May 26, 1964 K. VEGSUND 3,134,205

PANEL SANDING APPARATUS

Filed March 12, 1963 3 Sheets-Sheet 1

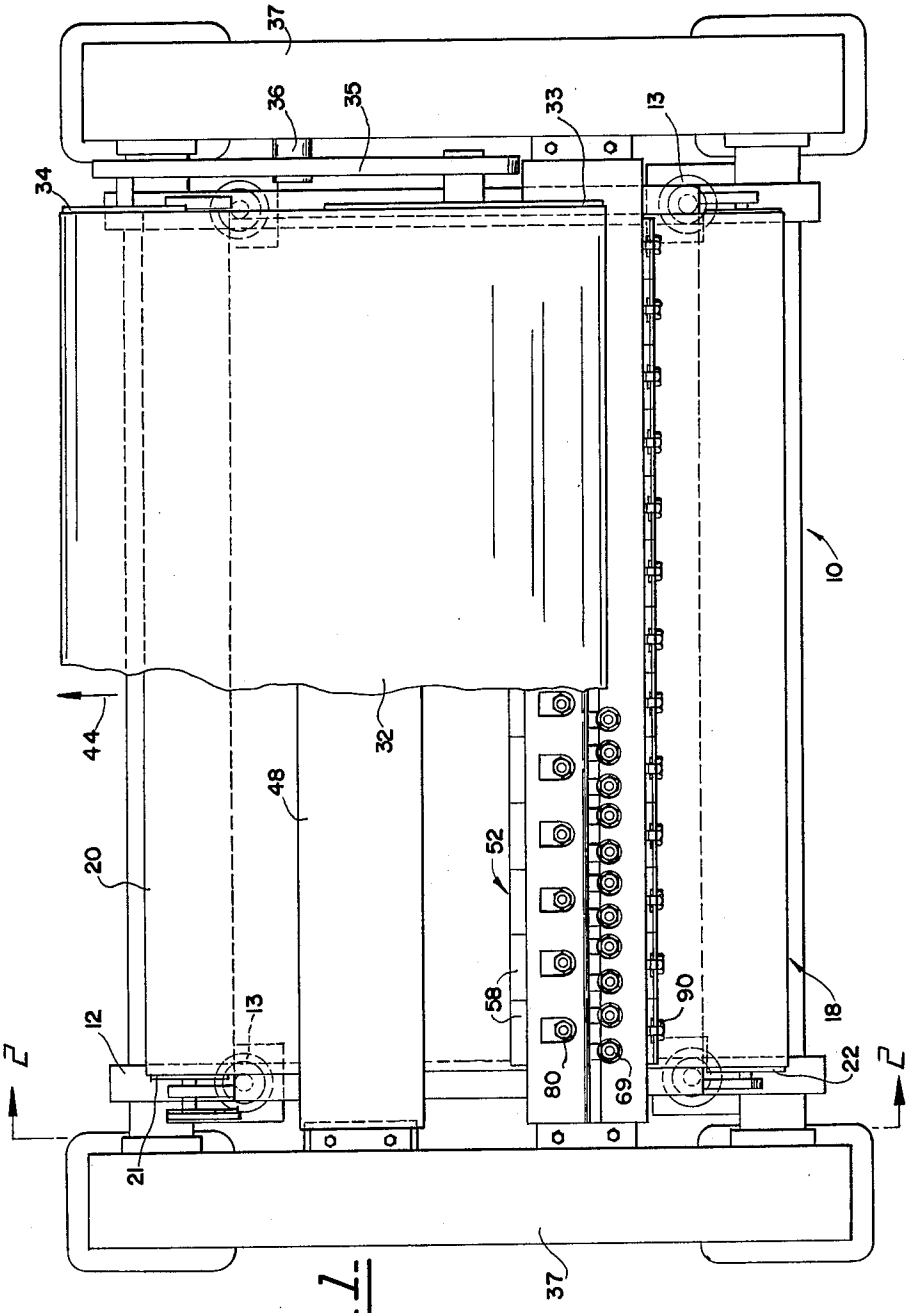


FIG. 1.

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PANEL SANDING APPARATUS

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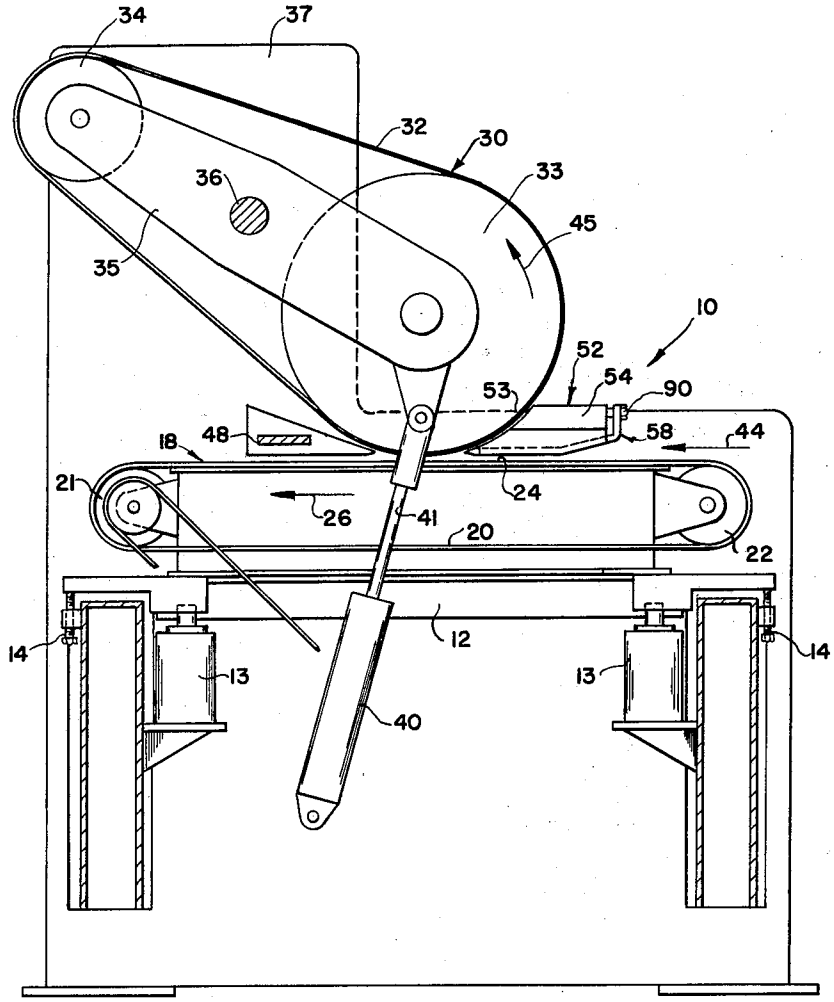


FIG. 2.

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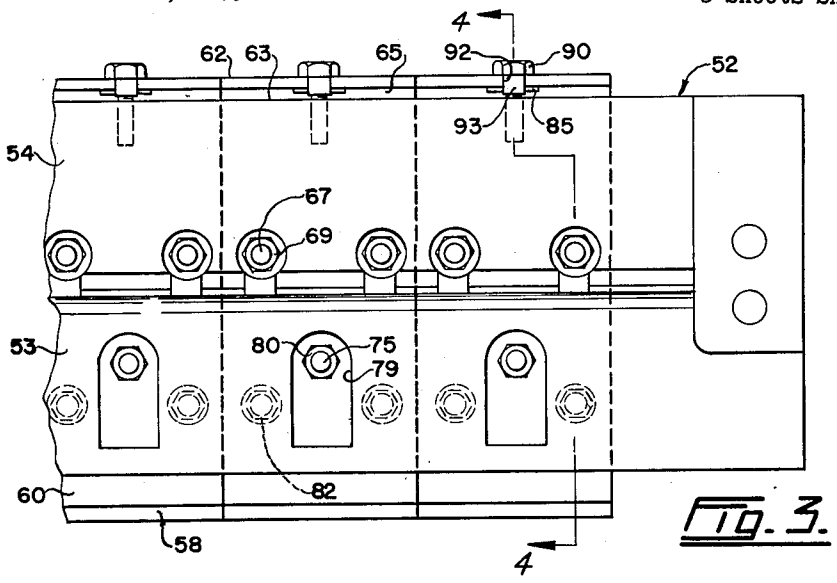


Fig. 3.

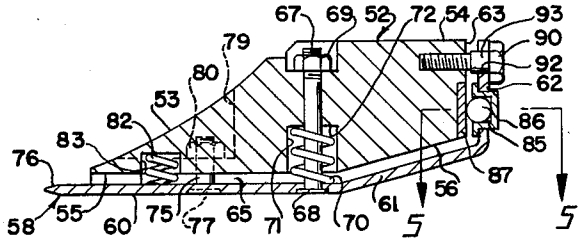


Fig. 4.

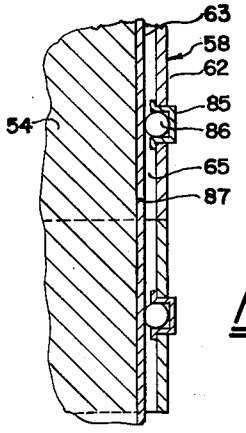


Fig. 5.

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PANEL SANDING APPARATUS

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17 Claims. (Cl. 51—138)

This invention relates to apparatus for sanding panels that may have patches or other irregularities projecting from the surface thereof, and particularly to single side sanding.

This apparatus is particularly designed for sanding the faces of plywood panels at or near the last stage of the manufacture of the plywood. During the manufacture of panels of a given thickness, say, for example, ¾ inch, the panels are of different thicknesses at this stage, and it is important to sand properly the faces thereof without making the face ply too thin or even going through the face ply. In the prior art, there are two methods of measuring or determining the amount of wood to be sanded off each panel, namely, the fixed feed bed and the floating bed methods. The fixed feed bed method involves the establishment and maintenance of a fixed thickness of any panel, and it is in effect sanding of the top face of the panel with reference to the bottom face thereof. Variation in the thickness of the panels arriving to be sanded results many times in a major portion of the thickness of the face veneer and sometimes more than the thickness of the face veneer being removed from the panel. This results in a high percentage of reject panels.

The floating bed method is one of sanding the face of the panel with reference to the top surface thereof. In other words, a predetermined thickness of wood is removed from the face veneer, and this is measured from the outer surface down. In this method, the panel being sanded moves over a floating bed or table. Pressure is applied to the upper surface of the panel so as to depress the bed if the panel is thicker than it should be. This method is not very successful for panels having patches or other irregularities in the face veneer thereof, or when the panels vary considerably in thickness. These patches project slightly above the surface of the face veneer, and the projecting patches cause the bed to be depressed so that portions of the face are missed by the sander.

The present invention is an improvement of the floating bed method. The apparatus includes means for pressing against the upper surface of a panel about to be sanded, but which is not influenced by a patch approaching the sander, so that the sanding thicknes is not changed. The apparatus may be set so that a predetermined number of patches which are aligned transversely of the direction of travel will not materially affect the sanding thickness. However, if more than the predetermined laterally-aligned patches approach the sander or if the whole panel is oversized in thickness, the feed bed or table is depressed so that the sanding operation is affected in order not to damage the sanding tool by too many patches or not to sand too much off the surface in the case of the thick panels.

Apparatus according to the present invention comprises a sander, a floating table beneath the sander and over which a panel is moved along a predetermined path with a face thereof exposed to said sander, adjustable loading means for urging the table upwardly towards the sander, an articulated shoe member mounted above the table immediately ahead of the sander with reference to the direction of movement of a panel therebeneath, said shoe member including a plurality of shoes arranged side by side across said path and movable toward the table, individual pressure means for each shoe urging the latter downwardly, said shoes applying a force on each panel moving therebeneath against the loading of the table and said loading means being set in order that a predetermined thickness is sanded off the panel as it moves beneath the sander, each shoe tending to move upwardly when a patch moves therebeneath without raising the other shoes so that the downward pressure on the table is not materially increased by this patch and the sanding thickness is not disturbed.

The present invention is illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 is a diagrammatic plan view of the sanding apparatus, with parts of the sander thereof broken away,

FIGURE 2 is a section taken substantially on the line 2—2 of FIGURE 1,

FIGURE 3 is an enlarged fragmentary plan view of the shoe member of the apparatus,

FIGURE 4 is a cross section taken on the line 4—4 of FIGURE 3, and

FIGURE 5 is a fragmentary sectional view taken on the line 5—5 of FIGURE 4.

Referring to the drawings, sanding apparatus **10** includes a floating bed **12** resiliently and adjustably retained in different horizontal positions by springs, fluid means or the like. In this example bed **12** is mounted on pneumatic or hydraulic cylinders **13**, there being one of these cylinders near each corner of the bed. The lower limit of movement of bed **12** may be adjusted by means of screws **14**. A table **18** is mounted on bed **12** and moves up and down therewith. In this example, the table is in the form of an endless belt **20** running around pulleys **21** and **22**. Belt **20** is horizontally arranged, and the upper run **24** thereof extends in a substantially horizontal plane and forms the surface of table **18**. Table **18** is large enough to handle plywood panels and to move them in the direction of arrow **26**, shown in FIGURE 2.

A sander **30** is mounted above table **18** and positioned to sand the upper surface of plywood panels as they move over the table. Any standard sander may be used for this purpose. In this example, sander **30** is in the form of a sanding belt **32** extending around a large drum **33** and a smaller drum **34** mounted at opposite ends of arms **35** which are pivotally mounted on stub shafts **36** carried by suitable supports **37**. The effective position of sander **30** over table **18** is adjustable and maintained by means of a pneumatic or hydraulic cylinder **40** connected to one of the arms **35** through its projecting piston rod **41**. A sanding drum may be used instead of the sanding belt without affecting the usefulness of this invention.

Belt table **18** is adapted to move plywood panels beneath sander **30**, and the path of travel is indicated by arrow **44** in FIGURE 2. Drum **33** is rotated by a suitable source of power, not shown, in the direction of arrow **45** so that the portion of sanding belt **32** which comes into contact with the upper surface of the plywood panels moves in the opposite direction to the movement of said panels.

A fixed shoe **48** is carried by supports **37** and extends across table **18** behind sander **30** with reference to the direction of movement of the panels along path **44**. The lower surface of shoe **48** is in line with the sanding surface of sander **30** so that said lower surface may ride lightly on the sanded surfaces of the panels. The position of shoe **48** may be adjusted vertically in relation to the set position of the sanding surface of sander **30**, and its purpose is to guide the sanded panels and to prevent them from flapping as they clear the sander.

An articulated shoe member **52** extends above the surface of table **18** across path **44** ahead of sander **30** with reference to the direction of movement of the panels and is suitably supported by supports **37**. This member **52** is illustrated in detail in FIGURES 3 to 5.

Member **52** includes a bar **54** extending transversely

relative to table 18 and having a downwardly inclined upper surface 53 which enables the bar to be fitted close to drum 33 without coming into contact with belt 32, as shown in FIGURE 2. Bar 54 also has an inner horizontal lower surface 55 and an outer inclined lower surface 56. A plurality of shoes or plates 58 are arranged side by side beneath bar 54 and are carried by said bar. There are sufficient of these shoes or plates located side by side to cover the full width of the path of travel of the plywood panels. As shoes 58 are identical, only one will now be described in detail.

Shoe 58 is in the form of a plate having a horizontal inner section 60 lying beneath bar inner surface 55, an outer inclined section 61 overlying bar surface 56, and a vertical outer end 62 which extends upwardly along the outer end surface 63 of the bar. It will be noted that the entire shoe is spaced from bar 54, as indicated at 65 in FIGURE 4. The shoe is resiliently urged to this spaced outer position, but it may move upwardly towards bar 54. In this example, shoe 58 is carried by a pair of inner bolts 67 which extend downwardly through bar 54 and through the horizontal inner section 60 of the shoe. The head 68 of each bolt is recessed in shoe section 60 so that its outer or lower surface is flush with the lower surface of said shoe, see FIGURE 4. A nut 69 threaded on the upper end of each bolt 67 limits the downward movement of the shoe. A spring 70 on each bolt 67 positioned in a recess 71 in bar 54 extends between the shoe and the inner or upper end 72 of the recess and urges the shoe downwardly as far as the nuts 69 permit. Another bolt 75 extends downwardly through bar 54 near the inner tip 76 of shoe 58, said bolt having a head 77 recessed in the inner horizontal section 60 of the shoe. The upper end of bolt 75 extends into a recess 79 opening out through the inclined surface 53 of bar 54, and has a nut 80 threaded thereon which helps to limit the extent of movement downwardly of shoe 58. A pair of springs 82 fit in sockets 83 formed in the inner surface 55 of bar 54 and bear against the upper surface of shoe section 60 to urge the shoe downwardly within the limit set by nuts 69 and 80 on their respective bolts 67 and 75.

The outer end 62 of shoe 58 is provided with a hardened cup 85 which opens inwardly towards bar 54 and carries a hardened ball 86 which bears against a hardened wear strip 87 mounted on the outer end of surface 63 of bar 54. This ball helps to position shoe 58 relative to bar 54 while permitting vertical movement of the latter. A guide bolt 90 is threaded into the outer end 63 of bar 54 and extends through a vertical slot 92 formed in the outer end 62 of the shoe. Bolt 90 is provided with a shoulder 93 which slidably fits in vertical slot 92 so as to prevent shoe 58 from shifting laterally along bar 54 while permitting up and down movement of the shoe.

The springs 70 and 82 of the shoes 58 are designed to exert a predetermined downward force against the shoes and, therefore, against the plywood panels moving under the shoes. This total downward force may be adjusted within limits by means of nuts 69 and 80 on their bolts 67 and 75. The more the nuts are tightened down on their bolts, the more are these springs compressed, and therefore, the greater the downward pressure against a panel moving under shoes 58 while raising said shoes and vice versa. It is obvious that springs 70 and 82 can be replaced by pneumatic or hydraulic pressure devices or cylinders.

Bar 54 with shoes 58 is adjustable vertically and is set so that when sander 30 is sanding a panel therebeneath, the actual sanding surface of the sander protrudes below the level of the horizontal inner sections 60 of the shoes. The extent of this protrusion equals the thickness of panel surface to be sanded off.

Standard air controls, not shown, are provided for air cylinders 13 of the floating bed 12 and table 18. This enables the operator to set the pressure in cylinder 13 so as to exert a predetermined upward force through table 18

against the panels and against the downward thrust of shoes 58. When the apparatus is set to handle panels of a given thicknes, for example, ¾ inch panels, the pressure in air cylinders 13 is set so that sander 30 will remove the predetermined thickness of wood from the upper surface of each panel, measuring downwardly from the upper surface of the unsanded panels over which shoes 58 ride. If a panel that is thicker than usual enters the apparatus, there is a tendency to lift shoes 58, but the total spring load of these shoes is such that table 18 is depressed so that the predetermined thickness of wood is sanded from the upper surface of the panel. Similarly, if a thinner panel than usual enters the apparatus, the pressure of air cylinders 13 will raise the panel so that the same thickness is sanded off its upper surface.

One of the advantages of this apparatus results from the fact that a plurality of individual shoes 58 effect the downward force on the panels instead of a single shoe extending from side to side of the apparatus. By having an articulated shoe member, if there is a patch projecting from the upper surface of a panel, it will move under and raise one or at the most two shoes 58, thus increasing the downward pressure against the panel. However, this is not sufficient to depress table 18 to materially change the thickness of the wood sanded off the panel. Thus, the patch and the require thickness of material are sanded off. Without the articulated shoe member, the patch would tend to raise the entire pressure shoe thus lowering the floating bed and this would result in portions of the panel surface being missed altogether by the sander.

The spring loading of shoes 58 is such that if more than a predetermined number of these shoes are at the same time lifted higher than usual, the table will be depressed and the patches will not be proprely sanded off so that it becomes a reject panel. It has been found that the pressure in air cylinders 13 and the springs 70 and 82 of the articulated shoe members may be adjusted so that the raising of at least a given number of shoes, say five shoes, increases the spring load against the panel enough to force the table to depress, whereas the raising of four laterally-aligned shoes will not increase the spring load against the panel sufficiently to produce this result.

Thus it will be seen that the articulated shoe member makes it possible to sand the surfaces of panels having patches protruding therefrom in a floating table machine without the patches affecting the operation of the sanding unless there are more than a predetermined number of patches aligned transversely of the panel, in which case it usually is desirable to reject said panel.

What I claim as my invention is:

1. Sanding apparatus for wood panels, comprising a sander, a floating table beneath the sander and over which a panel is moved along a predetermined path with a face thereof exposed to said sander, adjustable loading means for urging the table upwardly towards the sander, an articulated shoe member mounted above the table immediately ahead of the sander with reference to the direction of movement of a panel therebeneath, said shoe member including a plurality of shoes arranged side by side across said path and movable towards the table, and individual pressure means for each shoe urging the latter downwardly, said shoes applying a force on each panel moving therebeneath against the loading of the table and said loading means being set in order that a predetermined thickness is sanded off the panel as it moves beneath the sander, each shoe tending to move upwardly when a patch or other irregularity protruding from the surface of the panel moves therebeneath without raising the other shoes so that the downward pressure on the table is not materially increased by one patch or irregularity and the sanding thickness is not disturbed.

2. Sanding equipment as claimed in claim 1 in which the loading means of the table is set so that a plurality of shoes above a predetermined number raised at the same time move the table downwardly.

3. Sanding equipment as claimed in claim 1 including means for adjusting the individual pressure means of each shoe.

4. Sanding equipment as claimed in claim 1 in which the articulated shoe member comprises a bar mounted to extend across the panel path above said path, and a plurality of plates forming the shoes independently and resiliently suspended from the bar, each plate extending beneath the bar in the general direction of movement of the panels.

5. Sanding equipment as claimed in claim 4 in which the individual pressure means of each shoe plate is mounted on the bar and resiliently presses against said plate to urge the latter to a normal position spaced below the bar.

6. Sanding equipment as claimed in claim 4 in which each shoe plate is suspended from the bar about mid way between ends of the plate, and including guide means to limit lateral movement of the plate when it moves towards and away from the table.

7. Sanding apparatus for wood panels, comprising a sander, a floating table beneath the sander and over which a panel is moved along a predetermined path with a face thereof exposed to said sander, adjustable loading means for urging the table upwardly towards the sander, a bar mounted above the table immediately ahead of the sander with reference to the direction of movement of a panel therebeneath, a plurality of shoe plates arranged side by side across said path and spaced beneath the bar and above the table, means for suspending each plate from the bar for movement towards and away from the bar, and individual pressure means for each plate normally resiliently urging said plate to a lowermost position above the table, said plates applying a force on each panel moving therebeneath against the loading of the table and said loading means being set in order that a predetermined thickness is sanded off the panel as it moves beneath the sander, each plate tending to move upwardly when a patch or other irregularity protruding from the surface of the panel moves therebeneath without raising the other plates so that the downward pressure on the table is not materially increased by one patch or irregularity and the sanding thickness is not disturbed.

8. Sanding equipment as claimed in claim 7 in which each shoe plate is elongated and is suspended from the bar substantially mid way between ends of the plate.

9. Sanding equipment as claimed in claim 8 in which each plate has a horizontal section and an upwardly inclined section extending from the horizontal section in the direction from which the panels travel towards the sander.

10. Sanding equipment as claimed in claim 8 in which each shoe plate has a vertical end spaced from a vertical surface on the bar, a cup carried by said vertical end and opening towards said vertical surface, and a hard ball in said cup bearing against said vertical surface.

11. Sanding equipment as claimed in claim 10 in which the vertical end of the plate has a vertical slot therein, and including a pin projecting from the bar and extending through the slot, said pin preventing lateral movement of the shoe plate.

12. In sanding apparatus for wood panels, an articulated shoe comprising an elongated bar, a plurality of shoe plates arranged side by side, and spaced beneath the bar, means for suspending each plate from the bar for movement towards and away from the bar, and individual pressure means for each plate normally resiliently urging said plate to a lowermost position relative to the bar.

13. Apparatus as claimed in claim 12 in which each shoe plate is elongated and is suspended from the bar substantially mid way between ends of the plate.

14. Apparatus as claimed in claim 13 in which each plate has a horizontal section and an upwardly inclined section extending away from the horizontal section.

15. Apparatus as claimed in claim 13 in which each shoe plate has a vertical end spaced from a vertical surface on the bar, a cup carried by said vertical end and opening towards said vertical surface, and a hard ball in said cup bearing against said vertical surface.

16. Apparatus as claimed in claim 15 in which the vertical end of the plate has a vertical slot therein, and including a pin projecting from the bar and extending through the slot, said pin preventing lateral movement of the shoe plate.

17. Sanding apparatus for wood panels, comprising a sander, a floating table beneath the sander and over which a panel is moved along a predetermined path with a face thereof exposed to said sander, adjustable loading means for urging the table upwardly towards the sander, an articulated shoe member mounted above the table immediately ahead of the sander with reference to the direction of movement of a panel therebeneath, said shoe member including a plurality of shoes arranged side by side across said path and movable towards the table, and individual pressure means for each shoe urging the latter downwardly, said shoes bearing against the upper surface of each panel moving therebeneath over the upwardly-urged table and being normally positioned relative to the sander to permit a predetermined thickness of the panel to be sanded off, and the pressure means of the shoes being such that when the panel thickness condition is such that there is a tendency to raise more than a predetermined number of shoes above said normal position, the combined downward pressure of said latter shoes is sufficient to cause the table to be depressed.

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