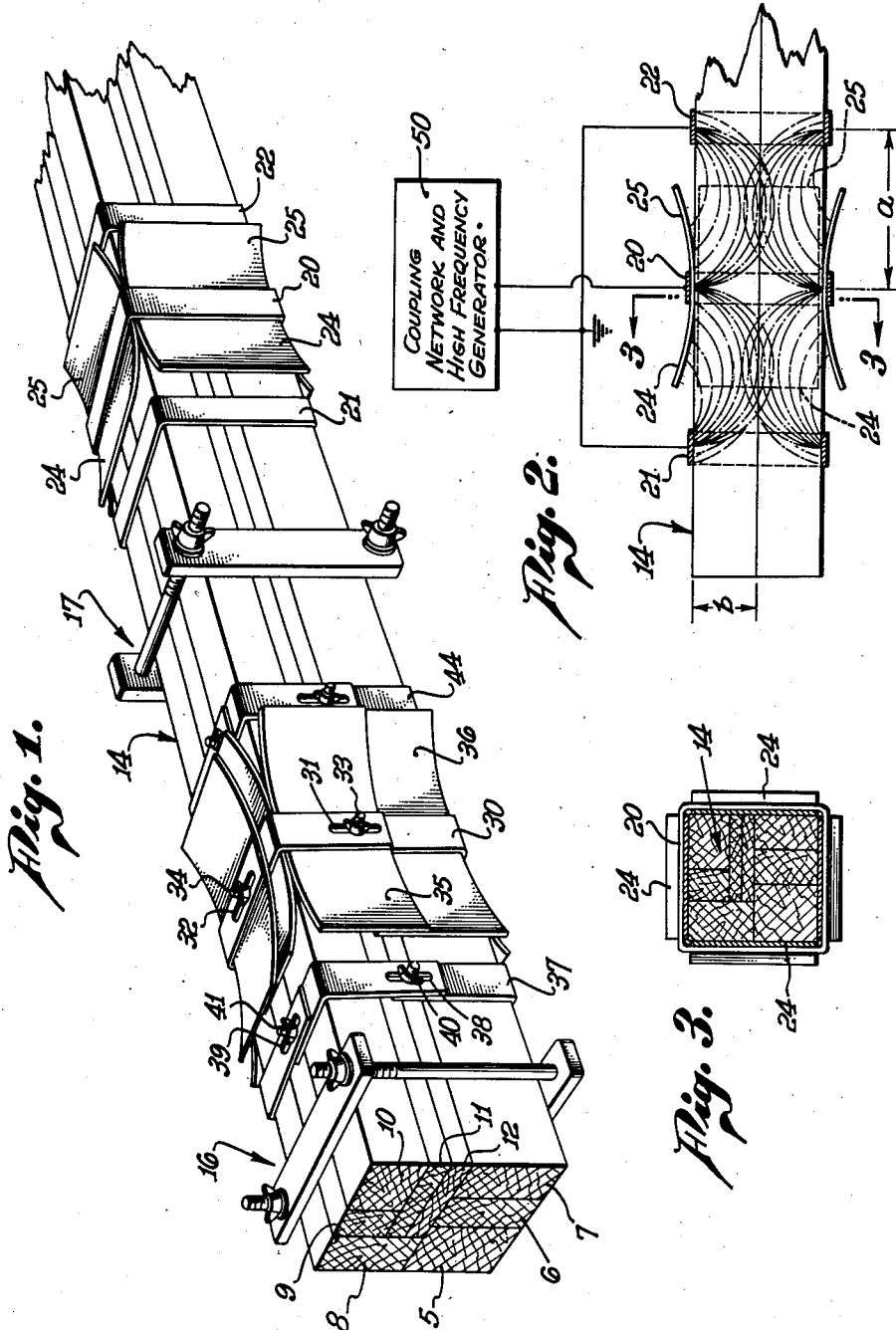


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WOOD ADHERING MACHINE
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WOOD ADHERING MACHINE

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4 Claims. (Cl. 219—47)

1 This invention relates to high frequency heating systems, and particularly to a high frequency system for gluing a number of elements, such as wood beams, either at predetermined points, called "spot" gluing, or over the entire length of the composite beam.

The use of high frequency current for setting glue is well-known, reference being made to Stephen U. S. Patent No. 2,231,457 of February 11, 1941, while a spot gluing system for the edges of lumber is disclosed and claimed in Linquist U. S. Patent No. 2,317,281 of April 20, 1943. The present invention, however, is directed to an improved system of directing the heating currents efficiently through a large synthetic timber beam made up of multiple parts in which the abutting surfaces or glue lines run in planes at angles to one another, particularly at right angles. For instance, in the edge gluing process disclosed by Linquist, two electrodes are placed directly on the glue line or abutting surfaces of the boards so that the high frequency currents pass directly into the glue, since the electrodes are in contact therewith. Since the boards are comparatively thin, the field is uniform within the glue between electrodes. In a large timber made up of a plurality of narrow pieces of different cross-sections, or a round hollow or solid pillar, it is realized that some of the glue lines will run at various angles to other glue lines. Electrodes placed on opposite sides of a square or rectangular timber do not permit the efficient heating of glue along all glued surfaces, especially at right angles to the direction of the field. Furthermore, it has been found that the provision of a linear varying potential gradient between electrodes increases the heating efficiency by high frequency and thus shortens the heating period necessary to set the glue.

The arrangement of the electrodes in the present invention, therefore, permits the currents to flow directly into the glue lines regardless of their position, and the electrodes are so formed as to provide a uniform field between the high potential and grounded electrodes. Thus, the heating of all glue throughout the cross-section of the timber at the spot being glued is uniform and simultaneous. Thus, the spot gluing method disclosed by Linquist is made effective for the making of large dimensioned beams of differently shaped cross-sections.

The principal object of the invention, therefore, is to facilitate the gluing together of small strips of lumber to produce a large beam.

Another object of the invention is to improve

2 the high frequency heating efficiency of glue along surfaces at angles to one another.

A further object of the invention is to provide an improved electrode system for efficiently applying high frequency energy to an element having glue lines running at right angles to one another.

A still further object of the invention is to provide an electrode system in which a uniform field is provided throughout the dimensions of a wooden timber.

Although the novel features which are believed to be characteristic of this invention will be pointed out with particularity in the appended claims, the manner of its organization and the mode of its operation will be better understood by referring to the following description read in conjunction with the accompanying drawings, forming a part hereof, in which:

Fig. 1 is a perspective view of two forms of electrodes applied to a rectangular or square wooden timber made up of smaller strips.

Fig. 2 is a diagrammatic arrangement showing the connections between the high frequency generator and the electrodes, and

Fig. 3 is a cross-sectional view taken along the line 3—3 of Fig. 2.

Referring now to the drawings, in which the same numerals identify like elements, it will be noted that a plurality of wood strips 5-12, inclusive, of different cross-sections have been fitted together to form a large beam 14 having a cross-section which is approximately square, although the invention is similarly applicable to a rectangular beam of any dimension. The invention may also be used for hollow or solid pillars or columns, the electrodes being shaped to the external form of the article. The contacting surfaces between the parts 5-12, inclusive, are coated with glue, and they are held together by clamps, such as shown at 16 and 17. As explained in the above-mentioned Linquist patent, after the glue, at a spot along the timber, has been properly set by high frequency, the clamps may be removed and the heated spot will hold the strips together until the remainder of the glue has set. It is necessary, however, that the glue be set throughout the cross-sectional area of the beam, otherwise separation between surfaces will occur and the beam is thereby weakened. The electrode systems of the invention provide this result for a large dimensioned beam with glue lines at angles to each other with the same efficiency as the Linquist system provides for a single glue line.

Two types of electrode systems are shown in Fig. 1 surrounding the rectangular beam 14. The electrodes shown at 20, 21, and 22 are continuous integral encircling rings having flat sides, and are used when a large number of beams of the same dimensions are to be manufactured. The high potential central electrode 20 has side flares 24 and 25 on all four sides to provide a uniform high frequency field through the entire cross-sectional area of the beams 14 between the electrodes, as shown by the dotted lines in Fig. 2. Only one of the electrodes 21 and 22 may be used, but a better application of the generator energy is obtainable in the manner shown.

The other electrode system is of a similar nature, but is adjustable to accommodate differently sized beams. A central high potential electrode 30 is provided with slots 31 and 32 and thumb screws 33 and 34, respectively, for tightening the electrodes in any adjusted position. Similarly, electrode 37 has slots 38 and 39 in the different sections thereof along with thumb nuts 40 and 41, respectively, for tightening the electrode into different positions. The sections of the electrodes on the back and bottom surfaces of the beam 14 are also similarly provided with adjustable slots. If the beam were round, circular electrodes would be used.

Referring now to Fig. 2, a generator such as shown at 50 may be of the type disclosed and claimed in copending U. S. applications of Frederick G. Albin, Ser. No. 540,767, filed June 17, 1944, and Ser. No. 560,465, filed October 26, 1944, now Patent No. 2,442,451, June 1, 1948. The electrodes 21 and 22 and electrodes 37 and 44 are grounded electrodes, while the central electrodes 20 and 30 with the flares 24, 25, 35, and 36, respectively, are the high potential electrodes. By extending the high potential electrode toward each grounded electrode with a slight substantially exponential outward curvature at an angle depending upon the separation between electrodes, but approximately fifteen to thirty degrees to the axis of the beam 14, the semi-spherical fields, shown in Fig. 2 by the dotted lines, are produced. That is, in the example illustrated, two overlapping or intersecting fields will be directed through the beam 14 in each of two planes, the two fields being at right angles to one another and extending between regions adjacent the respective electrodes spaced along the lines of intersection of the contacting surfaces.

The separation of, or spacing between, the electrodes depends upon the larger dimension of the beam being glued. The general rule is that the distance between electrodes be twice the depth of the glue line to be heated. This is illustrated in Fig. 2, where the distance a is at least twice that of distance b .

Thus, the glue lines between elements 5, 6, and 7 and between 8, 7, and 10 will be heated by the upper and lower sections of the electrodes in direct contact therewith, while the glue lines at right angles thereto, such as those between elements 11 and 12, 12 and 6—7, 11 and 9—10, and 5 and 8 will be heated by the fields produced by the opposite side sections of the electrodes. Thus, not only are equi-potential fields provided between the electrodes, but all glue lines will receive the same degree of heating and all the glue will be set in the same period of time, thus safely permitting the removal of the clamps 16 and 17 after a short application of the high frequency energy.

I claim:

1. A system for heating the glue lines between

adjacent surfaces of a plurality of pieces of lumber, said glue lines running at right angles to one another comprising a pair of clamps for clamping said pieces into a predetermined form, a high frequency generator, a first electrode completely encircling and in contact with the periphery of said form and connected to said generator, and a second electrode completely encircling said form and connected to said generator, said second electrode being in contact with said form periphery at a distance from the center of said first electrode which is twice the depth of the glue line to be heated, said second electrode being flared away from said form in a direction toward said first electrode along a substantially exponential curve which is tangent to a plane at the region of contact of said second electrode with said form, said flare being at an angle of from fifteen degrees to thirty degrees with respect to said plane, said first and second electrodes being dimensioned to substantially surround the portion of said form in which the glue lines are to be dried, and said first and second electrodes being adjustable to fit various beam sizes.

2. An electrode system for applying high frequency oscillations to glue between abutting lumber surfaces at angles to one another comprising means for applying pressure to said surfaces, a pair of spaced electrodes encircling said lumber, said electrodes contacting the edges of all of said abutting surfaces, and a third electrode positioned between said spaced electrodes, and encircling said lumber said third electrode being in contact with said lumber periphery and flaring away from its region of contact with said lumber upward in both directions toward said spaced electrodes along a substantially exponential curve which is tangent to a plane at the region of contact of said second electrode with said lumber, said flare being at an angle of between fifteen degrees and thirty degrees with respect to said plane, said spaced electrodes and said third electrode being dimensioned to substantially surround the portion of said lumber in which the glue lines are to be dried, said spaced electrodes and said third electrode being adjustable to fit various lumber sizes, and means for applying a radio frequency potential difference between said third electrode and each electrode of said pair.

3. An electrode system for applying high frequency oscillations to glue lines angularly disposed between the surfaces of a plurality of pieces of lumber fitted to form a beam, said system comprising a first electrode encircling and in contact with said beam periphery, and a second electrode encircling said beam and in contact with said beam periphery at a distance from the center of said first electrode which is twice the depth of the glue line to be heated, said second electrode being flared away from said beam in a direction toward said first electrode along a substantially exponential curve which is tangent to a plane at the region of contact of said second electrode with said beam, said flare being at an angle of from fifteen degrees to thirty degrees with respect to said plane, said first and second electrodes being dimensioned to substantially surround the portion of said beam in which the glue lines are to be dried, and said first and second electrodes being adjustable to fit various beam sizes.

4. An electrode system for applying high frequency oscillations to glue lines angularly disposed between the surfaces of a plurality of pieces of lumber fitted to form a beam, said system com-

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prising a pair of longitudinally spaced electrodes encircling and in contact with said beam periphery, a third electrode positioned between said spaced electrodes and encircling said beam, said third electrode being in contact with said beam periphery and flaring away from its region of contact with said beam upward in both directions toward each of said spaced electrodes along a substantially exponential curve which is tangent to a plane at the region of contact of said second electrode with said beam, said flare being at an angle of between fifteen degrees and thirty degrees with respect to said plane, said spaced electrodes and said third electrode being dimensioned to substantially surround the portion of

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said beam in which the glue lines are to be dried, and said spaced electrodes and said third electrode being adjustable to fit various beam sizes.

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