

[54] **METHOD OF MAKING BLIND JOINTS
FOR PRECISE POSITIONING OF
MEMBERS**

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Related U.S. Application Data

[62] Division of Ser. No. 691,094, Nov. 24, 1967, abandoned.

[52] U.S. Cl. **144/309 L**, 144/323, 144/315, 287/127, 287/20.92 D

[51] Int. Cl. **B27f 1/08**

[58] Field of Search 144/309 L, 315, 323; 287/127, 287/20.92 D, 20.92 E

[56]

**References Cited
UNITED STATES PATENTS**

2,263,198 11/1941 Valiton 144/315
2,236,926 4/1941 Surface 287/20.92 E

FOREIGN PATENTS OR APPLICATIONS

571,918 3/1933 Germany 287/20.92 D

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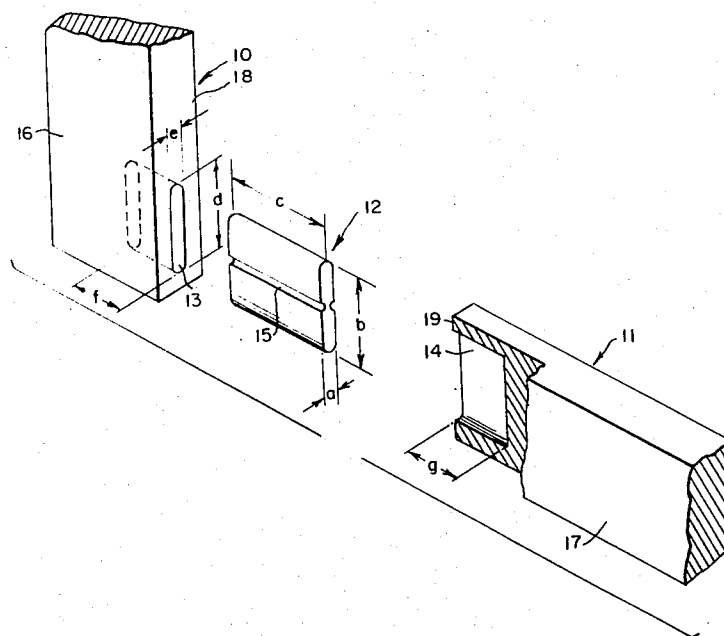
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[57]

ABSTRACT

Oblong mortises having substantially parallel walls are cut into the confronting faces of elements to be joined. These mortises are precisely positioned relative to a particular face of the elements. A spline is then cut to conform to the dimensions of the cavity formed by the mortises and inserted therein in order to complete the joint.

4 Claims, 4 Drawing Figures



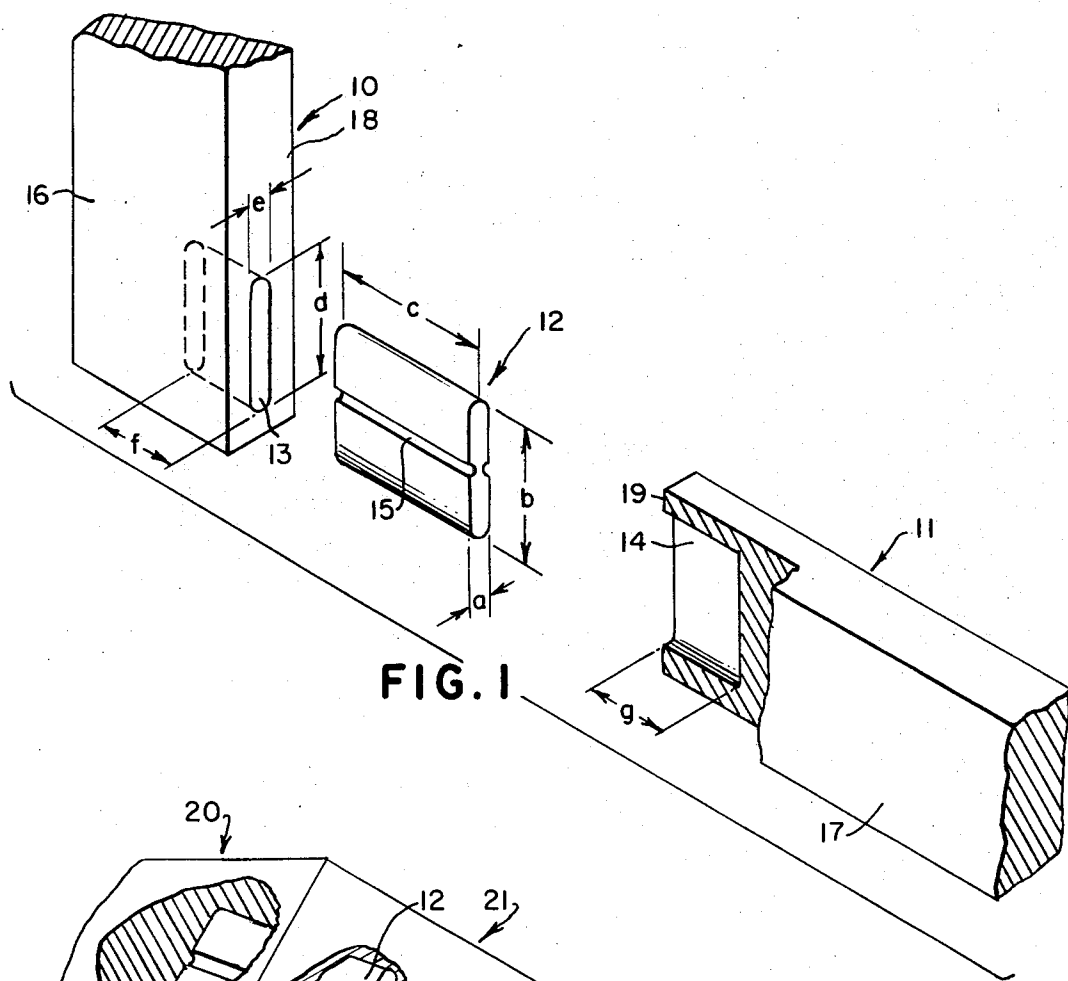


FIG. 1

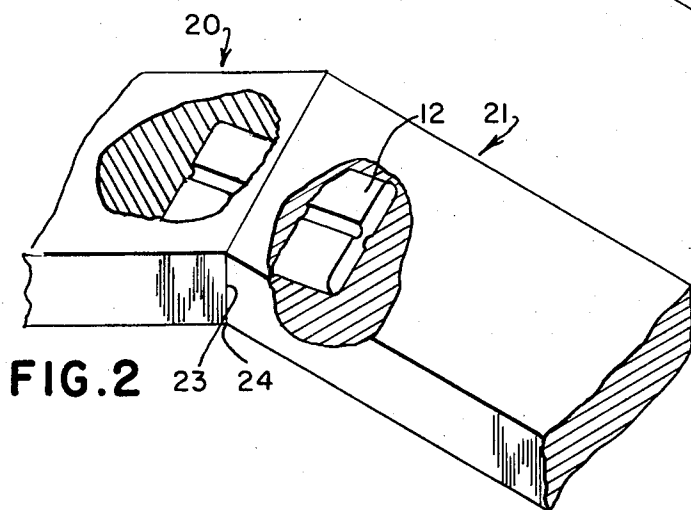


FIG. 2

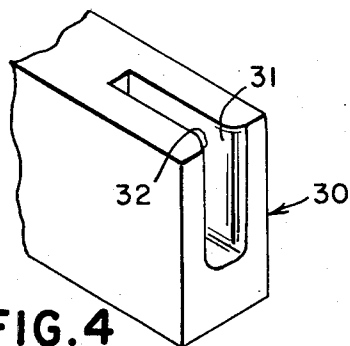


FIG. 4

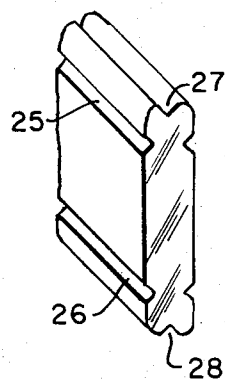


FIG. 3

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METHOD OF MAKING BLIND JOINTS FOR PRECISE POSITIONING OF MEMBERS

CROSS-REFERENCE TO RELATED APPLICATION

This is a division of patent application Ser. No. 691,094, filed Nov. 24, 1967 now U.S. Pat. 3,502,359.

FIELD OF THE INVENTION

This invention relates to jointing methods for effecting joints between separate pieces of material. More particularly, it relates to methods for effecting secure butted joints.

DESCRIPTION OF THE PRIOR ART

The art of cabinet construction has devised numerous techniques for joining wood and similar materials. For example, it is well known to use nails and screws, and it also is known to use various gluing arrangements in combination with internal and external supplementary pieces of material. Thus, it is customary to use glue blocks to secure shelves to the stiles, rails, and sides of a frame and it is well known to employ dowels in combination with glue as internal securing means.

The more sophisticated forms of cabinet construction make it necessary to effect the joining of the various elements of a cabinet without showing any sign of the joining means. Nevertheless, the joints should be easy to effect, and permit last minute modifications to insure accurate positioning of the elements being joined. In other words, if holes, or the like, must be bored, there should not be a need for close tolerances in either positioning or size of such holes.

Furthermore, the joint should be rigid. With respect to the method used, not only is the method of effecting the joint important, but also, the finish of the materials being joined should not be subjected to any abrasion and the joint should be secure almost immediately after assembly of the elements being joined.

For rigidity and neatness, the well-known mortise and tenon joint is often found to be of superior quality. This type of joint is both firm and rigid and when carefully prepared tends to position the joined elements in proper surface relationship. The difficulty with this kind of joint resides in the fact that the tools required to develop the tenon are cumbersome and the proper preparation of the pieces to be joined is extremely time consuming and difficult.

The use of dowels inserted in holes in each of the members to be joined is a technique sometimes employed as a substitute for the mortise and tenon joint. This latter jointing technique is not entirely satisfactory because it is difficult to properly align the joined pieces and, if only one dowel is used, there is considerable risk of rotation about the axis of the dowel.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages of the prior art jointing techniques and does so in a manner that is extremely easy to use both in the shop and in the field. The components of the invention are a splined member of substantially rectangular shape and cooperatively bored mortises adapted to receive the spline. It is relatively easy to accurately make mortises, and it is both easy and cheap to make long lengths of splined material. The combination of these elements in the manner disclosed by this invention makes possible cheap, accurate, and secure joints. This in turn leads to better and more economically produced cabinets and the like.

The features of the present invention provide means whereby the surfaces of the butt joined elements may be prepared to close tolerances and the joint itself may serve to align and position the elements. These features virtually eliminate the need for jigs when the joints are used in cabinet work and greatly facilitate fabrication of structures from pre-cut elements by unskilled labor. In addition, the splines used to complete the joints of this invention may be prepared in a manner to improve the holding ability of any adhesive used,

while also making it less likely that the elements will be damaged during assembly.

It is an object of the invention to provide a new method for butt joining material.

It is a further object of the invention to provide a new method for the butt joining of material, that can be employed irrespective of the configuration of the materials to be joined. The joint may be effected at the ends of mating pieces of material, in the face of one piece of material and the end of another, or in the ends of angularly disposed pieces of material. The only limitation on the shape of the pieces being joined is that there must be sufficient depth to accommodate the spline.

Another object of the invention is to provide a method of effecting joints with a minimum of tools and/or jigs.

Another object of the invention is to provide a method of effecting joints wherein the operations do not require a skilled craftsman and do not require close tolerances.

Another object of the invention is to provide a method of effecting joints wherein the joint is self holding during the set of any added adhesive.

Another object of the invention is to provide a method of joining materials wherein the materials are virtually self-aligned.

In accordance with the invention there is provided a method of butt joining the edges of pieces of material, to provide a predetermined relationship between adjacent particular face surfaces of said pieces, comprising cutting oblong mortises of similar peripheral dimensions in the confronting edges of the pieces to be joined, each of said mortises being of greater height than width and having substantially parallel walls one of which is precisely positioned relative to the said particular face of the respective piece of material, and each of said mortises being cut to a depth less than the depth dimensions of said pieces, inserting a spline having peripheral dimensions substantially the same as those of said mortises between said confronting edges, and bringing said confronting edges into butting contact.

Further objects and features of the invention will be obvious after consideration of the following description which is made in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of a typical butt joint, with a portion of one element cut away, in accordance with the invention;

FIG. 2 is an illustrative drawing partially in cross section of a butt joint in accordance with the invention;

FIG. 3 is a perspective of a portion of a spline for use in conjunction with joints made according to the invention; and

FIG. 4 is a perspective view of a typical mortise made according to an embodiment of the invention, wherein the upper portion of the member is removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As illustrated in FIG. 1, the basic components involved in forming a joint according to the present invention include the elements to be joined 10 and 11, and a spline 12. For purposes of discussion, it may be noted that the invention is particularly applicable to the joining of wooden materials. Nevertheless, it should be understood that other materials are within the contemplation of the invention and may partake of the advantages afforded by the invention. The spline 12 may be made of wood, plastic, or any similar material which is capable of being prepared in a rigid form suitable for insertion in a manner described hereinafter. It is particularly convenient to prepare long lengths of spline material and cut off individual pieces as desired.

In order to prepare the joint, the confronting surfaces 18 and 19 of elements 10 and 11 are smoothed and configured to appropriately conforming contours. Generally, this may be done by planing and/or sanding; but the invention is not

limited to instances where the butting surfaces are flat. It will be apparent that the surface 18, 19 can and should be prepared to close tolerances. This will insure that the resulting joint will accurately locate the joined elements 10, 11 relative to each other in all possible planes. This accuracy of positioning is not available with the conventional mortise and tenon joint because the butting surfaces of such joints include the shoulder of the mortise which is difficult to prepare within close tolerances.

After the confronting surfaces 18, 19 are prepared, mortises 13 and 14 are cut therein. Conventional mortising tools may be employed. The mortises are preferably cut in positions referenced from adjacent surfaces of the elements to be joined and when the elements are placed in final position, they form a cavity having smooth sides and a straight central axis. In joints of the type illustrated in FIG. 1, the mortises are preferably cut perpendicular to the surfaces 18, 19; however, in angular embodiments of the joint, it may be desirable to cut the mortise at an angle to the abutting surfaces in order to optimize the depth of the cut.

Spline 12 is prepared independently of the mortises, in a manner discussed hereinafter, and it is inserted to complete the joint. The dimensions of the spline are selected to have it nest within the cavity formed by the mortises 13, 14 when the elements 10, 11 are assembled with the butting surfaces 18, 19 in contact. For a firm and permanent joint, adhesive may be applied to the spline and/or to the mortises before the joint is formed. It is possible to avoid the use of adhesive if the respective dimensions of the spline 12 and joined elements 10, 11 are suitably selected, and the joint is force-fitted to form a high friction connection.

The lined mortises used in this invention can be placed not only in the edges and ends of elements being joined, but also may be placed on the faces of such elements. Thus, there are very few limitations upon the use of the described joint and since it can provide a joint stronger than the materials joined, it is extremely useful irrespective of location.

FIG. 2 illustrates the joining of two elements 20, 21 which are to be finally assembled at an angle to each other. With such joints, the confronting edges 23, 24 of the elements are shaped to provide butting contact when the elements are suitably disposed. The mortises are cut into each face to develop a cavity in the assembled position of the elements that has a linear longitudinal axis. The length and positioning of each mortise is, of course, limited by the dimensions of the elements 20, 21 and the desired assembled position. A particular advantage of the present invention, is the fact that the length of spline 12 can be varied without limit to conform with any of the depth limitations imposed upon the mortises.

The design of the splines used in this invention plays a critical role in the quality, ease, and cost with which joints are formed. In general, with reference to FIG. 1, the width a , height b , and length c of each spline is substantially the same as the corresponding width e , height d , and double depth $2f$ of the mortise cavity. Of course, there is no necessity for making the mortises in each joined element of equal depth, but, this is usually convenient. Obviously, in order to insert the spline 12 into the mortises 13, 14 it must be slightly smaller than the cavity. Furthermore, when an adhesive is used, room must be left in the cavity to accommodate the adhesive. The amount of room left for adhesive will depend both upon the adhesive used and the porosity of the spline 12 and the joined elements 10, 11.

An important feature of the spline is the provision of grooves therein. In FIG. 1, the spline 12 is illustrated as having a single longitudinal groove 15 at the center of each side. In FIG. 4, a portion of another spline is illustrated, wherein there is a pair of longitudinal grooves 25, 26 along each side and further longitudinal grooves 27, 28 along the top and bottom edges. The function of the grooves is two-fold. When the spline is made of a deformable material, such as wood, the grooves permit some resilient compression of the spline which permits the use of slightly oversized splines or slightly under-

sized mortises. This aspect of the grooves also enhances the friction with which the respective members hold together. The second and perhaps more important function of the grooves is concerned with the use of adhesives.

When the spline is forced into the mortise with a liquid adhesive, the adhesive and any trapped air must be given a vent or the element containing the mortise may be cracked. This is a danger faced when using the prior art mortise and tenon joining method. The grooves on the spline provide the necessary vents and not only protect the elements against cracking, but make insertion of the spline easier. The grooves also provide a discrete volume within the mortise cavity and along the length of the spline within which an adhesive may be retained. The sides of the grooves provide increased surface area for adhesive contact and even if most of the adhesive is squeezed out of the cavity due to intimate contact between the mortise walls and the surface of the spline, enough will be retained in the grooves to insure a good bond. For some uses, rather than using longitudinally positioned grooves, it may be desirable to arrange them in a spiral about the spline, or if venting is considered of minor importance in particular circumstances, transverse grooves may be employed to improve the bonding between the spline and the mortise walls.

The present invention also provides features which appear initially to be contradictory in their effect. As mentioned above, the joints of the invention are self-aligning, that is, when the mortises are properly made, insertion of the spline automatically positions the surfaces of the joined elements in correct registration. This is of great importance when working with materials having pre-finished surfaces that cannot be further modified by planing, sanding, or the like. On the other hand, the joints of the invention also permit last minute modifications when assembling a joint in order to correct for minor misalignments that may have arisen due to imperfectly prepared elements. This too, is of great importance, particularly when the elements are prepared at one location and assembled at another.

FIG. 4 shows an exaggerated perspective view of the end of a mortised element 30 with the upper portion removed. This view illustrates that the edges 31, 32 of the mortise may be chamfered or beveled. When this is done, the spline may be moved slightly within the mortise cavity in order to permit adjustment of the element from the position that would normally be imposed if the fit was snug. The chamfering of edges 31, 32 also provides an additional space for adhesive when the faces of the joined elements are in butting contact.

A number of specific embodiments of the invention have been shown and described. It is recognized that with the teachings disclosed and suggested herein, further modifications and improvements may be made by those skilled in the art, and all such arrangements are contemplated to fall within the scope of the following claims.

I claim:

1. In a method of butt joining the edges of pieces of material to provide a predetermined relationship between adjacent particular face surfaces of said pieces, wherein rectangular mortises of similar peripheral dimensions are cut into the confronting edges of the pieces to be joined to a depth less than the depth dimension of said pieces, and a spline is inserted therein, the improvement comprising:

- A. precisely positioning the major side wall of each said mortises a predetermined distance from said particular face surface of the respective piece of material;
- B. preparing a long strip of material with rectangular cross-sectional dimensions slightly less than the cross-sectional dimensions of the mortise cavity formed when said confronting edges are in butting contact,
 - a. the major faces of said strip being substantially flat and parallel yet including at least one longitudinal groove extending from end to end, and
 - b. the walls of said groove terminating at the respective faces of the strip;

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- C. cutting a spline from said strip of material, having transverse ends substantially perpendicular to the faces of said strip, and a length substantially equal to the length of said mortise cavity; and
 - D. inserting said spline in said cavity along with an adhesive, to bind said pieces of material together.
2. A method of butt joining according to claim 1, wherein said spline is coated with an adhesive prior to insertion.

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3. A method of butt joining according to claim 1, including enlarging the edges of said mortises at the confronting faces prior to inserting said spline.
4. A method of butt joining according to claim 2, including enlarging the edges of some mortises at the confronting faces prior to inserting said spline.
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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,674,068 Dated July 4, 1972

Inventor(s) Donald E. Lucci

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 33 Second word "lined" should be
 --blind--

Signed and sealed this 17th day of October 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents