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Gerber et al.

[11] **3,719,113**

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[54] **PENETRABLE BED USED FOR CUTTING SHEET MATERIAL AND METHOD FOR TREATING SAME**

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[52] **U.S. Cl.** .....**83/56,** 83/169, 83/170, 83/174, 83/658, 83/701, 83/925 CC

[51] **Int. Cl.**.....**B26d 7/08,** B26d 7/10

[58] **Field of Search** .83/171, 174, 658, 659, 925 CC, 83/13, 49, 56, 169, 170, 701; 156/81, 250

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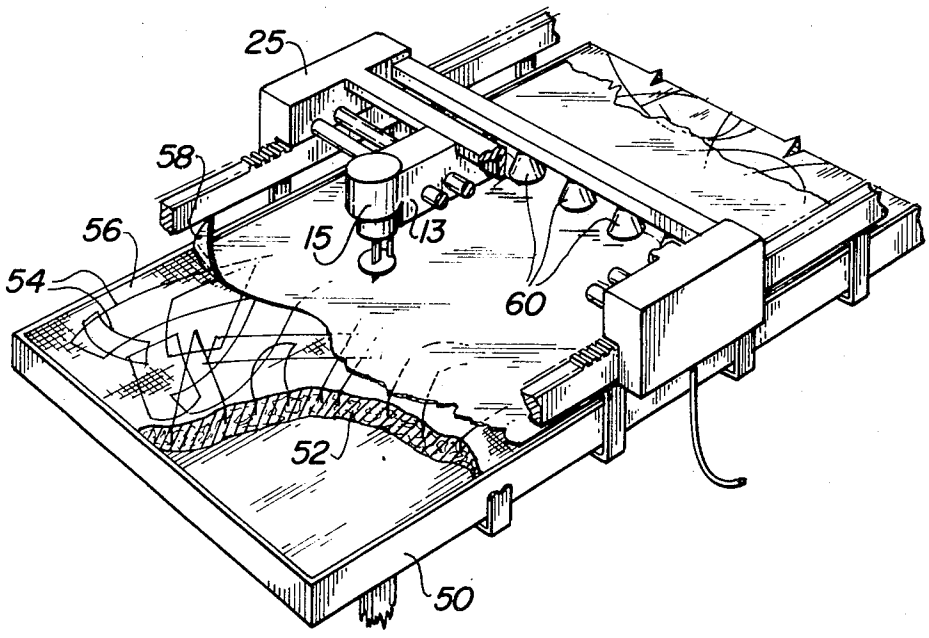
[57] **ABSTRACT**

A bed of material provides a supporting surface for supporting sheet material during a cutting process. The bed is used in combination with a cutting apparatus having a cutter and a means for moving the cutter and the bed with respect to each other. The supporting surface is penetrated and cut during the sheet material cutting operation. At least the top layer of the bed material is of such a nature that it may be restored to a substantially uncut or healed condition after having been penetrated and cut to the point where its capacity for properly supporting sheet material is impaired. This restoration may be accomplished by subjecting the bed material to a restoring influence such as heat, ultrasonic waves, or a solvent, or by bonding a thin sheet of plastic or other sheet material to the supporting surface. Particular apparatus combinations are disclosed which will apply the desired restoring mediums at the desired time.

17 Claims, 9 Drawing Figures



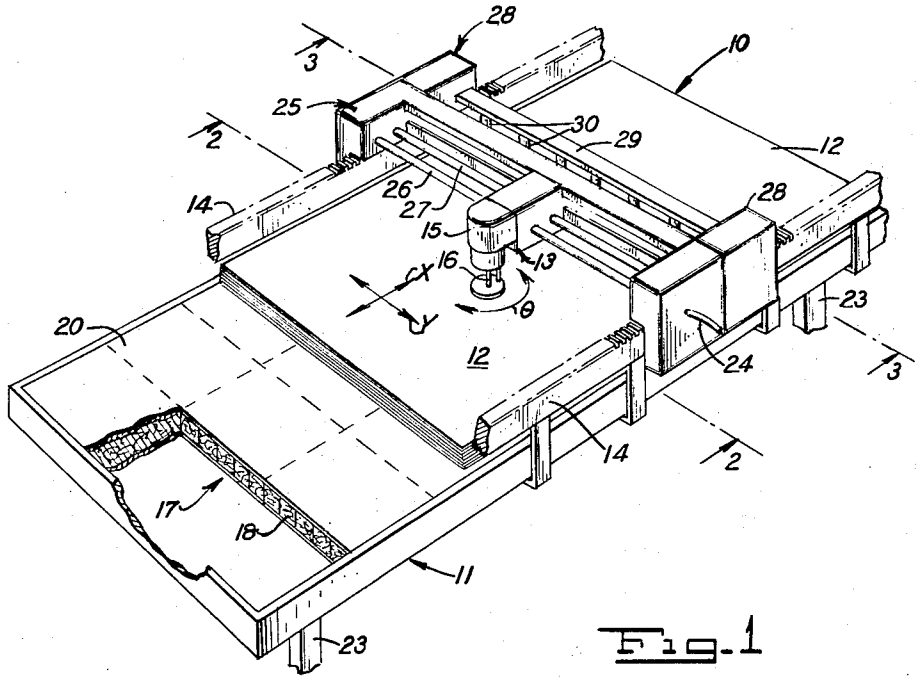


Fig. 1

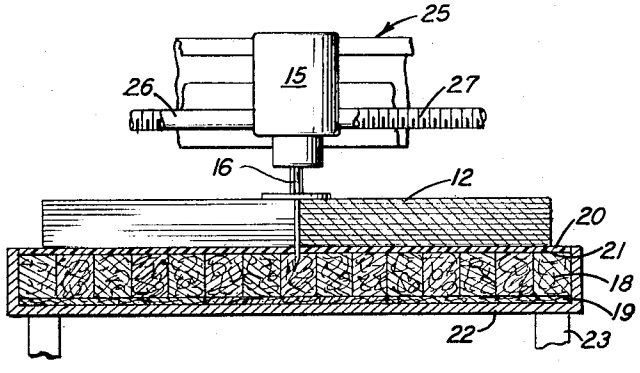


Fig. 2

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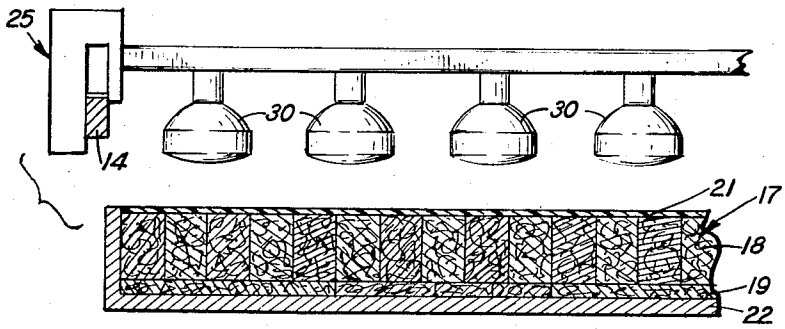

Fig. 3

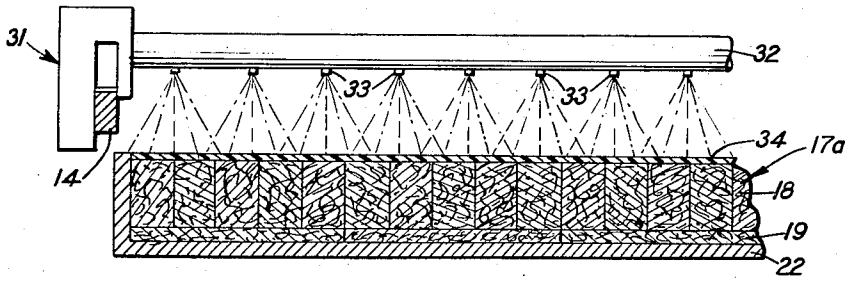

Fig. 5

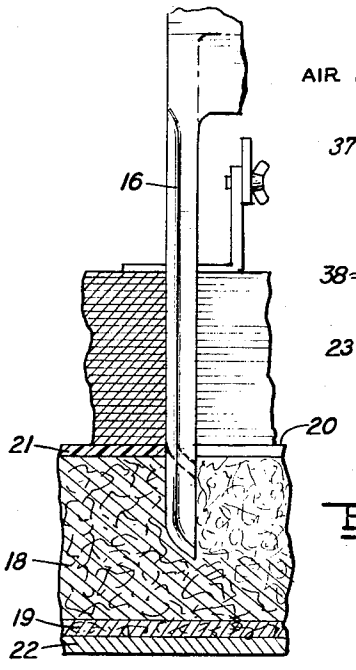

Fig. 4

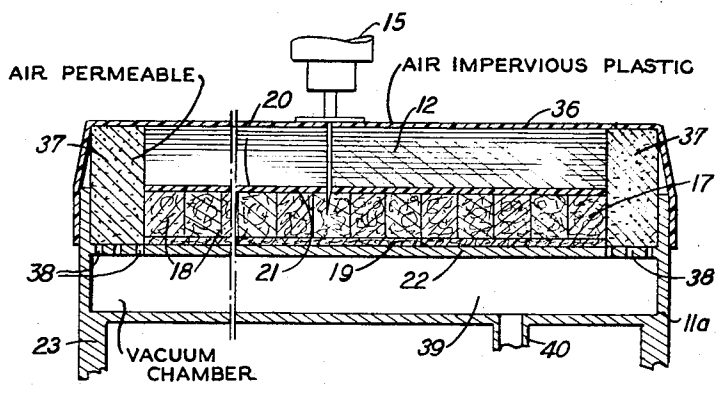

Fig. 9

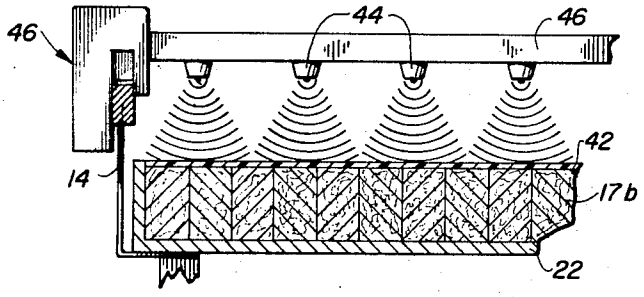

Fig. 6

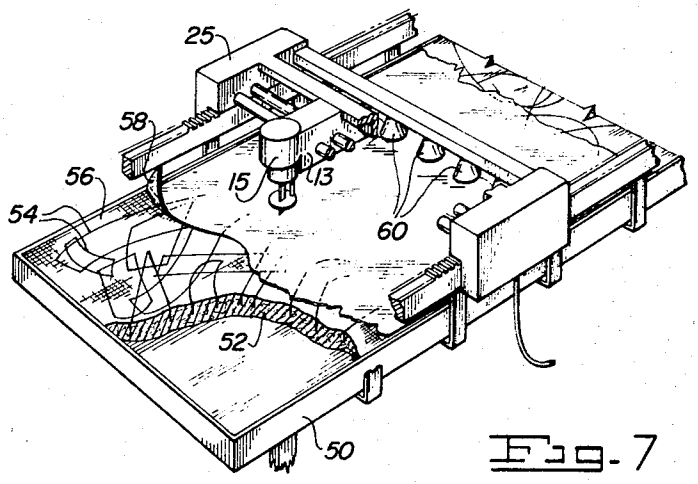

Fig. 7

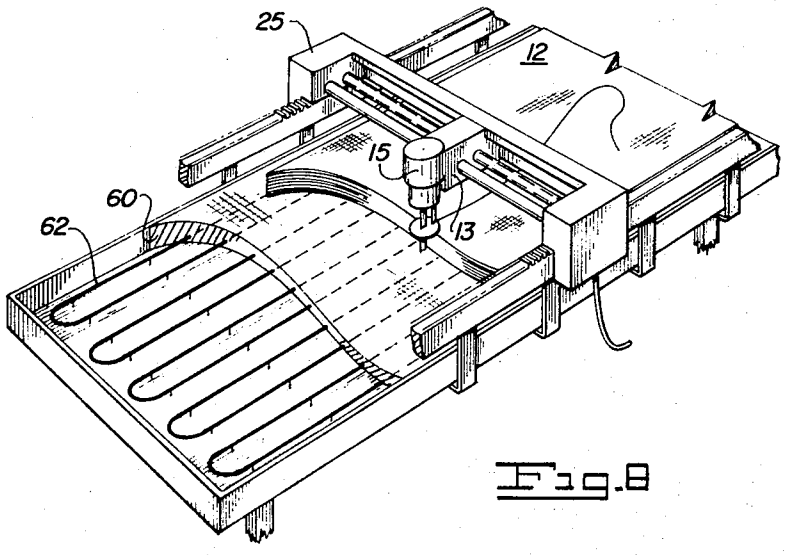

Fig. 8

PENETRABLE BED USED FOR CUTTING SHEET MATERIAL AND METHOD FOR TREATING SAME

RELATED APPLICATION

This application is related to subject matter disclosed in the copending U.S. application, Ser. No. 821,723, filed May 5, 1969.

BACKGROUND OF THE INVENTION

This invention relates to devices for cutting sheet material such as garment and upholstery materials and the like, and deals more particularly with a penetrable bed providing a supporting surface for sheet material to be cut and the means and methods for treating such a bed to periodically restore it to an improved condition.

The general object of this invention is to provide a supporting surface for supporting sheet material being cut by a knife or similar cutting tool and which supporting surface is provided by a bed of material capable of being penetrated by the cutting tool during the cutting process and capable of thereafter being treated to restore the supporting surface to a substantially uncut or healed condition so as to eliminate the necessity of replacing the bed after it becomes excessively used or worn.

It is another object of this invention to provide a means for effecting the restoration of the supporting surface while the bed material is in place relative to the remainder of the cutting apparatus and which is otherwise simple and easy to use.

Another object of this invention is to provide a bed of material defining a supporting surface, the top surface layer portion of which may be restored through the application of common easily applied and inexpensive mediums such as heat, ultrasonic waves or solvent material.

A further object of this invention is to provide methods for restoring the top surface layer of a penetrable bed after the bed has been used as a support means during the cutting of sheet material.

Other objects of this invention will appear in the following description and appended claims, reference being made to the accompanying drawings forming a part of the specification wherein like reference characters designate corresponding parts in the several views.

SUMMARY OF THE INVENTION

A penetrable bed of material having a restorable top supporting surface is used in combination with a sheet material cutting apparatus having a cutter with a cutting tool such as a reciprocating knife which penetrates and cuts the supporting surface during the cutting process. After the bed has been used throughout a series of cutting procedures, the supporting surface may be restored for further use by applying various types of restoring mediums thereto.

Specific embodiments of this invention include the use of thermoplastic material, in at least the top layer of the bed, which may be restored through the application of heat. The top layer of the bed may also be composed of a solvent soluble material which may be restored by application of a suitable solvent material thereon. Material which is subject to change by ultrasonic waves may also be used for forming the top layer of the bed. Also a sheet of thin penetrable plastic or other sheet material may be bonded by adhesive or heat to the supporting surface to effect its restoration.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a fragmentary perspective view of a sheet material cutting apparatus made in accordance with this invention;

FIG. 2 is an enlarged sectional view taken along line 2—1 of FIG. 1;

FIG. 3 is an enlarged, fragmentary sectional view taken along line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary side elevational view of the apparatus of FIG. 1 shown partially in section;

FIG. 5 is a view generally similar to FIG. 3 showing a further embodiment of the invention;

FIG. 6 is a view generally similar to FIG. 3 showing a further embodiment of the invention;

FIG. 7 is a view generally similar to FIG. 1 showing another embodiment of the invention;

FIG. 8 is a view generally similar to FIG. 1 showing a still further embodiment of the invention; and

FIG. 9 is a view generally similar to FIG. 2 but shows a further apparatus made in accordance with this invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS

FIGS. 1 to 4 show one form of apparatus embodying the present invention. Referring more specifically to these FIGS, a sheet material or fabric cutting apparatus, generally designated **10**, includes a table **11** having a bed of material **17** which provides a supporting surface **20** for a fabric layup **12** consisting of a plurality of fabric sheets arranged in vertically stacked relation. A work carriage, generally designated **13**, is adapted to move above and parallel to the surface of the table **11** in the coordinate directions indicated by the arrows X and Y. A cutter **15** having a reciprocating cutting blade **16** is mounted on the carriage **13** so that it can be driven to and from any predetermined point on the table surface and along any desired line of cut relative to the fabric layup **12**. The blade **16** extends downwardly from the main body of the cutter **15** and is reciprocated vertically by a motor in the cutter body. It may also be rotated about a vertical θ axis by another motor in the cutter body for the purpose of maintaining the blade tangent to the line of cut. The cutter may also be raised and lowered bodily, by another motor, to move the cutting blade out of and into cutting engagement with the fabric layup, FIG. 1 showing the cutter in its lowered position at which the blade is in cutting engagement with the fabric.

A main carriage **25** is movably mounted on racks **14, 14**, thereby providing movement for the cutter along the longitudinal dimension of table **11** or in the X coordinate direction. The work carriage **13** is movably mounted on a guide bar or tube **26** and a lead screw **34**, of the main carriage **25**, which extend transversely of the table **11**. Movement of the carriage **13** along the guide bar **26**, as driven by the lead screw **34**, is in the Y coordinate direction.

The main carriage **25** includes a drive shaft (not shown) which extends transversely of the table **11** and which has pinions at its opposite ends for engaging the racks **14, 14**. Movement of the main carriage **25** is ef-

fected in response to operation of a drive motor (not shown) which is connected to the main carriage drive shaft. The work carriage **13** moves transversely of the table in response to the operation of another guide motor (not shown) which is operably connected to the lead screw **34**.

The movement of the carriages **13** and **25** may be effected in response to positioning signals supplied through the cable **24** by an associated input means such as, for example, a numerically controlled controller or a computer (not shown). THe carriages **13** and **25** are capable of moving the blade **16** is cutting engagement with the layup **12** along any line which may be straight or curved as required in cutting a garment component or the like. When in cutting engagement with the fabric layup, the blade **16** during at least a portion of its stroke penetrates the upper supporting surface **20** of the table **11**. Except for the construction of the bed **17** and the means for periodically restoring its supporting surface **20**, as hereinafter described, the construction and operation of the cutting apparatus **10** is or may be similar to that described in copending application, Ser. No. 821,723, **filed May** 5, 1969, to which reference may be made for further details.

The invention of this particular application is directed specifically to the use of a penetrable bed **17** in the table **11** having a restorable supporting surface **20**, and to means and methods for effecting such restoration. In the table **11** of FIG. **1**, the bed **17** is disposed in a frame having a bottom wall **22** and side and end walls (not numbered) which extend upwardly from the bottom wall **22** to form a shallow container. The bed **17** may, if desired, be formed from a plurality of generally rectangular blocks, the broken lines in FIG. **1** indicating the boundaries of such blocks.

The bed **17** of FIG. **1** is one which is constructed so as to enable its supporting surface **20** to be restored by means of heat. In particular, the illustrated bed **17** includes a base portion **19**, a body portion **18** made of a material readily penetrable by the blade **16**, and a top thin layer or skin **21** made of a thermoplastic material having a relatively low melting point. The material from which the layer **21** is made is one which when applied as a thin layer or skin to the body portion **18** is readily penetrable by the knife blade **16** even though it may not be readily penetrable by the blade if formed into thicker sheets or blocks. In FIGS. **1** to **4** the thickness of the layer **21** is exaggerated for purposes of clarity and it should be understood that, depending on the material used for forming this layer, its thickness is sufficiently small that it may be readily penetrated with ease by the knife blade. Various different low melting point resins and plastics may be used to form this layer. The material of the body portion **18** may be any one of various different materials which are capable of providing the bed **17** with some depth, to accommodate the portion of the knife blade which extends below the supporting surface **20**, and through which the blade may pass with comparative ease. In the illustrated case this material is taken to be felt made of relatively loosely compacted fibers and formed into blocks or strips which blocks or strips are arranged on end and attached by glue to the base **19**. As an alternative the body portion **18** may be made of a cellular plastic material having a substantially higher melting point than the melting point of the material of which the top layer **21** is made. In FIG. **1** the base portion **19** is used to hold in assembly the individual strips or blocks of felt of the body portion **18**, and in cases where the body portion **18** is made of larger individual pieces of material, the base portion **19** may be omitted.

As mentioned above, in the specific embodiment disclosed in FIGS. **1** to **4**, the body portion **18** of the bed **17** is composed of relatively loosely constituted felt and has a coating or layer **21** of thermoplastic material on its upper surface and defining the supporting surface **20** of the bed. Actually, the thermoplastic material in making the bed **17** is applied to the felt body portion in a melted state and may actually be absorbed by the top portion of the felt body **18** so that the restorable surface layer or skin **21** becomes a composite structure made of the felt fibers and the thermoplastic material. In any event, the top surface layer **21** of the bed is penetrated by the knife blade **16**, as shown in FIGS. **2** and **4** during a cutting operation, and after the performance of many cutting operations the upper portion of the bed **17** may become so cut up along closely adjacent and intersecting lines that the bed no longer presents to the layup a continuous firm supporting surface but instead forms a surface divided into many separate discrete portions which are capable of moving and deforming relative to one another and which thereby allow the fabric of the layup to shift and deform in an undesirable manner as it is being cut. Once the bed **17** reaches such a state that it no longer provides desirable support for the material or cloth being cut, the upper layer or skin **21** is subjected to heat to melt or soften the thermoplastic material making up such layer and to refuse together the previously cut portions of such layer to again form a continuous firm surface.

The means by which heat is applied to the bed **17** to melt or soften the thermoplastic material of the layer **21** may take various different forms without departing from the broader aspects of this invention. In the embodiment of FIGS. **1** to **4**, this means comprises a plurality of heat lamps **30, 30** which are carried by a bar **29** attached to the main carriage **28** and extending transversely of the table **11**. The heat lamps **30, 30** are disposed with their output faces directed toward and spaced some distance from the supporting surface **20** and when it is desired to restore the supporting surface **20** these lamps are turned on and the carriage **28** is slowly moved from one end to the other of the table **11**. By properly selecting the rate of movement of the carriage **28** during this process, the heat lamps may be caused to heat the upper portion **20** of the bed to the optimum degree required to weld or refuse together the cut portions of the surface **21** and to restore it to its original condition as existing before any cutting had taken place.

In the apparatus of FIG. **1**, the heat lamps **30, 30** are, as mentioned, attached to the main carriage **28** for movement therewith. Since these heat lamps are used only infrequently to restore the supporting surface **20**, they may, if desired, be mounted on another carriage separate from the main carriage **25**, and this separate carriage for the heat lamps may, if desired, be a relatively simple carriage designed to be moved along the length of the table **11** by hand. It may also be designed

for easy attachment to and removal from the table **11** so as to enable it to be attached to the table only when needed to restore the supporting surface **20** and to enable its use with a number of individual tables. It will of course be understood that in place of heat lamps **30, 30** various other heating means may be employed, such as electrical resistance heating units.

In addition to the use of heat for restoring a bed having a thermoplastic upper surface layer, various other different means and methods may be used for restoring the supporting surface of a sheet material cutting device in accordance with this invention. FIG. **5**, for example, shows a device in which the supporting surface is restored by spraying a solvent onto it. Referring to this FIG., the illustrated bed **17***a* is substantially similar to the bed **17** of FIG. **1** except for including, in place of the thermoplastic upper layer or skin **21** of FIG. **1**, and upper layer or skin **34** made of a material which is readily soluble by a suitable solvent. The remainder of the bed **17***a* may include a body portion **18** similar to the body portion **18** of FIG. **1** and a base **19** similar to the base **19** of FIG. **1**. After the bed **17***a* becomes cut to an undesirable degree, restoration of the cut top surface layer **34** is effected through the use of a carriage **31** which may be part of the main carriage **25** or a separate unit. A supply of solvent material is applied to the carriage **31** and is applied to the top surface layer **34** of the bed **17***a* through a plurality of nozzles **33, 33** disposed along a conduit **34** carried by the carriage **31** and extending transversely of the bed **17***a*. As the solvent is sprayed from the nozzles **33, 33** the carriage **31** is moved longitudinally along the length of the table from one end to another. The solvent puts at least some of the material of the layer **34** into solution and after the solvent thereafter evaporates it leaves behind a newly reformed upper layer **34** which is restored to substantially the same condition as existed before any cutting had taken place.

FIG. **6** shows another embodiment of the invention which uses ultrasonic wave energy for restoring the top layer of the supporting bed. As shown in this FIG., the illustrated apparatus is substantially similar to that of FIG. **3** except that the penetrable bed **17***b* includes an upper layer **42** of material, substituted for the layer **21** of FIG. **3**, which is of a type which changes its physical state from a solid or semisolid to a liquid or semiliquid in the presence of ultrasonic wave energy and which returns to its solid or semisolid state when the ultrasonic wave energy is removed. Cooperating with the bed **17***b* of FIG. **7** are a plurality of ultrasonic wave generators **44, 44** carried by a support member **46** extending transversely of the bed **17***b* and carried by a carriage **46** for movement longitudinally of the bed. When it is desired to restore the surface of the bed **17***b*, the ultrasonic wave generators **44, 44** are turned on and act to direct ultrasonic wave energy onto the surface **42**, and as the generators are turned on the carriage is moved longitudinally from one end to the other of the bed **17***b* to treat the entire upper surface of the bed. It will be understood that as the material of the top surface receives the ultrasonic wave energy it is transformed temporarily to a liquid or semiliquid state which causes the cut areas thereof to flow together and after the receipt of the wave energy is terminated the material resolidifies to refuse the surface into a single continuous form.

In addition to restoring the supporting surface of a penetrable bed by treating the upper surface layer of the material of such bed, the supporting surface may also be restored by adding to the supporting surface new material which bonds together the cut portions of the bed and which itself forms a new surface. One method and apparatus for effecting restoration in this manner is shown by way of example in FIG. **7**. Referring to this FIG., a table is shown at **50** and includes a bed of penetrable material **52** which is taken to be a cellular foamed plastic such as Ethofoam, but which could also take various other different forms of easily penetrated material such as loosely compacted felt. The lines indicated at **54, 54** represent previous lines of cut made in and through the original supporting surface **56** of the bed **52**. In order to restore the cut supporting surface **56**, a thin sheet **58** of thermoplastic material is spread over the surface **56** and is then heated to a degree sufficient to cause it to bond, after removal of the heat, to the material of the bed **52**. That is, by properly controlling the heat applied to the sheet **58**, it may be made to melt slightly and to a degree sufficient to cause it to weld or bond to the material of the bed **52** without destroying its continuity. Therefore, after the heat is removed, the sheet **58** in effect becomes part of the bed **52** and forms a new continuous surface for such bed. As shown in FIG. **7**, the heat used to bond the sheet **52** to the bed **52** may be provided by a row of heat lamps **60, 60** carried by the carriage **25**.

In addition to the sheet **58** being made of a thermoplastic material and bonded to the bed **52** by means of heat, sheets of the same or different material as the sheet **58** may also be used and may be bonded to the surface **56** of the bed **52** by means of suitable adhesive, the adhesive first being applied to the surface **56** and the sheet thereafter being placed over the adhesive coated surface. Also, instead of using a performed sheet, a hardenable liquid, such as an epoxy resin with an appropriate catalyst, may be spread over the cut supporting surface and thereafter hardened to form a new continuous supporting surface.

In the above embodiments of the invention utilizing heat as a medium for restoring the supporting surface of the penetrable bed, the heat has been applied by localized heating means moved relative to the table. If desired, however, the heat may also be applied by various heating means built into the body of the table **11** and adapted to heat at one time the full extent of the supporting surface or at least large zones of such surface. One such apparatus is shown in FIG. **8** in which the heating of the illustrated bed **60** is effected by an electric resistance heating element **62** incorporated in the bed **60**. The illustrated element **62** is in the form of a wire extending in many loops throughout the length of the bed **60** so as when it is energized it substantially uniformly heats the entire extent of the bed, the element **62** being located below the level of the maximum penetration of the knife **16**. Except for the addition of the heating element **62** and the omission of the heat lamps **30, 30**, the apparatus of FIG. **8** is substantially similar to that of FIG. **1**, and parts of FIG. **8** which are similar to those of FIG. **1** have been given the same reference numerals as in FIG. **1** and need not be redescribed.

In the embodiments of the invention described above the fabric layup **12** has been supported on the support-

ing surface 20 of the bed by principally its own weight. In many cases it may be desirable to add an additional holding influence to the layup to prevent its shifting during the cutting operation, and one very desirable means for effecting such holding influence involves the use of an air impervious sheet covering the layup and acting in conjunction with a vacuum means for evacuating the space between the air impervious sheet and the supporting surface so that atmospheric pressure acting on the outside of the air impervious sheet forces it toward the supporting surface and causes it to hold the layup in a relatively rigid condition.

This general concept of a vacuum holddown for a fabric layup is disclosed in U.S. Pat. No. 3,495,492 to which reference may be made for further details of such a means. As shown in this patent, the means for evacuating the space between the supporting surface and the air impervious sheet includes a vacuum chamber located below the penetrable bed and air passages extending through the bed material from the supporting surface to the vacuum chamber. In cases, such as described above, wherein the bed includes a restorable upper layer defining the supporting surface, it may be difficult to retain air passages through the bed as the surface layer is restored. Therefore, where it is desirable to use a vacuum holddown means in combination with a bed having a restorable supporting surface, the difficulty in maintaining air passages through the penetrable bed may be circumvented by designing the evacuating means so as to withdraw air from the edges of the layup rather than from the bottom of the layup and through the bed material. One arrangement for doing this is shown, by way of example, in FIG. 9.

Referring to FIG. 9, the apparatus there shown includes a table 11*a* including a bed of penetrable material 17 similar to the bed 17 of FIG. 1. Below the wall 22 the table 11*a* includes a vacuum chamber 39 connected to a suitable source of vacuum through a conduit 40. The upper wall 22 of the vacuum chamber extends outwardly, on both sides, beyond the longitudinal edges of the bed 17, and outboard of the bed 17, on each side, includes a number of passages 38, 38 passing through the wall 22. Positioned above the passages 38, 38 and extending along the length of the longitudinal edges of the bed 17 are two side blocks 37, 37 of air permeable material such as loose fibered felt or open celled foamed plastic. In FIG. 9 only a few of the passages 38, 38 are illustrated but it should be understood that the table 11*a* includes a large number of such passages arranged along the full length of the table on either side thereof so that along the full length of the table the side blocks 37, 37 are subjected to the vacuum of the vacuum chamber. Each side block 37 extends upwardly beyond the supporting surface 20 of the bed 17 and into adjacent relationship to the associated longitudinal edge of the layup 12. An air impervious plastic sheet 36 is placed over the top of the layup 12 and also extends over the side blocks 37, 37 and downwardly into overlying relationship with the side walls of the table 11*a*. When a vacuum is applied to the vacuum chamber 39 through the conduit 40, air is withdrawn through the air permeable blocks 37, 37 and through the passages 38, 38 to evacuate the space between the supporting surface 20 and the air impervious plastic sheet 36 with the result that atmospheric pressure acting on the top of the sheet presses it downwardly toward the supporting surface to hold the material of the layup firmly in place. It is here assumed that the material of the layup 12 is relatively air permeable so that when vacuum is applied to the vacuum chamber the air trapped in the layup may be withdrawn laterally through the material of the layup. In cases where the material of the layup consists of relatively air impervious sheets, such as sheets of plastic, an air conducting means such as a sheet of corrugated cardboard or a sheet of air permeable material may be sandwiched between the air impervious plastic sheet 36 and the top surface of the layup 12 to permit evacuation of the space therebetween and to achieve the desired holddown by atmospheric pressure.

We claim:

1. In a sheet material cutting apparatus the combination comprising means providing a supporting surface for supporting in a spread condition sheet material to be cut, a cutter having a cutting tool, and means for supporting and moving said cutter and said supporting surface relative to one another in such a manner that during a cutting operation said cutting tool passes through and cuts the material on said supporting surface and penetrates said supporting surface and so that said cutting tool is movable relative to said supporting surface along a desired line of cut, such that said cutter is translated on a locus of points lying in a plane substantially parallel to said sheet material during said cutting operation, said means providing a supporting surface comprising a bed of material including a body portion made of material readily penetrable by said cutting tool, and a skinlike top layer of material superimposed on said portion and directly forming said supporting surface, said cutting tool during a cutting operation passing through said top layer and penetrating said body portion of said bed, said top layer being made of a material which is restorable through the action of a restoring medium to heal cuts therein after having been penetrated and cut by said cutting tool during a cutting operation.

2. The combination defined in claim 1 further characterized by said top layer of said bed including a thermoplastic material, and means for periodically heating said top layer to restore said supporting surface.

3. The combination defined in claim 2 further characterized by said body portion of said bed being made of a fibrous material.

4. The combination defined in claim 1 further characterized by said top layer of said bed including a solvent soluble material which is restorable by the application of a solvent material, and means for periodically applying a solvent to said top layer to restore said supporting surface.

5. In a sheet material cutting apparatus the combination comprising means providing a supporting surface for supporting in a spread condition sheet material to be cut, a cutter having a cutting tool, means for supporting and moving said cutter and said supporting surface relative to one another in such a manner that during a cutting operation said cutting tool passes through and cuts the material on said supporting surface and penetrates said supporting surface and so that said cutting tool is movable relative to said supporting surface along a desired line of cut, said means providing a

supporting surface comprising a bed of material including a body portion made of a material readily penetrable by said cutting tool, and a top layer of material superimposed on said body portion and directly forming said supporting surface, said top layer of said bed including a material which is restorable by the application of ultrasonic wave energy thereto to heal cuts therein after having been penetrated and cut by said cutting tool during a cutting operation, and means for periodically applying ultrasonic wave energy to said layer to effect a restoration of said supporting surface.

6. A supporting surface defining a bed of material for use in a sheet material cutting apparatus of the type which utilizes a reciprocating blade or similar cutting tool which is translated substantially normal to the direction of reciprocation of said blade and which cuts the supporting surface and penetrates the bed by a given distance during a cutting operation, said bed comprising: a body portion made of a material readily penetrable by a cutting tool, and a relatively thin skin-like top surface layer portion overlying said body portion and directly defining said supporting surface and made of material capable of being restored to a continuous state through the application of a restoring medium after it has been cut during a cutting operation, said top surface layer portion having a thickness substantially less than said given distance by which said cutting tool penetrates said bed whereby said cutting tool in penetrating said bed passes completely through said top surface layer portion and penetrates said body portion while cutting along a locus of points lying in a plane substantially normal to the direction of reciprocation of said blade.

7. A bed as defined in claim 6 further characterized by said top surface layer portion being made of a thermoplastic material which may be restored by the application of heat thereto.

8. A bed as defined in claim 7 further characterized by said body portion thereof being made of felt, and said top surface layer portion including a thermoplastic material.

9. A bed as defined in claim 6 further characterized by said top surface layer portion comprising a solvent soluble material which is restorable by the application of a solvent thereto after a cutting operation.

10. A supporting surface defining bed of material for use in a sheet material cutting apparatus of the type which utilizes a reciprocating blade or similar cutting tool which penetrates and cuts the supporting surface during a cutting operation, said bed comprising: a relatively thick body portion made of a material readily penetrable by a cutting tool, and a relatively thin top surface layer portion directly defining said supporting surface and made of a material which is restorable to a continuous state by the application of ultrasonic wave energy thereto after it has been cut during a cutting operation.

11. A method for cutting sheet material by means of a reciprocating cutting tool which method comprises the steps of providing a bed having a body portion made from a material readily penetrable by a cutting tool and a skinlike surface layer portion overlying said body portion, translating said reciprocating cutting tool substantially normal to the direction of reciprocation of said cutting tool in the region adjacent to said cutting tool during each of said strokes, said skinlike surface layer portion defining a supporting surface and being made from a material which is restorable through the action of a restoring medium to heal cuts therein after having been penetrated and cut by a cutting tool during a cutting operation, placing sheet material to be cut on said supporting surface, cutting said sheet material with a reciprocating cutting tool cutter which during each stroke passes through and cuts booth said sheet material and said skin-like surface layer portion and which penetrates and cuts said supporting surface said body portion, and thereafter restoring said skinlike surface layer portion supporting surface to heal the cuts made in said supporting surface therein by said cutting tool and to render it substantially continuous for use in a subsequent cutting operation.

12. The method defined in claim 11 further characterized by said step of providing a bed involving the provision of a bed having a skin-like surface layer portion made of a thermoplastic material, and said step of restoring said supporting surface being accomplished by heating said surface layer portion of said bed to soften the material thereof to the point where the material on opposite sides of cuts therein is united and then removing the heat to allow said material to resolidify to a continuous state.

13. The method defined in claim 11 further characterized by said step of providing a bed involving the provision of a bed having a skinlike surface layer portion made of a solvent soluble material, and said step of restoring said surface being accomplished by applying a solvent to said surface layer portion of said bed.

14. A method for cutting sheet material which method comprises the steps of providing a bed of material having a supporting surface, placing sheet material to be cut on said supporting surface, cutting said sheet material with a cutter which passes through said sheet material and penetrates and cuts said supporting surface, and thereafter restoring said supporting surface to heal the cuts made therein by said cutting tool and to render it substantially continuous for use in a subsequent cutting operation, said step of providing a bed involving the provision of a bed having a surface layer portion defining said supporting surface which surface layer portion is made of a material which changes state from substantially a solid to substantially a liquid in the presence of ultrasonic wave energy, and said step of restoring said surface being accomplished by exposing said surface layer portion of said bed to ultrasonic wave energy.

15. A method for cutting sheet material which method comprises the steps of providing a bed of material having a supporting surface, placing sheet material to be cut on said supporting surface, cutting said sheet material with a cutter which passes through said sheet material and penetrates and cuts said supporting surface, and thereafter restoring said supporting surface to heal the cuts made therein by said cutting tool and to render it substantially continuous for use in a subsequent cutting operation, said step of restoring said supporting surface being accomplished by spreading a sheet of thermoplastic material over said surface and thereafter heating said sheet to bond it to said supporting surface.

16. A method for cutting sheet material which method comprises the steps of providing a bed of material having a supporting surface, placing sheet material to be cut on said supporting surface, cutting said sheet material with a cutter which passes through said sheet material and penetrates and cuts said supporting surface, and thereafter restoring said supporting surface to heal the cuts made therein by said cutting tool and to render it substantially continuous for use in a subsequent cutting operation, said step of restoring said supporting surface being accomplished by applying an adhesive to said supporting surface and thereafter applying a thin sheet of material over said supporting surface so as to be bonded thereto by said adhesive.

17. The method defined in claim 11 further characterized by said step of restoring said supporting surface being accomplished by spreading over said supporting surface a hardenable liquid, and thereafter hardening said hardenable liquid.

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