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Haug

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[54] **APPARATUS FOR JOINING OF PLYWOOD PLIES**

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[51] **Int. Cl.²** **B31F 5/00**

[58] **Field of Search** ..... 156/290, 291, 295, 304, 156/305, 502, 544, 509, 546, 548, 555, 578; 161/37, 148; 144/309 L, 309 P, 317; 214/1 S; 219/101; 264/263

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[57] **ABSTRACT**

Plywood plies are abutted in edge-to-edge relationship so as to form a juncture at the butt, and a plurality of spaced dots of adhesive are applied to the juncture so as to connect the plies together. A method and an apparatus for carrying out the invention are disclosed.

10 Claims, 3 Drawing Figures

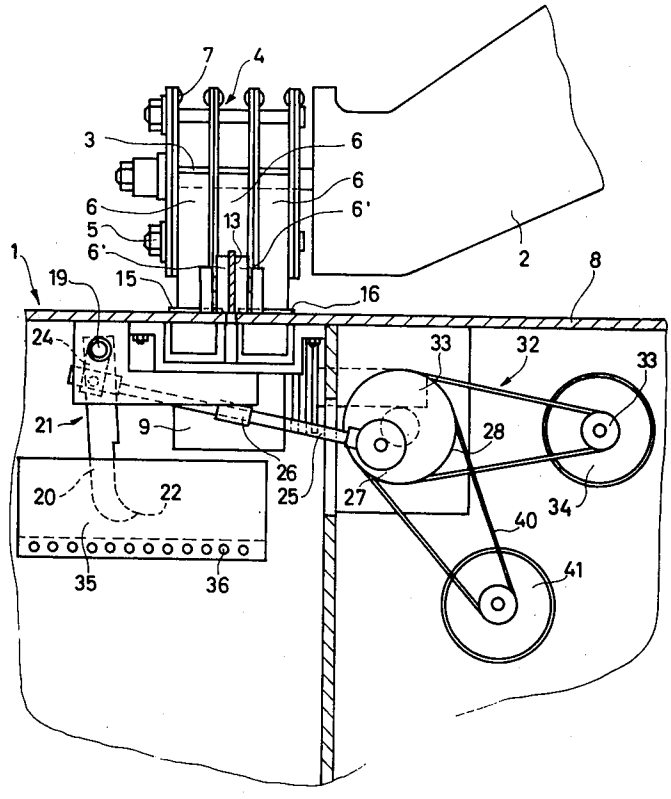


Fig. 1

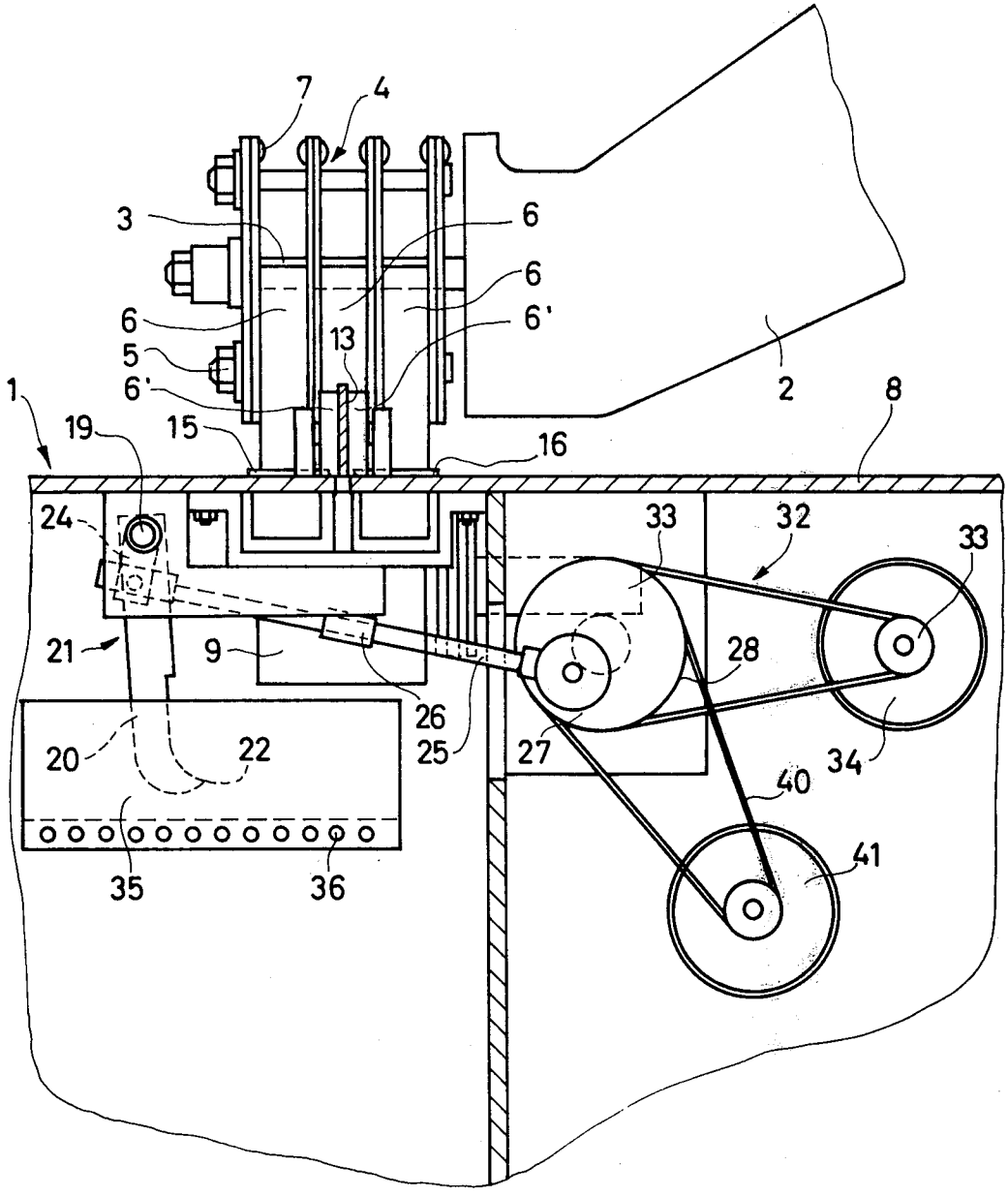

7
4
3
6
6
6
6'
13
5
6'
1
19
15
16
2
8
24
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32
33
21
9
28
26
25
27
34
20
22
40
41
35
36

Fig. 2

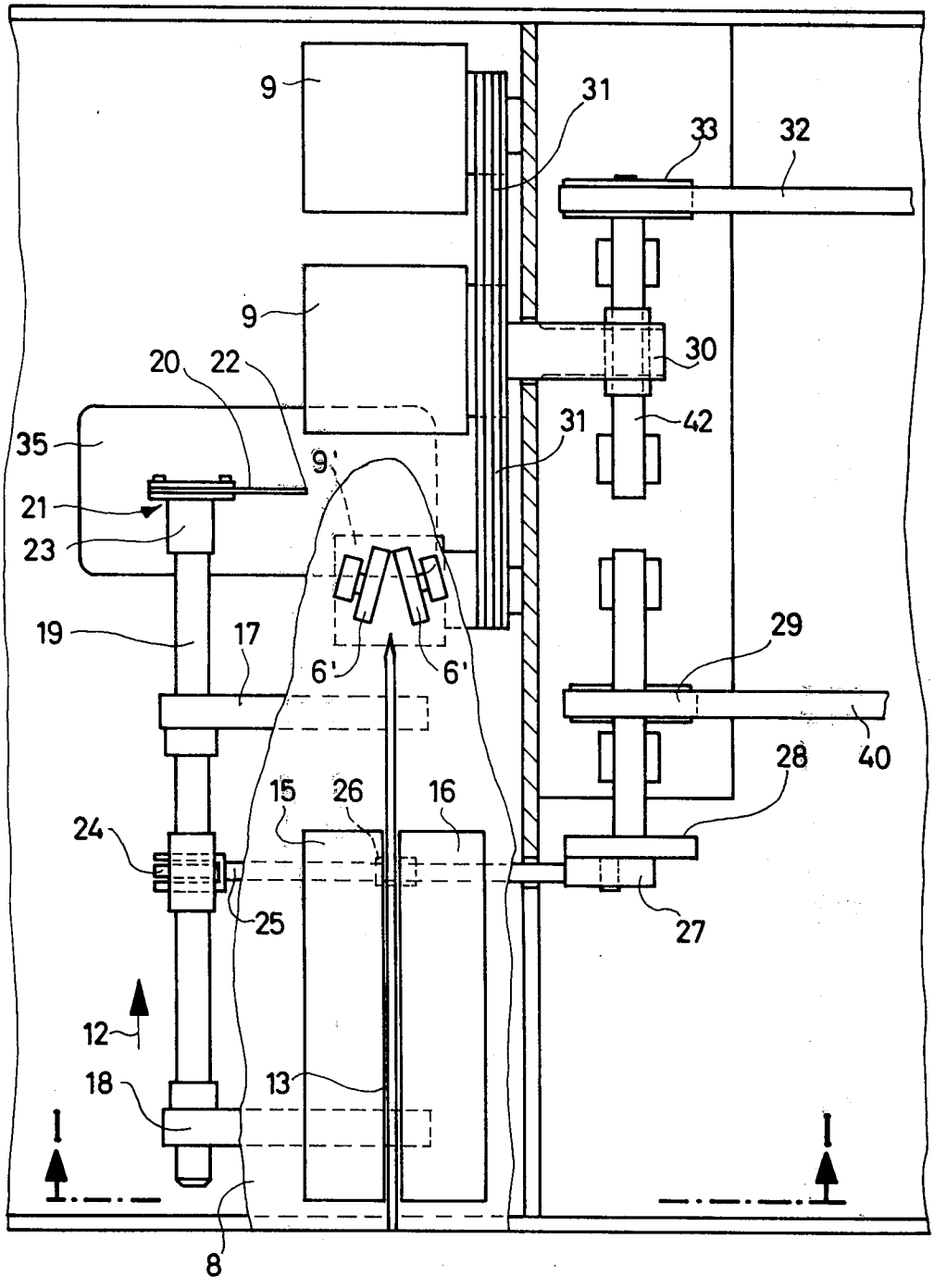
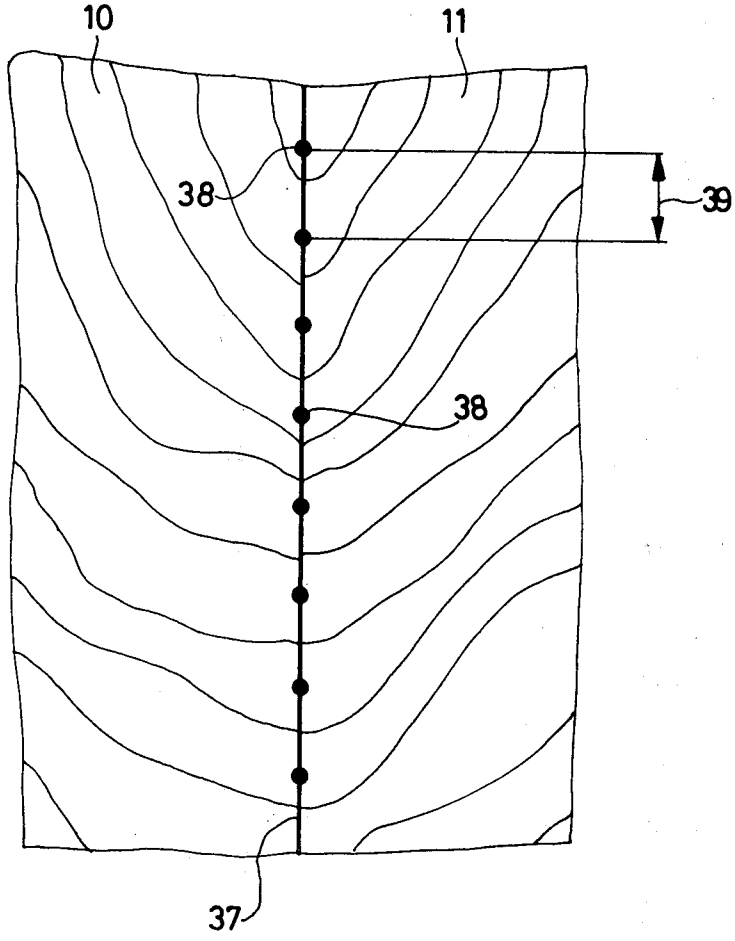

9
31
33
32
9
30
20
22
31
42
35
9'
21
23
19
17
6'
6'
29
40
28
15
26
16
24
25
27
12
18
13
8

Fig.3



APPARATUS FOR JOINING OF PLYWOOD PLIES

BACKGROUND OF THE INVENTION

The present invention relates generally to the joining of plywood plies, and more particularly to a method and an apparatus for joining plywood plies in abutted edge-to-edge relationship.

It is known in the prior art to abut two plies of plywood in edge-to-edge relationship and to connect them by pasting a strip of paper across the butt joint. The plywood plies are thus connected and ready for further processing. This further processing involves their adherence to a filler layer, that is to a board, underlyament or the like, for which they serve as the outer exposed layer. Before they can be thus secured to the filler or support layer, the paper strip must be removed again, which is usually carried out by grinding it off. The grinding operation required to do this is relatively time-consuming and requires particular skill because, although the paper must be removed, there must be no visible traces of the grinding operation left on the plywood itself. Moreover, before the paper strips can be pasted onto the plywood plies, they must be stored in a cool and dry environment because otherwise they loose their adhesive ability quite rapidly (they are adhesive-coated strips). Still another difficulty with the prior art is that quite frequently the plywood plies are slightly wavy, resulting in stresses after the paper has been applied to them to connect them, which stresses can lead to a tearing of the paper strip and can disadvantageously affect the connection between the plies.

Another approach known from the art involves the application —by means of an essentially sewing machine-like device of a thread of adhesive which is made to pass in zigzag fashion over the butt joint between the plies to be connected. However, this type of device is relatively expensive and, even more objectionably, traces of the adhesive will remain visible in the finished product.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the invention to overcome the disadvantages of the prior art.

More particularly it is an object of the present invention to provide an apparatus which avoids the aforementioned disadvantages.

An additional object of the invention is to provide such an apparatus which is reliable in its operation, simple in its construction and inexpensive to produce.

Still a further object of the invention is to provide such an apparatus which permits the abutted plies to be connected at their butt joint in such a manner that there is no subsequent need for removal of the connecting means employed.

An additional object of the invention is to provide an apparatus which is capable of providing for an intimate connection at the butt joint and which is not influenced, in the quality of connection which it provides, by a certain unevenness (e.g., waviness) of the plies being connected.

An additional object of the invention is to provide a novel method of connecting plies.

In keeping with these objects, and others which will become apparent hereafter, one feature of the invention resides, in a method of joining plywood plies, in abutting two plywood plies in edge-to-edge relationship, so as to form a butt joint, that is a juncture between them. Thereupon, spots of adhesive are applied to the juncture for connecting the plies to one another.

The novel apparatus comprises means for abutting the plywood plies in edge-to-edge relationship so as to form a juncture, and means for applying to this juncture a plurality of spaced dots of adhesive so as to connect the plies with one another.

With the present invention it is thus not necessary to provide a carrier for the adhesive, such as the previously used paper strip, but instead of the adhesive is directly applied to the butt joint between the plies. The adhesive is usually a fusion-type adhesive.

On application of the dots of adhesive, some of the adhesive of each dot will penetrate between the facing edgde faces of the abutted plies, so that a very reliable connection will be established between them. The amount of adhesive involved in each dot is small, so that the adhesive will cool rapidly without having to be subjected to special cooling steps, which further simplifies the operation of the device. The application of the adhesive in form of spots is simple and rapid, and because of this, and also because of the rapid cooling of the adhesive once it has been applied, the apparatus can operate at relatively high throughput speed.

A particular advantage of the invention is the fact that enough space will remain between the small localized spots of adhesive so that, when the plies are subsequently to be bonded to a carrier, they can be bonded right up to the juncture so that a later opening of the juncture or a separation along the juncture will be impossible. The subsequent removal of the adhesive spots is not necessary, as in the case of the paper web, and even relatively wavy plies can be readily connected in accordance with the present invention. Because of the use of spaced spots of adhesive, tensions can be compensated to some extent which might occur in the connected plies, so that such plies are relatively flexible at their juncture.

It is particularly advantageous if the device for supplying the adhesive is arranged below a supporting table over which the plies pass, and if only its contact or transfer face extends through an opening in the table in order to apply the spots of adhesive to the juncture of the plies.

The device for supplying the adhesive may be in form of a pivotable arm having a dot-shaped contact or applying face, and being so journalled that the arcuate path traversed by this face passes through an adhesive container and the juncture of plies located on the table. The arm then pivots to and fro and during each pivoting movement its abutment or transfer face will dip into the adhesive container, picking up some of the adhesive, which is transferred in form of a dot to the juncture of the plies. In terms of simplicity and advantageousness of structure it is particularly beneficial if the arm is connected rigidly with a shaft which can turn, and on which there is mounted a further arm extending transversely thereto and having a free end connected with an eccentric which is driven by a drive shaft, the latter in turn being driven by a motor. This is a reliably operating construction, and it can be readily adjusted by providing an adjusting device on a rod which is pivoted to the free end of the transverse arm and whose other end is connected with the eccentric mentioned above. Such an adjusting device permits an adjustment of the extent to which the arm can pivot, and in particular the point of engagement of the transfer face with the plies can be adjusted in this manner.

It is advantageous if a separate motor is provided for driving the applying device, and if the drive shaft can be driven at variable RPM, for instance by interposing between it and the motor a variable-RPM belt drive. This permits the application of the adhesive spots onto the juncture at adjustable spacing, depending upon the thickness of the plies, the type of wood involved, the strength and the like.

However, the drive shaft can also be coupled with the drive for the transport rollers which engage and transport the plies. In this case the spacing between successive adhesive spots is constant, independently of the speed at which the plies are transported through the machine.

This latter type of construction is particularly advantageous for the so-called "hot-cold process," in which the adhesive is applied as a fusion type adhesive, for instance at a temperature of approximately 200°C. The temperature of the applied adhesive drops so rapidly that in the short time before the plies leave the machine a sufficient adhesive force will have been established to connect the plies. However, it is also possible to use the so-called "cold-hot process," wherein conventional adhesive is applied at the usual temperature, and a heating device is provided in the machine which assures that before the plies leave the machine the adhesive will have set sufficiently to provide a bond of requisite strength.

According to still a further concept of the invention the device which the adhesive can be constructed in form of a pump having an outlet opening which supplies spots of adhesive to the juncture of the abutted plies, or it is possible to use a roller provided with projecting portions extending from its periphery and having respective contact faces which alternately dip into the adhesive in an adhesive container and then transfer the thus picked-up adhesive in form of adhesive spots to the juncture between abutting plies.

It is advantageous if the adhesive container itself can be removable, for instance pivoted out of its normal operating position, to facilitate both cleaning and refilling with additional adhesive. It is also possible to use a mechanism which raises and lowers it into and out of the path of movement of the applying device and which operates when the applying arm is stationary, so that while the arm is stationary it does not become lodged in and frozen in the rigidifying adhesive. because this could result in damage to the apparatus when it is restarted.

The novel features wich are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal section of an exemplary embodiment of the present invention, taken on line I—I of FIG. 2;

FIG. 2 is a top-plan view of the apparatus in FIG. 1, with certain portions having been omitted for the sake of clarity; and

FIG. 3 is a bottom-plan view of two abutted plies which have been connected in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing in detail, and firstly FIG. 3, it will be seen that reference numerals **10** and **11** illustrate two fragmentarily shown plies of plywood which have been abutted in edge-to-edge relationship, thus forming a juncture or butt joint **37.** At distances whose magnitude is designated by the arrow **39,** the plies **10** and **11** are connected by means of adhesive dots or spots **38** which have been applied over the juncture **37,** so as to connect the plies **10** and **11** with one another.

An apparatus for carrying out this connection has been shown in the exemplary embodiment illustrated in FIGS. **1** and **2.** In these Figures reference numeral **1** identifies a frame carrying an arm **2** which in turn supports a shaft **3.** Mounted on the shaft **3** are scissors **4** the lower ends of which are provided with shafts **5** for pressure rollers **6,** and the upper ends of which are provided with springs **7** which urge the pressure rollers **6** in the direction towards a table **8.** Transport rollers **9** are provided which are predominantly located beneath the upper plane of the table **8.** The rollers **6** and **9** cooperate with additional pressure rollers **6'** and transport roller **9'** which serve to tightly abut the plies **10** and **11** in edge-to-edge relationship. The plane of contact of the rollers **6, 6'** and the rollers **9, 9'** is located approximately at the level of the upper surface of the table **8.** In the direction of advancement of the plies **10** and **11,** as indicated by the arrow **12** in FIG. **2,** an abutment **13** projects from the upper surface of the table **8,** ahead of the rollers **6'** and **9',** which serves to properly align the plies **10** and **11.** To the left and to the right of the abutment **13** there are provided shiftable plates **15** and **16** on the table **8,** which can be moved manually in the direction indicated by the arrow **12,** and opposite to the same.

A shaft **19** is pivotably mounted in carriers **17, 18** below the table **8.** At one end the shaft **19** carries an arm **20** which is part of an adhesive supplying device **21** and is provided with a dot-shaped contact or transfer face **22.** The arm **20** is removably connected on the shaft **19** by means of a holder **23.** Also mounted on the shaft **19** is a further arm **24** which is articulated to a rod **25** the effective length of which can be adjusted by an adjusting device **26.** The end of the rod **25** which is remote from the arm **24** is connected with an eccentric **27** which is mounted on a plate **28,** the latter being driven by a drive shaft **29** which can in turn be driven at variable RPM by a motor **41** via an adjustable belt drive **40.** Thus, the desired RPM value at which the shaft **29** is to be driven, can be selected at will.

A further drive shaft **42** is provided, which drives one of the transport rollers **9** via a worm drive **30,** and belts **31** connect this driven transport roller **9** with the other transport rollers **9** and **9'.** The drive shaft **42** is connected with a motor **34** via a belt drive **32,** and the belt pulleys **33** can be adjusted or can be in form of variable sheaves, so that the RPM of the shaft **42** can also be varied, whereby the speed at which the plies **10** and **11** advance through the apparatus is adjustable.

A container **35** for adhesive is arranged below the arm **20,** and in the illustrated embodiment heating elements **36** are provided beneath the bottom wall of the

container **35**, although they might possibly be omitted (depending upon the type of adhesive involved) or might be located elsewhere, for instance incorporated within the bottom wall of the container **35**. In any case, the arm **20** is so pivoted that its contact face **22** will in its one end position dip into the adhesive in the container **35** as the arm **20** is pivoted via the arm **24**, the rod **25** and the eccentric **27**; in the other end position the contact face **22** will contact the juncture **37**, straddling the same. During each rotation of the shaft **29** the arm **20** is moved from the position shown in FIG. **1** in which it dips into the container **35**, towards the table **8** and into contact with the juncture **37**, and back to the container **35**.

The plies **10** and **11** to be connected are placed onto the plates **15** and **16** against the abutment **13**, in such a manner that their grain is matched. Thereupon the plies **10** and **11** are pressed against the plates **15** and **16** and moved with the same against the rollers **6'** and **9'** which grip them and move them into edge-to-edge abutment, forming the juncture **37**. The plates **15** and **16** are spring biassed and are then returned to their starting position under the urging of their biassing springs. Driven by the shaft **29**, the contact face **22** of the arm **20** sequentially contacts the juncture **37** from below, applying spots of adhesive which are identified with reference numeral **38** in FIG. **3**. During further transport of the plies **10** and **11** through the apparatus, by means of the rollers **6** and **9**, the applied spots **38** of adhesive will set, so that despite the relatively high throughput speed for the plies **10** and **11** the connected plies will be firmly secured to one another by the time they leave the apparatus.

By selecting a desired rotary speed of the shaft **29** relative to the shaft **42**, the specing of consecutive spots **38** from one another can be varied at will. Experience has shown that a spacing of approximately 16 millimeters, with the adhesive spots **38** having a diameter of approximately 3 millimeters, furnishes good connections between the plies **10** and **11**.

It is advantageous in the embodiment illustrated herein if an adhesive is used which is heated in the container **35**, by means of the heating elements **36**, for instance to a temperature of approximately 200°C. The container **35** itself is movable, ir it can be automatically lowered out of the path of the arm **20** when the latter is stationary, so that the arm **20** cannot extend during a stationary period of the machine into the adhesive and become entrapped therein as the adhesive cools.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in the adhesive connection of abutted plywood plies, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In an apparatus for joining plywood plies, a combination comprising first means for abutting plywood plies in edge-to-edge relationship so as to form a juncture; and second means for applying to said juncture a plurality of spaced dots of adhesive so as to connect said plies, said second means comprising an arm having a transfer face dimensioned to transfer a spot of adhesive, a source of adhesive, and pivot means mounting said arm for pivoting movement in a path in which said transfer face picks up adhesive from said source and applies such adhesive to said juncture.

2. A combination as defined in claim **1**; further comprising a table over which said plies move; and wherein said second means are at least partially arranged beneath said table.

3. A combination as defined in claim **1**, wherein said pivot means comprises a rotatable shaft on which said arm is fixedly mounted, a transverse arm on said shaft, a rod having one end articulated to said transverse arm and an other end, an eccentric connected with said other end, and a motor for driving said eccentric.

4. A combination as defined in claim **3**; and further comprising an adjusting device provided on said rod.

5. A combination as defined in claim **3**; further comprising a drive shaft connected with said eccentric; and a belt drive connecting said motor with said drive shaft and being adjustable so as to vary the speed of rotation of said drive shaft per unit of time.

6. A combination as defined in claim **3**; further comprising a drive shaft connected with said eccentric and siad motor; and drive roller means driven by said drive shaft and operative for engaging and advancing said plies.

7. A combination as defined in claim **1**; further comprising spaced drive rollers and cooperating pressure rollers for engaging and advancing said plies; and wherein said second means are arranged for applying said adhesive spots intermediate two of said drive rollers.

8. A combination as defined in claim **1**, wherein said transfer face is arranged to travel in an arcuate path; and wherein said source comprises a container which can be inserted into and removed from said path.

9. A combination as defined in claim **8**; and further comprising moving means operative for moving said container out of said path when said arm is stationary.

10. A combination as defined in claim **1**, said source including a container for adhesive; and further comprising heating means for heating the adhesive in said container.

* * * * *