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3,167,889

APPARATUS FOR FINISHING WOOD AND THE LIKE

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3 Sheets-Sheet 1

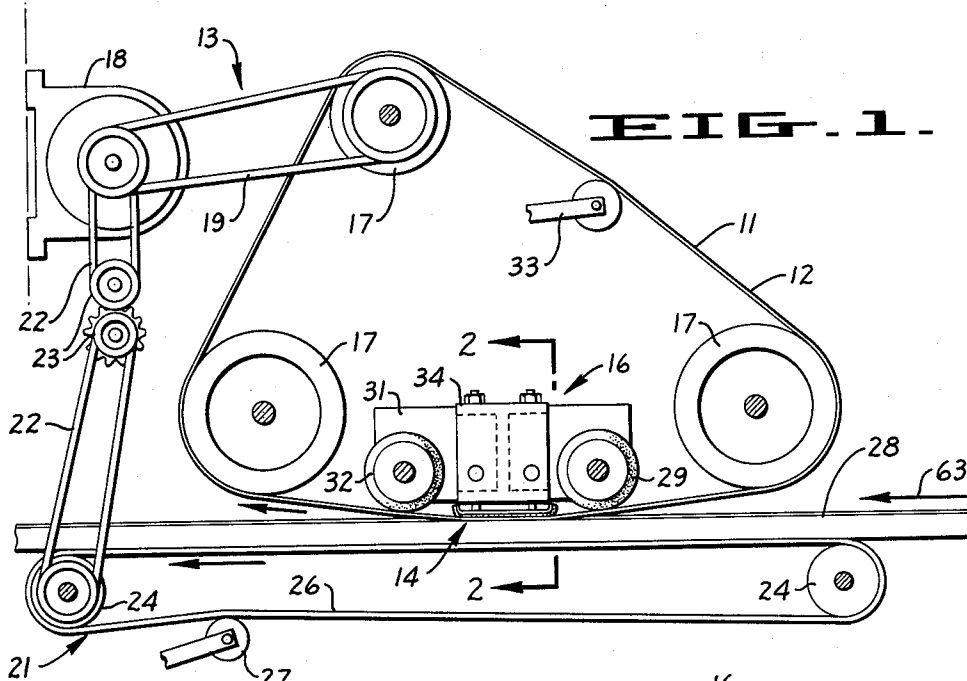


FIG. 1.

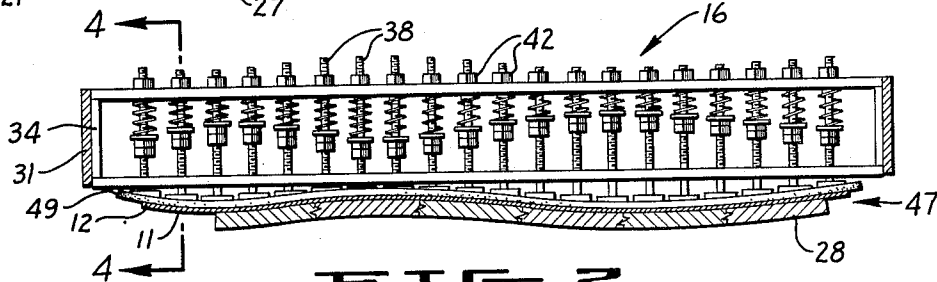


FIG. 2.

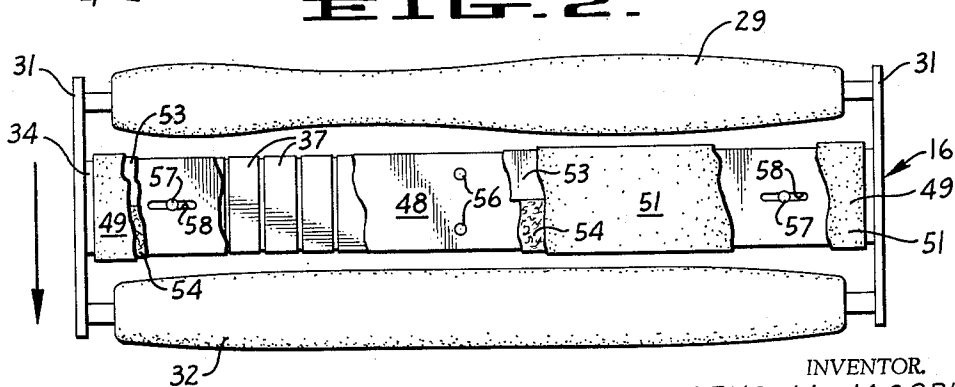


FIG. 3.

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3 Sheets-Sheet 2

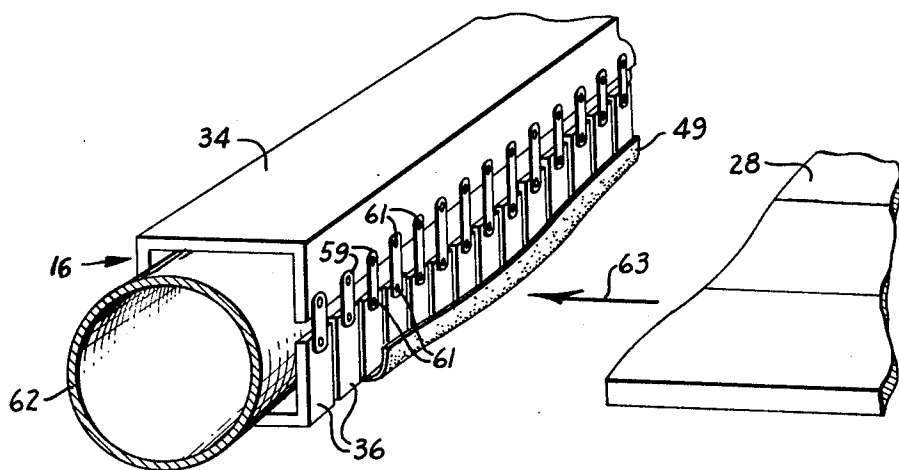
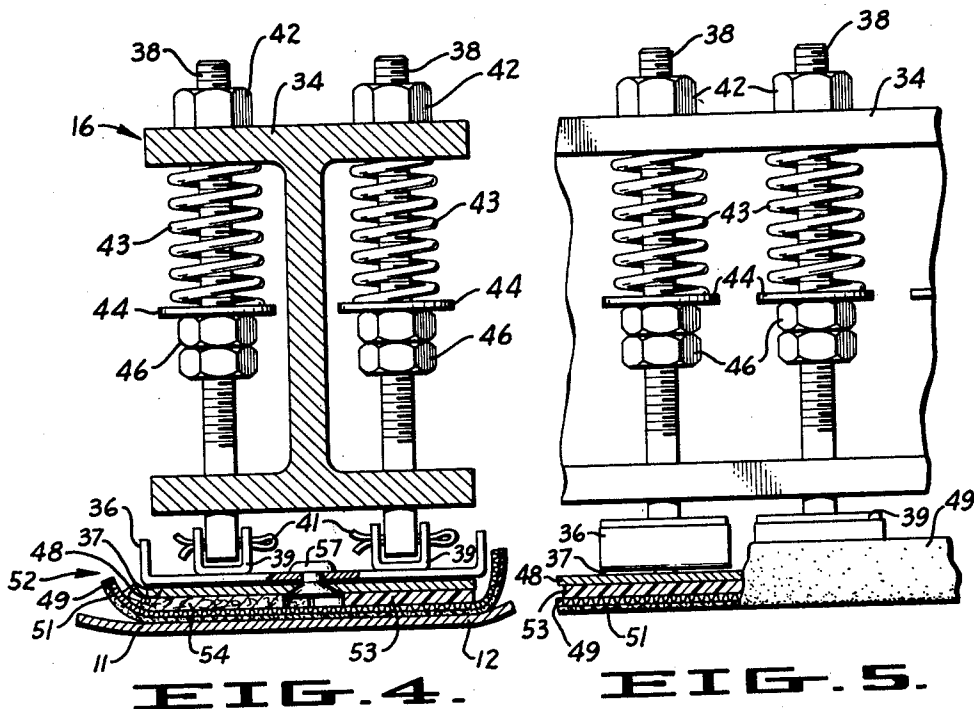


FIG. 6.

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3 Sheets-Sheet 3

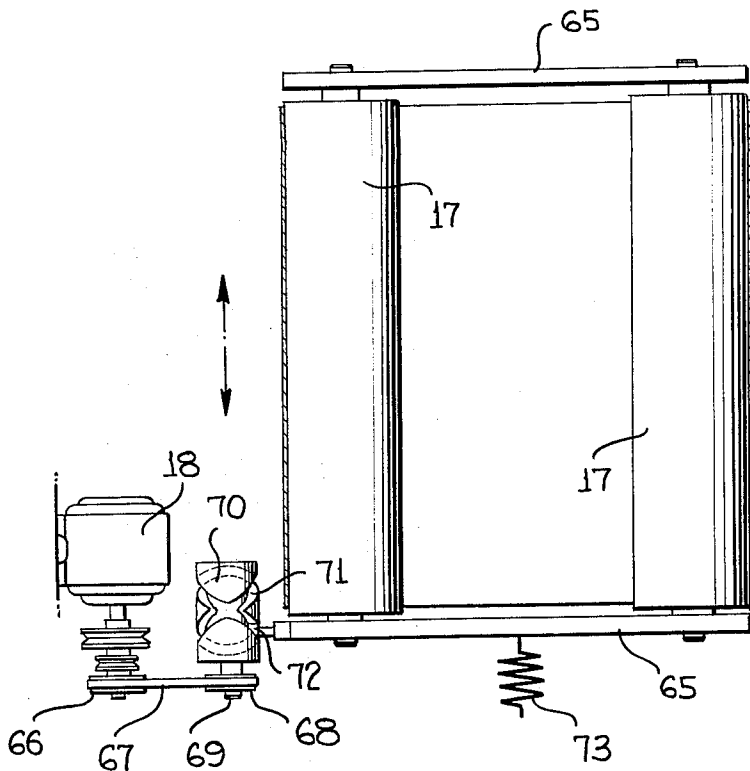


FIG. 7

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APPARATUS FOR FINISHING WOOD

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The present invention relates to improvements in a finishing apparatus and particularly to an apparatus for providing finished surfaces on irregularly shaped surfaces of wood and the like.

Conventionally wood and similar materials are finished by sanding or like processes to provide a smooth surface, and many different machines have been developed for carrying out this process. While these machines are eminently suitable for use on most flat and simple curved surfaces, they are generally not suitable for practical operation on work which is irregularly curved and wide.

Accordingly, it is a primary object of this invention to provide an apparatus for finishing irregularly shaped or curved surfaces that gives highly satisfactory results and has a practical and efficient mode of operation.

Another object of the invention is to provide an apparatus for finishing irregular surfaces which utilizes a belt having an abrasive surface which is resiliently pressed against all areas of the irregular surface.

A further object of this invention is to provide an apparatus of the character described which maintains a pressure against the recessed portions of the surface being finished equal to or greater than the pressure exerted against the raised portions of the surface.

Still another object of the invention is the provision of a finishing apparatus of the character described that is capable of sustained high speed operation.

A still further object of the invention is to provide an apparatus for finishing a curved surface with a rotating abrasive belt that also has oscillatory motion at the work to provide an especially good finish.

Further objects and advantages of my invention will be apparent as the specification progresses, and the new and useful features of my finishing apparatus will be fully defined in the claims attached hereto.

In its broad aspect, the present invention embraces a belt finishing apparatus having any of a variety of abrasives on a surface thereof. The abrasive may be sand, carborundum, corundum, emery abrasive, jeweler's rouge, or others. However, the preferred abrasive is sand and the apparatus will usually be a type of belt sander. Accordingly, the description will be mainly directed to a belt sander constructed according to the invention.

The preferred forms of my invention are illustrated in the accompanying drawings, forming a part of this specification, in which:

FIGURE 1 is an elevational view of a belt sander constructed according to the invention;

FIGURE 2, a cross-sectional view taken in the plane of line 2-2 of FIGURE 1;

FIGURE 3, a bottom view of the apparatus of FIGURE 1 as seen from the position where sanding is effected, and with the belt removed to illustrate the parts supporting and shaping the belt;

FIGURE 4, a cross-sectional view taken in the plane of line 4-4 of FIGURE 2;

FIGURE 5, an enlarged view of the fragmentary portion of FIGURE 2 partly broken away to better illustrate certain of the parts;

FIGURE 6, a perspective view of a backing unit suitable for use in an alternate embodiment of the invention; and

FIGURE 7 is a partial plan view of FIGURE 1 showing one means for imparting oscillating motion to the belt.

2

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the claims attached hereto without departing from the spirit of the invention.

Referring to the drawing in greater detail, there is shown in FIGURE 1 an apparatus for finishing irregularly shaped surfaces on a work piece to be finished, comprising a belt 11 having an abrasive surface 12 containing sand or the like and drive means 13 for moving said belt circumferentially and through work station 14. The apparatus also comprises a backing unit 16 at work station 14 adjacent to belt 11 on the side opposite abrasive surface 12. This backing unit presents an irregular surface which matches the configuration of the desired finished surface.

Drive means 13 may be constructed in a variety of ways and here comprises rollers 17 for guiding belt 11, motor 18 for supplying power, and drive belt 19 for transferring power from motor 18 to belt 11. Motor 18 is also herein used to drive conveyor means 21 for conveying work having an irregularly shaped surface to be finished through work station 14. In this way, the surface of the work to be finished is moved in juxtaposed position with respect to the abrasive surface 12. In this system, power is transferred from motor 18 to conveyor 21 through drive belts 22 and pulleys 23 which are geared to each other as shown.

In the form illustrated in FIGURE 1, conveyor means 21 comprises rollers 24, belt 26 and roller 27 for adjusting belt tension. A work piece 28 is carried through work station 14 on conveyor 21 with the direction of the work being similar to the direction of the moving belt but at a slower speed. This method of moving the work is particularly satisfactory and accordingly is preferred. However, it is also possible to use other means for moving the work through the station with the important structure being that which holds the work at the desired distance with relation to the abrasive surface.

The sanding belt 11 normally assumes a flat configuration with rollers 17 being substantially cylindrical. However, the belt is flexible and assumes the desired irregular configuration at work station 14. In order to move the belt at the desired high speed and still have its surface in the proper configuration at the work station, means is provided for shaping the belt in front of the work station to form a predetermined irregularly shaped surface of substantially the same shape as the irregularly shaped surface of the backing unit. As shown in FIGURES 1 and 2, this means may comprise a roller 29 mounted for rotation in main frame 31, which roller has an irregular surface designed to preshape belt 11.

After passing through work station 14, the belt is preferably reshaped to a flat configuration. This may be accomplished by roller 32 which is also journaled for rotation in main frame 31, and which has a substantially circular, cylindrical surface. The shaping of the belt is provided by maintaining the necessary tension in the belt, and this tension is provided by adjustable roller 33.

In the embodiment shown in FIGURES 1 through 5, the backing unit 16 comprises a frame 34, a plurality of U-shaped members 36 carried on frame 34 having outer surfaces 37 relatively movable to provide an irregularly curved surface across the width of the belt 11, and means for resiliently holding members 36 in position. As best seen in FIGURE 4, frame 34 is in the form of an I beam having bolts 38 carried in pairs on each side. Each pair of bolts is pivotally attached to U-shaped members 36 through brackets 39 and cotter pins 41. Brackets 39 are

attached to members 36 by welding, brazing or any other suitable means.

The distances of faces 37 of members 36 from the frame 34 are restricted by nuts 42, and adjusted by rotation thereof. The faces 37 are resiliently held at these allowed distances by compression springs 43. As best seen in FIGURES 4 and 5, compression springs 43 are carried on bolts 38, and bear against washers 44 which in turn are adjustably positioned by nuts 46. Thus, nuts 46 adjust the compressive force of springs 43. Preferably, the compression is adjusted to be greatest on the springs for the members 36 at the recessed portions of the curved surfaces being sanded, see FIGURE 2.

In order to cushion the belt 11 and allow easy passage of the shaped surfaces 37 of members 36 thereunder, a flexible cushion 47 is provided on members 36, and the outer surface of the cushion is lubricated with graphite or similar material. A typical cushion which is particularly satisfactory comprises a flexible metal strip or plate 48 which is preferably made of thin sheet steel, a textile or cloth facing 49 having graphite 51 on its face, and a shock absorber 52 between the metal strip 48 and the cloth facing.

Shock absorber 52 preferably contains a plastic pad 53 at the side first contacting the work, and a felt pad 54 at the side last in contact with the work, see FIGURE 4. The steel strip is riveted to members 36 at a plurality of places. For example, rivets 56 hold the plate at a central position and rivets 57 hold it at each side. Note that rivets 57 are held in slots 58 on plate or strip 48 to allow expansion of the plate as it heats up during operation of the apparatus. The plastic pad 53 and felt pad 54 glued or otherwise bonded to the steel plate, and cloth facing 49 is glued or bonded to the plastic pad 53 and felt pad 54.

Preferably the plastic used for fabricating plastic pad 53 is a laminated phenol-formaldehyde resin such as that sold under the trade name Formica. However, many other plastics or equivalent materials are suitable. Similarly, different materials may be used for the felt pad 54 and the cloth facing 49. The important consideration is the provision of a material that will act as a cushion and also allow the belt to move rapidly thereby without undue wear and shock.

As indicated above, the adjustable springs used to resiliently push the U-shaped members toward the work are preferred. However, other systems are within the scope of the invention. For example, air pressure could be used instead of spring means. An embodiment using air pressure is illustrated in FIGURE 6 wherein a flexible hose such as a fire hose carrying air under pressure is used.

Thus in FIGURE 6, there is shown a backing unit 16, comprising frame 34 in the shape of a channel shaped member having U-shaped members 36 held thereto by flexible straps 59. Straps 59 are pivotably attached as through rivets 61, and the straps are designed of a length sufficient to allow the outer surfaces of the members 36 to assume the desired configuration. Cloth facing 49 is carried on the members 36 through a cushion constructed according to cushion 47 in a manner similar to that described in detail for the embodiment of FIGURES 1 through 6.

When air pressure is exerted within fire hose 62, members 36 are resiliently forced into position. In this way substantially equal pressure is exerted on all of the U-shaped members and therefore the pressure is maintained uniform across the irregularly shaped belt 11.

The apparatus is particularly suitable for finishing curved surfaces such as those used on the backs of church benches. For example, a suitable curved piece may be made by glueing curved pieces together to form the curved board 28, see FIGURES 2 and 6. The board may then be sanded by running it through the apparatus as indicated by arrow 63.

The machine is capable of finishing such a board with one pass, and each operation may be accomplished at

comparatively high speeds. Thus it is seen that the apparatus of this invention is particularly valuable when the irregular surface to be finished is a curved cylindric surface, that is, a surface which is formed by a straight line moving in a curved path including corrugated surfaces and combinations of curved and straight surfaces.

The belt 11 is oscillated in a direction parallel to the axis of the closed loop by a means disclosed in FIGURE 7, wherein the rollers 17 are rotatably mounted within frame members 65. The motor 18 has a pulley 66 on the shaft thereof which drives a belt 67. The belt engages and drives a pulley rotatably mounted on a shaft 69. The shaft 69 also has rotatably mounted thereon a cylinder 70 which cylinder is fixed to and rotated by the pulley 68. The cylinder has a return screw thread 71 cut into the body thereof. A follower 72 mounted on one of the frame members 65 has an end thereof in the return screw thread 71 and moves in a reciprocatory or oscillating manner when the cylinder is rotated, thus giving an oscillating motion to the frame and the roller 17. This causes the working face of the belt 11 to be moved in an oscillating manner past the work station 16 so that the belt is moved transversely of the work so that unsightly grooves will not be cut in the work. A spring 73 may be provided between the frame carrying the roller 17 and a stationary part of the machine to maintain the follower in the return screw thread.

However, it is also seen that machine could be used for finishing other types of irregular surfaces. For example, work could be rotated through the work station or otherwise passed therethrough to give a variety of other operations, if desired.

I claim:

1. An apparatus for finishing irregularly shaped surfaces on wood and the like, comprising a belt having an abrasive surface, means for moving said belt through a work station, means for moving work through said work station with the surface of the work to be finished in juxtaposed position with respect to the abrasive surface of the belt, a backing unit at said work station adjacent to said moving belt on the side opposite the abrasive surface, said backing unit having an irregular surface of a configuration which matches the configuration of a desired finished surface, and means for shaping the belt in front of the work station to form a predetermined irregularly shaped surface of substantially the same shape as the irregularly shaped surface of the backing unit.

2. An apparatus for finishing irregularly shaped surfaces on wood and the like, comprising a belt having an abrasive surface, means for moving said belt through a work station, means for moving work through said work station with the surface of the work to be finished in juxtaposed position with respect to the abrasive surface of the belt, a backing unit at said work station adjacent to said moving belt on the side opposite the abrasive surface, said backing unit having an irregular surface of a configuration which matches the configuration of a desired finished surface, means for shaping the belt in front of the work station to form a predetermined irregularly shaped surface of substantially the same shape as the irregularly shaped surface of the backing unit, and means for reshaping the belt to a substantially flat configuration after the belt has left the work station.

3. The apparatus defined in claim 2, in which the belt is moved through a closed loop and is provided with an oscillating motion at the work station, said oscillating motion being in a line parallel to the axis of the closed loop.

4. The apparatus defined in claim 2, in which the work is moved linearly through the work station substantially tangentially to the loop at a speed slower than the belt movement around the loop.

5. An apparatus for finishing irregularly shaped surfaces on wood and the like, comprising a continuous belt having a surface containing an abrasive material, means

for moving said belt circumferentially in a looped path which passes through a work station, and a backing unit at said work station adjacent to said belt on the side opposite said abrasive surface, said backing unit containing a frame, a plurality of members carried on said frame having surfaces relatively movable to provide an irregularly curved surface across said belt, a single flexible metal plate carried on said members and extending across the entire width of said belt, slotted holding means for holding said plate on said plurality of members allowing relative movement between the plate and the member whereby different changes in relative position due to the shaping of the curved surface and expansive forces are obtained, and means for resiliently holding said members in position to present a desired irregular configuration on said flexible plate adjacent the belt.

6. An apparatus for finishing irregularly shaped surfaces on wood and the like, comprising a continuous belt having a surface containing an abrasive material, means for moving said belt circumferentially in a looped path which passes through a work station, means for conveying work through said work station in position to be sanded by said abrasive surface of the belt, and a backing unit at said work station adjacent to said belt on the side opposite said abrasive surface, said backing unit containing a frame, a plurality of members carried on said frame having surfaces relatively movable to provide an irregularly curved surface across said belt, means for resiliently holding said members in position to present a desired irregular configuration adjacent the belt, a flexible cushion on the irregularly curved surface provided by the members, and a lubricant on said flexible cushion.

7. The apparatus defined in claim 6, in which compression spring means are used for resiliently holding the members in position.

8. The apparatus defined in claim 6, in which pneumatic pressure is used for resiliently holding the members in position whereby a substantially uniform pressure is provided over the entire surface of the flexible plate.

9. The apparatus defined in claim 6, in which the flexible cushion comprises a flexible metal strip, a shock absorber in the form of a plastic sheet mounted on the flexible metal strip, and a cloth facing on said shock absorber having the lubricant on said cloth facing.

10. An apparatus for finishing irregularly shaped surfaces on wood and the like, comprising a continuous belt having a surface containing an abrasive material, means for moving said belt circumferentially in a looped path which passes through a work station, means for conveying work through said work station in position to be sanded by said abrasive surface of the belt, a backing unit at said work station adjacent to said belt on the side opposite said abrasive surface, said backing unit containing a frame, a plurality of members carried on said frame having surfaces relatively movable to provide an irregularly curved surface across said belt, means for resiliently holding said members in position to present a desired irregular configuration adjacent the belt, a flexible cushion including a flexible metal plate mounted on the irregularly curved surface provided by the members, a lubricant on said flexible cushion, means for shaping the belt in front of the work station to form a predetermined irregularly shaped surface of substantially the same shape as the irregularly shaped surface of the backing unit, and means for reshaping the belt to a substantially flat configuration after the belt has left the work station.

11. The apparatus defined in claim 10, in which com-

pression spring means are used for resiliently holding the members in position.

12. The apparatus defined in claim 10, in which pneumatic pressure is used for resiliently holding the members in position whereby a substantially uniform pressure is provided over the entire surface of the flexible plate.

13. The apparatus defined in claim 10, in which the flexible cushion comprises a flexible metal strip, a shock absorber in the form of a plastic sheet mounted on the flexible metal strip, and a cloth facing on said shock absorber having the lubricant on said cloth facing.

14. The apparatus defined in claim 10, in which the belt is also oscillated at the work station in a direction perpendicular to the general movement of the belt.

15. An apparatus for finishing irregularly shaped surfaces on wood and the like, comprising a continuous belt having a surface containing an abrasive material, means for moving said belt circumferentially in a looped path which passes through a work station, means for conveying work through said work station in position to be sanded by said abrasive surface of the belt, a backing unit at said work station adjacent to said belt on the side opposite said abrasive surface, said backing unit containing a frame, a plurality of U-shaped members each having a flat surface and bolts adjustably held a fixed distance from said frame to present the flat surfaces along a line which generally defines an irregular curved surface across said belt, compression springs carried on the bolts of said U-shaped members for urging the surfaces of said members resiliently away from said frame, a flexible cushion on the irregularly curved surface defined by said members, and a graphite lubricant on said flexible cushion.

16. The apparatus defined in claim 15, in which the flexible cushion comprises a flexible metal strip, a cloth facing having the lubricant on a surface thereof, and a shock absorber between the flexible metal strip and the cloth facing which includes a plastic pad at the side first contacting the work and a felt pad at the side last in contact with the work.

17. The apparatus defined in claim 16, in which the metal strip is steel and the plastic is a phenolformaldehyde plastic.

18. The apparatus defined in claim 16, in which the belt is also oscillated at the work station in a direction perpendicular to the general movement of the belt.

19. The apparatus defined in claim 16, in which the work is moved linearly through the work station substantially tangentially to the loop at a speed slower than the belt movement around the loop.

References Cited in the file of this patent

UNITED STATES PATENTS

761,023	Yarnell	May 24, 1904
804,902	Tyden	Nov. 21, 1905
807,809	Clemans	Dec. 19, 1905
900,249	Wysong	Oct. 6, 1908
1,096,882	Wysong	May 19, 1914
1,493,779	Humphreys	May 13, 1924
1,927,330	Williams	Sept. 19, 1933
2,279,782	Fowler	Apr. 14, 1942
2,594,646	Hendrickson	Apr. 29, 1952
2,618,913	Plancon et al.	Nov. 25, 1952
2,624,160	Harper	Jan. 6, 1953
2,633,679	Cross et al.	Apr. 7, 1953
2,693,669	Riedesel	Nov. 9, 1954
3,022,611	Schaller	Feb. 27, 1962