for numerous repair patches caused by a single knot.

A further object is to provide a novel repair plug which may be inserted in a log in the lathe before the lathe operation is finished which will cut with the body of the wood in making a veneer to effect a permanent repair for parts which have been cut out.

Another object is to provide a novel plug to be inserted where defects have been cut out of plywood logs, which will be cut by the lathe knife into slices along with the main body of the wood and which slices will be securely and permanently retained as patches in the cut veneer to maintain face veneer quality.

Another object is to provide a method for repairing certain concealed defects in plywood logs as soon as such defects are discovered and before the lathe has cut deeply into the defective portion.

Another object is to provide an improved method of repairing defects in wood by boring out the defects and replacing them with plugs which respond similarly to expansion and contraction as the surrounding wood.

In carrying out the present invention, the plywood logs are turned down in the normal manner until some hidden defect, such as a knot of the type described, is discovered. The lathe is then stopped and the knot or other defect is bored out in a novel manner to provide retention for a special plug adapted to tightly fit and interlock in the bore. Such plugs are cut across the grain so that they may be inserted in the bore with their grain in general conformity with the grain of the log. The material of the plug is preferably selected or conditioned to respond similarly to expansion and contraction as the wood of the log. The plug may have, however, a slightly lower moisture content than the log so that it will absorb moisture from the log and swell into firm engagement therewith. After the material of the plug has attained the same moisture content as the log, it will thereafter respond to varying conditions in the same manner as the surrounding wood, to thereby become a substantially integral part thereof.

After such repair, the lathe operation may be resumed with the lathe knife cutting normally

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through the repair plug to slice off patches which are securely held in the veneer sheet. The cutting action through the plug is no different than in the rest of the log, and in the cut veneer the resulting patch is inconspicuous and in harmony with the veneer surface.

The invention will be described in greater detail in connection with the accompanying drawings in which:

Figure 1 is a cross sectional view through a peeler log which appears from the outside to be perfect but which contains a number of hard knots in the center thereof;

Figure 2 is a sectional view taken as Figure 1, showing the log after it has been turned down to reveal the hidden knots, the latter having been bored out for repair in accordance with the present invention;

Figure 3 is an enlarged fragmentary sectional view showing a repair plug in place in one of the bores shown in Figure 2;

Figure 4 is a fragmentary plan view showing how a slice of the repair plug appears as a patch in a sheet of cut veneer; and

Figure 5 is a sectional view taken on the line 5—5 of Figure 4, showing how the slice patch is locked in place in a relatively thin sheet of veneer.

In Figure 1 the log 1, with the bark removed, has been selected for making face veneer for plywood or other purposes because it appears to be perfectly sound and clear without any blemishes or defects appearing on its surface. Well in toward the center of the log, however, there are three hard knots 2, which would damage the lathe knife and which would necessitate a multitude of small patches in the veneer sheet to keep it of face quality. In the practice of the present invention the log 1 is turned down in the lathe in the customary manner to produce a continuous sheet of high grade veneer from the outer part of the log. This outer part of the log comprises a considerable number of growth rings 3 representing many years of growth after the small branches which cause the knots 2 have been broken off. In the present illustration the numeral 4 designates the last growth ring in which these branches were present. In the first few years after the loss of these branches their ends became completely covered over by new growth, and thereafter the tree continued to grow in a normal manner with a smooth surface under the bark just as though these branches had never existed. There is, therefore, no indication of their presence until the lathe has removed all this subsequent growth.

When the presence of the knots 2 is discovered, the lathe is stopped and the knots are bored out as shown in Figure 2. In this instance it may be assumed that all the knots were discovered simultaneously, or that the lathe was not stopped until all three knots were revealed. In practicing the invention, an experienced lathe operator would probably continue after the first knots were discovered to see if there were indication of other knots which would soon appear, before stopping the machinery. Those knots which had already been cut into the veneer sheet would then be repaired, if necessary, with individual patches in the conventional manner and the remaining depth of the knots in the log would be plugged according to the present invention.

The true shape and character of the bore holes 5, represented conventionally in Figure 2, is shown in detail in Figure 3. The hole 5 is seen to have a smooth bottom 6 formed by the cutting

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end of a special auger, a small depression 7, formed by the corkscrew tip of the auger, and a tapering, ribbed side wall portion 8 cut by special teeth on the auger bit. The ribs and grooves in the side wall portion 8 preferably take the form of a continuous helical thread. A buttress shaped thread is best adapted for the purpose wherein each thread has an upper face 9 at a small angle with the axis of the bore, which face may be said to constitute a ramp face, and a lower face 10 more nearly perpendicular to the axis of the bore, which face may be said to constitute an abutment face. The plug 11, which is inserted in this bore, has a similar buttress thread having a lower ramp face 12 and an upper abutment face 13. With this type of thread the plug may easily be driven into the bore, in which action the ramp 12 slides over the ramp 9 until the plug is seated to fit the taper of the bore with the abutment face 13 firmly locked behind the abutment face 10 to solidly secure the plug in place as a permanent part of the surrounding wood. By driving the plug into the bore instead of screwing it in, glue or other adhesive may be used effectively on the threads without an excessive amount of wiping action, and further, the grain of the plug may be oriented to conform with the grain of the log. The general taper of the bore permits the plug to be inserted freely to a considerable depth before driving is necessary, thereby reducing the wiping action to a minimum. In order to make grain conformity possible, the plug is cut across the grain from the piece of wood from which it is taken so that when it is inserted in another piece of wood in the manner shown in Figure 3 as a repair plug, the continuity of the grain structure may be substantially preserved. The holes 5 are bored to such a depth that the lathe knife ordinarily never reaches the lower end 14 of the plug. However, if the log is turned down below the end of the plug the hole may be re-bored and re-plugged.

Figure 4 shows a piece of veneer 15 containing a patch 16 sliced from the plug 11, with the grain in the patch running in substantial conformity with the grain in the veneer. Conditions producing shrinking or swelling will then affect the veneer the same as the patch so that there is no tendency for the patch either to buckle or loosen in the opening. If the moisture content of the plug is originally slightly less than that of the wood to which it is applied, the patches will swell sufficiently to bind them securely in place so that glue may be unnecessary, or so that the glue bond will be enhanced if glue is used.

The effectiveness of the helical thread in forming a patch lock in thin veneers is shown in Figure 5. It will be observed that regardless of how thin the veneer 15 may be cut, the helical thread must traverse its thickness from one face to the other so as to produce a locking joint at least part way around the periphery of the patch. In this instance the veneer is thick enough so that the thread forms a locking joint on opposite sides of the patch. If the veneer is of a thickness substantially greater than half the thread pitch, the locking joint will extend completely around the patch. It will be appreciated that the ramp faces 9 and 12 also constitute abutments in the same manner as abutment faces 10 and 13 to prevent removal of the patch from either side of the veneer and thereby forming a secure locking joint substantially without assistance from the adhesive. If the interlocking ridges and grooves are not in the form of a continuous thread, the

pitch thereof should be less than twice the thickness of the veneer because in such case there will either be a locking joint all the way around the patch or none at all.

In the preferred embodiment of the invention, the bore and plug are tapered and a helical buttressed thread is preferred for the reasons stated, but it is to be understood that this particular construction is described for purpose of illustration and not for the purpose of limitation, and that the invention is intended to include all variations and modifications falling within the scope of the appended claims.

It will also be apparent to persons skilled in the art that the present invention is not limited to application to peeler logs used in veneer and plywood manufacture. The present repair plug may be used in wood stock of any form, regardless of whether it is to be sliced, sawed, or whether it is already in its final form, provided the piece is thick enough to receive the plug. Thus, the plug may be used in timber cants which are to be sawed into lumber, or it may be used in lumber after the sawing operation. The invention, however, is used most advantageously on wood stock before the sawing operation, so that one plug will repair the defect in whatever number of pieces it would later appear, one of the stated objects being to avoid a large number of separate repairs to cure a single defect in the original wood. This advantage, and the saving of the lathe knife, make the invention most useful in the manufacture of veneer, where, due to the thinness of the sheet, the same defect is encountered repeatedly by the lathe knife and appears again and again in the cut veneer sheets.

The general principles of the invention may also be carried out in other ways and all variations in the method and in the form of plug within the scope of the appended claims are included in the invention.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. In the manufacture of veneer, the method of repairing defects in peeler logs from which the veneer is to be made comprising boring out said defects to form tapered, circumferentially grooved holes and inserting tapered circumferentially grooved plugs in said bore holes of a material having the same cutting action in the lathe knife as the material of the log, and cutting said veneer in a thin sheet circumferentially of the log so that transverse slices of said plug appear as successive patches in the cut veneer sheet.

2. In the manufacture of wood veneer from peeler logs, the method of repairing knots which have become overgrown with successive rings of normal growth, comprising turning said log in a lathe to cut veneer from said normal growth until said knots are exposed, then stopping said lathe and boring out said knots, inserting wooden plugs in said bored holes, and then operating said lathe to produce veneer containing slices of said plugs as repair patches.

3. The method of repairing defects in wood which is to be cut into pieces of reduced thickness comprising boring out said defects, inserting and interlocking wooden plugs in said bored holes, and then cutting said wood into said pieces of reduced thickness so that slices of said plugs constitute repair patches interlocked in said cut pieces.

4. The method of repairing defects in wood stock comprising boring out each of said defects to leave a tapered bore hole provided with an internal thread, forming a similarly tapered and threaded wooden plug to fit said bore hole, applying adhesive to said threads, loosely inserting said plug into said bore for a substantial length thereof and driving the remaining length of said plug into said hole to interlock said threads, the taper of said bore hole and plug being such that the distance necessary for said plug to be driven to effect interlocking engagement of said threads is but a minor fraction of the length of said plug, thereby reducing to a minimum the wiping action of said threads during relative longitudinal movement therebetween.

5. The method of producing lumber free from defects from wood stock containing defects comprising boring out the defects and inserting wooden plugs in the bored holes, and thereafter cutting said wood stock into pieces of lumber with the direction of cut being transversely of the plug so that transverse slices of said plug will appear as repair patches in the pieces of lumber cut from said wood stock.

6. The method of producing lumber free from knot holes from logs containing knots or knot holes comprising boring out the knots in a radial direction prior to the sawing of such log, preparing a plug cut across the grain from a piece of wood similar to the wood of said log to fit said bored hole, driving said plug into said bored hole and thereafter sawing said log into pieces of lumber with plug patches appearing in said pieces where said knot holes had been.

7. The method of repairing a defect in wood stock comprising boring out said defect to leave a tapered bore hole and providing an internal thread in said bore hole having its upper face disposed at a lesser angle to the axis of the bore than the angle of its lower face, forming a tapered plug of wood to fit said hole and having a registering thread with a forward face disposed at a lesser angle to its axis than the angle of the rear face to facilitate the driving of the plug, the taper and length of said bore and plug being such that the plug may be loosely inserted into said hole the most of its length, inserting said plug into said hole, and driving said plug for the remainder of its length into said hole to cause said faces of lesser angular disposition with respect to said bore axis to slide across each other until said plug is firmly seated whereupon said faces of greater angular disposition with respect to said bore axis enter into interlocking engagement to firmly retain said plug.

8. The method of repairing a piece of wood to eliminate a localized defect such as a knot, comprising boring out said defect to leave a tapered hole with uniformly spaced circumferential ridges and grooves extending substantially the depth of said hole, forming a similarly tapered plug for said hole from material which may be cut by wood saws and veneer knives and having circumferential grooves and ridges extending the length of the plug which is to be contained in said hole, said ridges of the hole and plug being of such height in relation to the angle of taper of the hole and lug that the hole receives the plug loosely and non-rotatively most of the depth of the hole, inserting said plug loosely and non-rotatively in said hole, and then driving said plug an additional distance to interlock said mating grooves and ridges throughout the length of contact of the hole and plug.

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9. A repair for eliminating a localized defect such as a knot in a piece of wood, comprising a tapered circular hole in the site of said defect in said piece of wood having uniformly spaced circumferential grooves and ridges extending substantially the depth of said hole, and a similarly tapered circular plug seated in said hole, said plug being formed of material which may be cut by wood saws and veneer knives, said plug having circumferential grooves and ridges mating and interlocked with said grooves and ridges of the hole throughout the length of said plug which is contained in said hole, and said ridges of the hole and plug being of such height in relation to the angle of taper of the hole and plug that the hole receives the plug loosely and non-rotatively most of the depth of the hole.

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