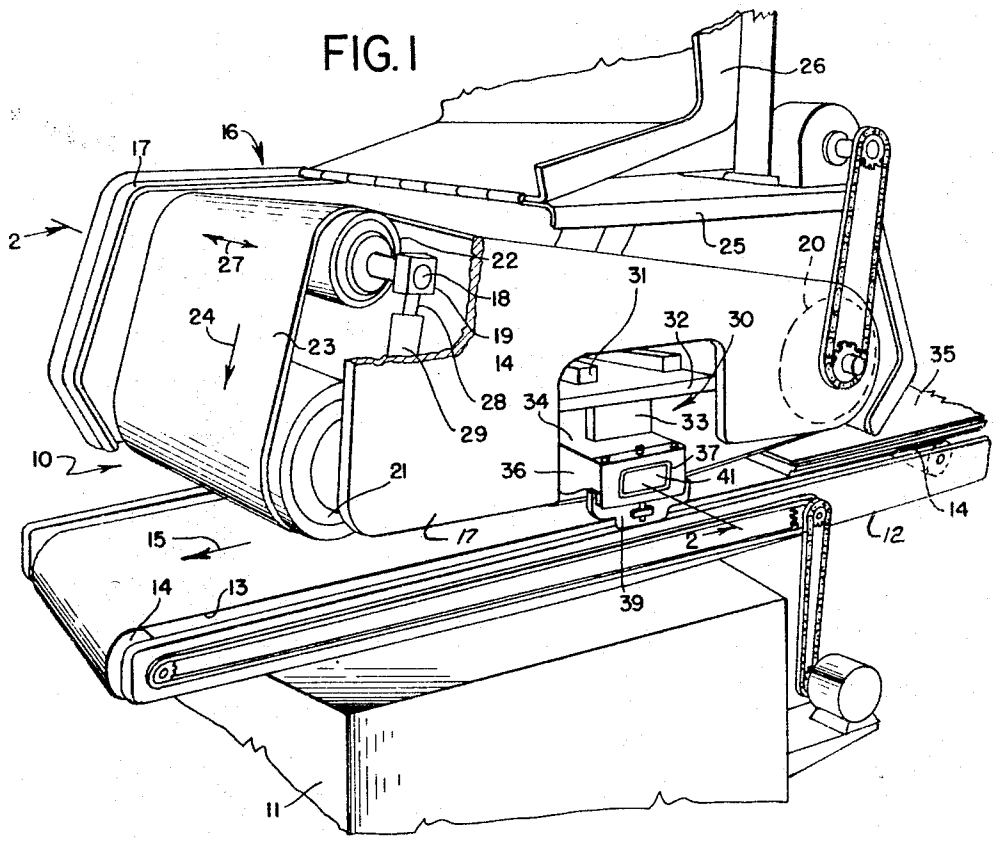
Nov. 8, 1966 H. W. CRETSINGER 3,283,447

PLATEN FOR CONTOUR SANDING, GRINDING AND POLISHING

Filed March 19, 1964 3 Sheets-Sheet 1

FIG. 1



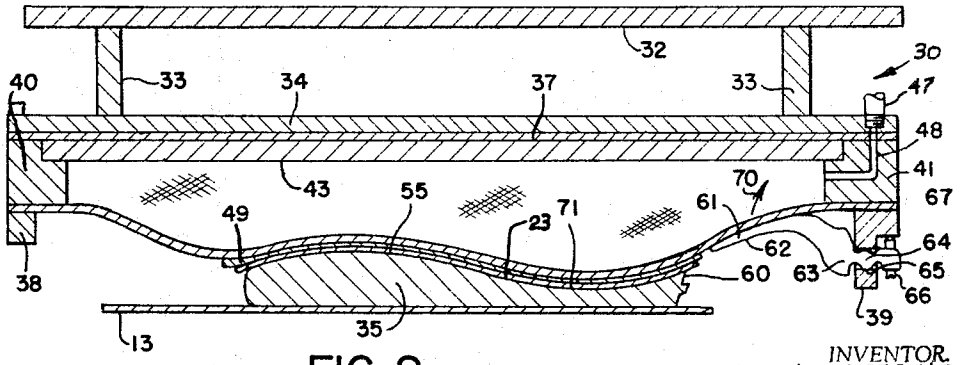


FIG. 2

INVENTOR.
HIRAM W. CRETSINGER

BY

Dugger, Ruddock, Johnson & Westman

ATTORNEYS

Nov. 8, 1966 H. W. CRETSINGER 3,283,447

PLATEN FOR CONTOUR SANDING, GRINDING AND POLISHING

Filed March 19, 1964 3 Sheets-Sheet 2

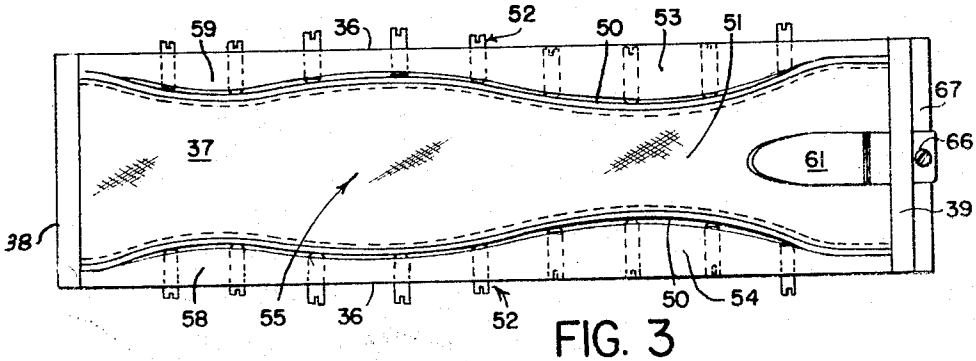


FIG. 3

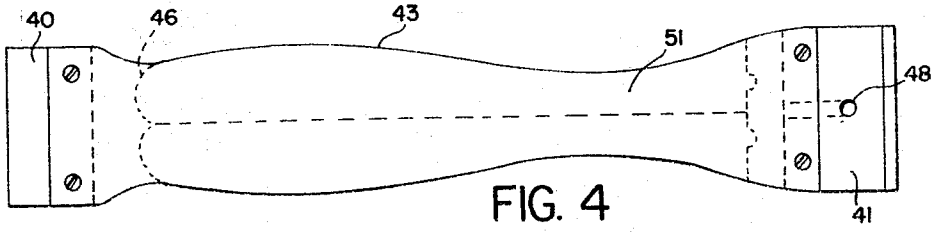


FIG. 4

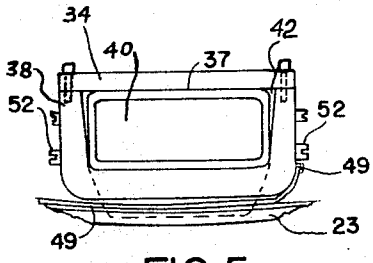


FIG. 5

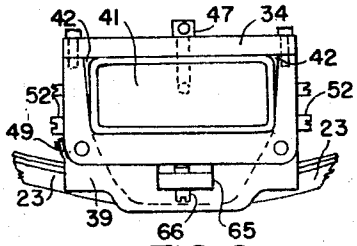


FIG. 6

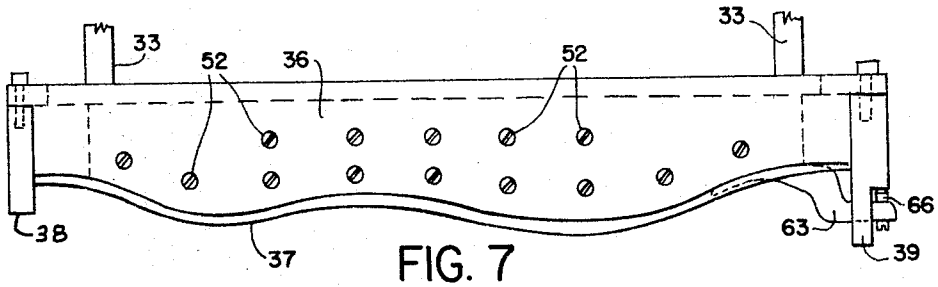


FIG. 7

INVENTOR.
HIRAM W. CRETSINGER

BY

Dugger, Braddock, Johnson & Weatherman

ATTORNEYS

Nov. 8, 1966 H. W. CRETSINGER 3,283,447

PLATEN FOR CONTOUR SANDING, GRINDING AND POLISHING

Filed March 19, 1964 3 Sheets-Sheet 3

FIG. 8

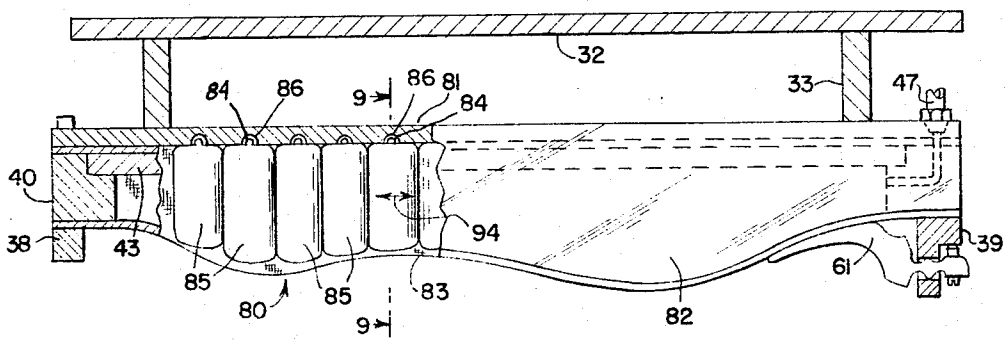


FIG. 9

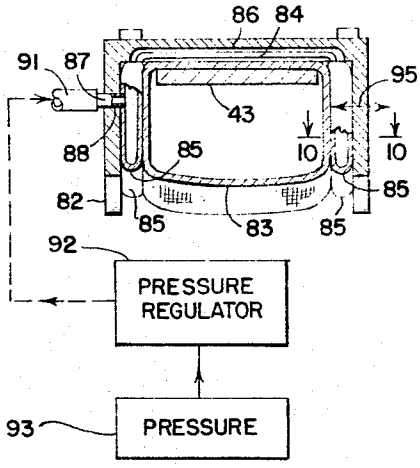


FIG. 10

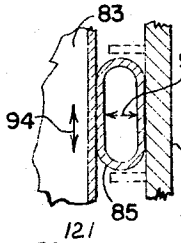


FIG. 11

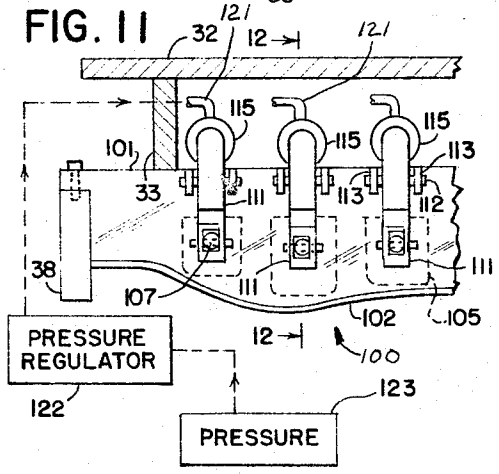
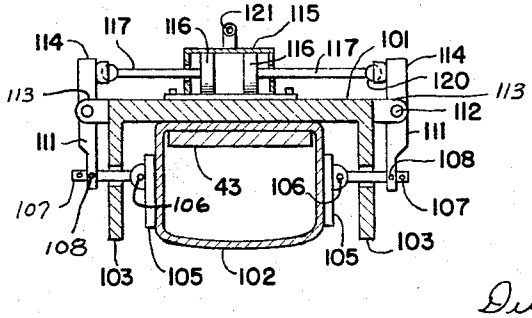


FIG. 12



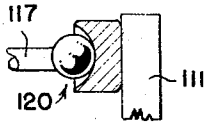


FIG. 13

INVENTOR.
HIRAM W. CRETSINGER

BY Duggan, Braddock, Johnson & Westman

ATTORNEYS

United States Patent Office

3,283,447

Patented Nov. 8, 1966

3,283,447

PLATEN FOR CONTOUR SANDING, GRINDING AND POLISHING

Hiram W. Cretsinger, 1401 S. 1st St., Redfield, S. Dak.

Filed Mar. 19, 1964, Ser. No. 353,138

20 Claims. (Cl. 51—141)

This application is a continuation-in-part of my copending application Serial No. 263,551, filed March 7, 1963, entitled Platen for Contour Sanding, Grinding and Polishing.

The present invention has relation to abrading machines and more particularly to a platen for use with a belt type abrading machine which will permit sanding, grinding or polishing work pieces with contours formed transversely to the direction of belt movement.

In the manufacture of wooden, metal or plastic items having great length and being curved transversely, for example the seats for church pews, cabinets or wood, metal or synthetic parts, the bottleneck to efficient production has been in sanding, grinding and polishing the piece. While belt sanders, grinders and polishers can be used efficiently for abrading flat work smooth, the transverse curve of a pew seat and other elongated pieces has defied mechanization. The common method now is to use very narrow belt sanders and sand a small portion of the transversely curved seat at a time. A fixed solid platen is used for shaping the belt to a portion of the curve. However, there are no machines being made in which the entire width of the church pew seat can be sanded at once and in a continuous operation.

The device of the present invention in the form as disclosed, illustrates a belt sander which has a novel platen that permits the application of the sanding belt to the curved surface to be sanded under uniform pressure. This eliminates the objectionable variations in pressure on the work pieces that are normally encountered when a curved surface is to be sanded, using a standard or fixed platen. In the ordinary application, the high portions are sanded too much and the low areas are not touched.

Many factors determine the pressure that the sanding belt exerts on the work piece. Belt speed, variable belt tensions, both static and under movement, as well as the resilience of the platen used for pressing the belt into engagement with the work piece. The unique structure utilized in the platen of the present invention permits adjustments in pressure at any location across the face of the work piece after the variables, such as speed and differential belt tensions are determined. The pressure can be adjusted while the machine is running.

A first form of the present invention, as shown, discloses a platen which can be utilized with a suitable abrading belt to finish transversely curved work pieces wherein the work piece has the same transverse configuration throughout its length. The platen is situated above the belt and work piece with its longitudinal axis extending transversely to the belt and work piece. The platen is laterally compressed in the portions thereof above the low points of the work piece. The platen will bulge in these laterally compressed portions and by supporting the platen with a flat plate on its upper side the bulges will protrude downwardly.

The bulges will force the belt into the depressions forming the transverse curve of the work piece, and, by proper adjustment of the lateral compression mechanism, the belt pressure will be kept uniform across the entire surface of the work piece.

Second and third forms of the invention illustrate platens which utilize quickly adjustable lateral support mechanism. The lateral support mechanisms of the second and third forms of the invention utilize fluid pressure which operates on devices designed to squeeze the sides

of a resilient platen to cause it to bulge downwardly. Several devices are used in each form and by providing individual pressure regulators for each device the amount of lateral compression in different portions of the resilient member can be different. This will cause different amounts of downward bulge in different portions of the resilient member and in this manner a transverse curve can be sanded.

The description herein will deal with a sanding machine but it is to be understood that the invention will work on grinders and polishers for wood, metal, plastic and other materials.

It is an object of the present invention to present a platen for an abrading machine which makes the machine usable for finishing transversely curved surfaces.

In the drawings,

FIG. 1 is a fragmentary perspective view of a belt type abrading machine having a platen made according to the present invention;

FIG. 2 is a sectional view taken as on line **2—2** in FIG. 1 and showing a platen used with the belt abrading machine in the present invention;

FIG. 3 is a bottom plan view of the platen of FIG. 2;

FIG. 4 is a top plan view of an insert member used in the platen shown in FIG. 3;

FIG. 5 is an end elevational view of the device of FIG. 2 as viewed from the left end thereof;

FIG. 6 is an end elevational view of the device of FIG. 2 as viewed from a right end thereof;

FIG. 7 is a side elevational view of the platen assembly of FIG. 2, with parts removed for clarity;

FIG. 8 is a side elevational view of a platen illustrating the lateral compression members made according to a second form of the invention with parts in section and parts broken away;

FIG. 9 is a sectional view taken as on line **9—9** in FIG. 8;

FIG. 10 is a fragmentary sectional view taken as on line **10—10** in FIG. 9;

FIG. 11 is a fragmentary side elevational view of a third form of mechanism utilized for lateral compression on the platen of the present invention;

FIG. 12 is a sectional view taken as on line **12—12** in FIG. 10; and

FIG. 13 is a fragmentary sectional view illustrating the connection of piston rods to rocker arms in the third form of the invention.

Referring to the first form of the invention illustrated in FIGS. 1–7, and the numerals of reference thereon, a belt type abrading machine (belt sander) illustrated generally at **10** is mounted on a base **11** and has a work support table **12** vertically adjustably mounted thereon. An endless work conveyor or feed belt **13** is mounted over a pair of rollers **14, 14** rotatably mounted on the ends of the work support table. The endless conveyor belt is used to feed the work to be sanded into the belt sander. The conveyor belt is driven through a chain and sprocket arrangement that is powered from a conventional electric motor so that the upper surface of the belt is driven in direction as indicated by arrow **15**.

The drive roller for the conveyor belt is in many cases driven through a variable speed drive of usual or preferred construction.

The work support table is positioned immediately below a belt sander drive assembly **16** that is also fixedly mounted with respect to base **11**. The belt sander drive assembly includes a pair of side frame members **17, 17**. The side frame members **17, 17** rotatably support a drive roller **20** (which, as shown, is driven from a conventional electric motor through suitable chain and sprockets), an idler roller **21** and an oscillation roller **22**. The idler roller **21** is spaced in longitudinal direction with respect

to the conveyor belt **13** from the drive roller **20**. The oscillation roller **22** is positioned above the idler roller **21**. An endless sanding belt **23** is mounted over the drive roller, idler roller and oscillation roller and is driven by the drive roller in direction as indicated by arrow **24**.

A support housing **25** is attached to the base **11** and supports the side frame members **17, 17**. The support housing has a hinged portion **26** which can be raised and lowered to cover the oscillation and idler rollers. The mounting of the oscillation roller is designed so that the axis of rotation thereof can be changed in angle in order to cause the sanding belt **23** to move back and forth in longitudinal direction on the oscillation roller, as indicated by double arrow **27**. This oscillation device can be any usual or preferred construction, typically it will involve mechanism for changing the position of one end of the roller shaft with respect to the other.

For example, as shown in FIG. 1, one end of the shaft **18** of the oscillation roller **22** can be rotatably mounted in a bearing block **19** that in turn is mounted on the end of a piston rod **28** for a short stroke air cylinder **29**. The roller is set so the belt tension at one edge is greater than at the other. This causes the belt to move axially along the rollers toward the edge with least tension. With the piston rod **28** extended, the roller is positioned so that the belt moves away from the cylinder **29**. When the belt reaches the far edge of the roller, suitable sensing mechanism is activated and air is directed to cylinder **29** so that the rod **28** retracts. This will decrease the tension in the sanding belt adjacent the air cylinder and cause the belt to move toward the air cylinder.

When the belt has moved to its limit toward the air cylinder other sensing and control mechanism directs air to cylinder **28** so as to cause the rod **28** to extend once again. This restores the tension in belt **23** on the air cylinder edge of the belt. The belt will once again move away from air cylinder **29** along roller **22**.

In this manner the belt is moved back and forth in order to eliminate any irregularities in sanding on the work piece and give a smooth finished job to the sanding. The main portions of the sanding machine just described are conventionally used for sanding flat work at the present time with the exception that the drive roller **20** and the idler roller **21** are spaced farther apart than in a conventional machine.

A platen assembly illustrated generally at **30** is positioned within the sanding belt substantially midway between the idler roller **21** and the drive roller **20** and bears against the inner surface of a bottom portion of the sanding belt **23**. The platen assembly **30** is designed so that a transversely curved work piece, for example a church pew seat **35**, will be sanded at a uniform pressure along its top surface. The pew seat **35** will be moved by conveyor belt **13** in direction as indicated by arrow **15**.

The platen is mounted on brackets **31** which can be released so that the platen can be removed from the drive assembly. The brackets releasably mount a top support plate **32**. A pair of depending brackets **33, 33** are fixedly attached to the top support plate and they in turn are fixedly attached to a base plate **34**.

The platen base plate **34** has a pair of spaced, integral walls **36, 36** depending therefrom. The bottom edges of the walls are curved to be substantially identical to curvature of pew seat **35** but are spaced upwardly from the sanding belt.

The platen base plate **34** rigidly supports and backs up a deformable resilient member **37**. As shown, the resilient member **37** is an air filled inflatable tubular member **37**. The resilient member **37** is attached to the base plate with suitable clamps **38** and **39** which are fastened at opposite sides of the base plate with suitable cap screws. The member **37** is positioned between the spaced walls **36, 36**. The inflatable or air filled resilient member **37** is plugged at its ends with suitable hard plugs **40** and **41**.

As can be seen in FIGS. 5 and 6 small wedge members **42** are located at the corner portions where clamps **38** and **39**, respectively, clamp onto the base plate **34**. The wedge members **42** are used to insure that a tight seal is obtained between the resilient member **37** and the end plugs. The plugs back up the member so that the clamps securely seal the member **37** on the plugs and, in turn, the clamps securely attach it to the platen base plate.

The resilient member **37** is preferably made of rubber or other air tight tubing having a tough canvas or other substantially non-stretchable cover. For example, in operation, a three inch fire hose has been found to be suitable. The member **37**, must have resiliency so a hard outer cover is not satisfactory.

The resilient member has, as shown, an integral rigid backbone or support **43** mounted therein. The backbone **43** is fixedly attached to the end plugs **40** and **41** and extends therebetween. As perhaps best seen in FIG. 4 the backbone or support **43** has the outer side edges thereof curved in a predetermined manner, depending on the cross section of the work piece that is being sanded. As shown, the backbone support **43** has each edge curved to identically represent the curvature of the pew seat **35**. As shown in dotted lines at **46** the outer edges of backbone **43** are formed by placing patterns taken from the cross section of the pew seats being sanded back to back and cutting the outer edges of support **43** to conform to the curvature of the seats.

The resilient member **37** is inflated to a predetermined pressure through a valve fitting **47** which is mounted on the base plate **34** and is open through a passageway **48** provided in block **41** into the interior of the resilient member. The member can be inflated to any desired or necessary pressure, as will be more fully explained later. The member also could be a pre-sealed air bag if the desired pressure was supplied prior to sealing.

The outer surface of the air filled resilient member, at the bottom thereof, forms the contour that the belt **23** of the belt sander is to follow. In order to eliminate wear directly on the member **37** a strip of lubricated or anti-friction cloth **49** is placed between the member **37** and the inner surface of the sanding belt **23**. The cloth **49** is attached to one of the side walls **36** of the platen assembly.

As can perhaps best be seen in FIG. 2 the bottom surface of the tubular air filled resilient member **37** forces the belt **23** to the proper configuration to sand the surfaces of the pew seat. In order to provide for the necessary curves in the surface of the member **37**, some portions of the resilient air filled member must be forced downwardly more than other portions. The resilient member **37** is, as shown, shaped by the curved inner surface of side wall **36, 36**. The walls **36, 36** substantially match the curves of backbone **43**, as seen in FIGS. 3 and 4.

The walls are shaped so that certain portions of the resilient member are forced inwardly, for example, portions **53** and **54**. This corresponds with the areas where the backing support is narrow. The air filled member **37** is forced downwardly by these same portions, thus causing a downward bulge. The bulge closely fits the contour of the pew seat being sanded. The narrow portions **51** of the backbone **43** permit the resilient member to be forced inwardly by the side walls and thus bulge down. In area where the backbone **43** is wide and the pew seat is raised, for example at the portions **55**, sidewalls **36, 36** are thinner and the air filled resilient member **37** is not forced downwardly. However, in portions **58** and **59**, where the pew seat again curves downwardly, the walls are thick and again cause the resilient member to bulge downwardly.

The final adjustment of the resilient member **37** is made by turning screws **52** against flexible strips **50, 50**

which bear directly on opposite sides of the resilient member. By turning screw **52** inwardly or outwardly, the curvature of the bottom edge of the resilient member is accurately controlled.

The backbone or support **43** holds the top of the resilient member to a definite shape and prevents the member from bulging in the wrong places. The backbone, as shown, determines the extent that the resilient member can be deformed and insures that the downward bulge in the areas where the walls **36, 36** extend inwardly will be along a definite predetermined curve. Also the base plate prevents the upper side of the member **37** from bulging upwardly.

It should be noted that if desired the walls **36, 36** can be of uniform thickness and the forming of resilient air filled member **37** can be accomplished through the use of adjustment screws **52** and flexible strips **50, 50** only.

The resilient member **37** is flexible but still has a certain amount of body to it so that the performing of the resilient member causes it to conform substantially to the curvature of the pew seat. As shown, at this time the resilient member is still uninflated and is not sufficiently rigid or hard to be usable.

The resilient member **37** is then inflated to the desired pressure in order to give the necessary firmness to the platen and exert sufficient force on the sanding belt **23**. In the areas where the member is bulged down the belt contacts the thin portions of the pew seat with a force equal to that at the high areas **55**. The amount of downward force in the different areas can be controlled through the adjustment screws **52** as desired. The final adjustment of screws **52** can be made with the machine running so that the variable forces are all compensated for at the final adjustment. The amount of air pressure necessary in resilient member **37** depends on the centrifugal force acting on the sanding belt, the friction between the belt and the work piece and the speed of the belt, as well as the hardness of the wood being sanded.

In the sanding of a pew seat, for example, it has been found that it is extremely difficult to keep the belt doing the sanding from wearing off the relatively sharp rear upper corner portion **60**. The corner portion **60** is important because this is where the back piece fits onto the pew seat and if it is rounded off the fit is poor and the resulting product looks inferior.

In order to relieve the pressure of the sanding belt on corner **60** sufficiently so that it can be sanded to a sharp point and not worn round by the belt, an auxiliary presser foot **61** is utilized. The pressure foot has a curved main portion **62** and a base portion **63**. A neck **64** extends from the base portion and has rounded pivotal surfaces thereon. The neck **64** extends through a provided opening **65** in end clamp **39**. The rounded surfaces of neck **64** pivot on the edge surfaces of this opening. An adjustment screw **66** is threadably mounted through an outwardly extending end of the neck portion **64** and engages a shoulder **67** on the end clamp **39**. When the adjusting screw **66** is threaded inwardly against the shoulder **67** the presser foot will pivot in direction as indicated by arrow **70** so that the curved portion **66** is pressed against the bottom surface of the resilient member **37**. This lifts the bottom surface of the member away from the corner **60** and the pressure against the corner is relieved. The sanding belt does not wear away the corner or round it off.

By adjustng the screws **52** to force the flexible strips against the resilient member to control its shape and adjusting the presser foot **61**, a uniform pressure between the pew seat to be sanded and the sanding belt can be easily achieved. Also, the air pressure within the resilient inflatable member **37** can be regulated to obtain the desired firmness of the platen.

When small variations in structure are sanded the adjusting screws can move to make the necessary adjustments. However, if a substantially different curvature is to be sanded, a new backbone or support **43** should be inserted within the resilient inflatable member and the side walls **36, 36** shaped to conform to the new curvature.

In operation the conveyor belt **13** will carry the pew seats **35** forwardly underneath the sanding belt **23** and the platen will force the belt down against the pew seats with the correct pressure for obtaining a good sanding job. No longer are the high areas, such as **55**, sanded flat and the low areas such as **71** left untouched. The pressure across the entire width of the pew seat is even and the sanding job is uniform.

If desired, an auxiliary roller can be positioned against the sanding belt adjacent the forward end of the pew seat in order to obtain a little more sanding around the curve at the front of the pew seat.

The angle of incidence between the belt **23** and the work piece is very small. The drive roller **20** and the idler roller **21** are nearly on a plane and the platen bottom surface is very little below the bottom edges of these two rollers. The distance between the drive and idler rollers is relatively large and thus the belt has sufficient space in which to conform to the configuration of the platen and no problem results from excessive wear or stretching of the belt. The oscillation of the belt back and forth as indicated by double arrow **27** does not affect operation of the platen.

Referring specifically to FIGS. 8, 9 and 10 and the second embodiment of the lateral support means for the platen of the present invention, it can be seen that a platen assembly **80** is mounted onto the top support plate **32** through the use of depending brackets **33, 33** in the previous form of the invention. A platen base plate **81**, which corresponds to base plate **34**, is fixedly attached to the brackets **33, 33**. The top support plate **32** can be supported in the machine as shown in FIG. 1. The platen base plate has a pair of spaced apart, integral walls **82, 82** depending therefrom. The bottom edges of the walls **82, 82** are curved to be substantially identical to the curvature of the pew seat or work piece on which they are working. The walls are spaced upwardly from the sanding belt as in the previous forms of the invention. A deformable resilient member **83** is mounted between the walls **82, 82** and below the platen base plate **81**. The platen base plate **81** backs up and rigidly supports the resilient member **83**, which as shown is a tubular air filled or inflatable member. The member **82** can be substantially identical in construction to the deformable resilient member **37** shown in the first form of the invention.

As in the first form of the invention the resilient member **83** is held to the base plate with suitable clamps **38** and **39**, which are fastened to the base plate with cap screws, as in the first form of the invention. The ends of the resilient member **83** are plugged with plugs **40** and **41**. The wedge members **42** are used in the same manner as in the first form of the invention to effect a tight seal. The plugs **40** and **41** back up the member **83** and the clamps securely seal the member on the plugs and in turn securely attach it to the platen base plate.

The resilient member **83** as shown, can be made of rubber or other air tight tubing having a tough canvas cover, for example, a three inch fire hose.

The backbone **43** is also fastened to the plugs **40** and **41** and clamps the upper wall of the resilient member **83** against the base plate **81**.

In place of utilizing the side walls on the platen support member which conform to the curvature of the backbone member, as in the first form of the invention, and the screw adjustment, the side walls **82, 82** are of substantially uniform thickness throughout their length. In order to provide adjustable lateral support for the resilient deformable member **83**, a plurality of resilient fluid filled bag members **85** are positioned along the side edges of the deformable member and fit between the in-

ner surfaces of the side walls **82, 82** and the deformable member. As can be seen in FIG. 8, the bags **85** are spaced closely adjacent one another and vary in vertical length, depending on the amount of downward protrusion of the deformable member **83**. The bags are positioned in transversely aligned pairs on opposite sides of the deformable member. The interior of the two bags forming each transverse pair on opposite sides of the deformable member are open to each other through a separate tube **84**. Each of the tubes is positioned within one of a plurality of recesses **86** formed into the platen base plate **81**. A valve member **87** of any usual or preferred design is provided in one bag of each pair of bags **85**. This provides a means for inflating the bags. The valve members **87** for each pair of bags passes through provided openings **88** in the adjacent side wall **82** of the platen support member.

The valve member **87** is connected through a suitable conduct **91** to a pressure regulator **92** which in turn receives fluid under pressure from a source **93**. The pressure source can be compressed air or other gas or, could be hydraulic fluid.

The pressure regulator is of any usual or preferred design which can be adjusted so that a known, set pressure can be supplied to the interiors of the bags **85, 85**. It will be noted that the pressure in the two bags of each pair will be equalized because of a tube **84** which opens to the interiors of the bags **85**. Each pair of bags is connected to a separate pressure regulator.

The bags will be tightly packed together, as can be seen in FIG. 8, and, if necessary, suitable small projection or fins (shown in dotted lines in FIG. 10) can be provided on the inner surfaces of the walls **82** to form individual segments or compartments for the bags and prevent the bags from expanding greatly in directions as indicated by double arrow **94**.

The bags are made of material which will stretch in directions as indicated by double arrow **95**. The bags will be inflated until they expand a sufficient distance in directions as indicated by arrow **95** so that the lateral pressure on the resilient member **83** will be sufficient to cause it to bulge downwardly to match the contour of the piece being sanded. This adjustment is made by adjusting the pressure regulators so that the desired pressure is maintained on each pair of bags **85, 85**. Thus the amount of lateral pressure or squeeze at any place along the resilient member can be varied. Consequently a greater or lesser amount of downward bulge of the resilient member in substantially the same section of the platen can be obtained.

The amount of lateral pressure can be very quickly adjusted in order to accommodate work pieces having a slightly different transverse curve, if desired. Also the contour can be accurately adjusted.

It should be noted that FIGS. 8 and 9 omit the sanding belt and the anti-friction cloth **49** for the sake of clarity. These would be postioned as shown in FIG. 2 in relation to the platen.

The resilient member **83** can be inflated through the valve member **47** as explained in connection with the first form of the invention. The presser foot **61** can be adjusted in order to prevent excessive sanding of the corner portion **60** of a pew seat, as previously explained.

It is therefore seen that by increasing the pressure in each pair of bags **85** so that they will expand in directions as indicated by a double arrow **95** the amount of lateral compression or force on the resilient member **83** is increased, thereby increasing the downward bulge of the resilient member in substantially the same portions. The resilient member will be forced to bulge downwardly because of the rigid backing of plate **81**. The greatest bulge downwardly will be in the low portions of the pew seat, as previously described.

In FIGS. 11, 12, and 13 there is a third form of the lateral support mechanism for the resilient member shown. In this form of the invention a platen assembly **100** is constructed substantially identical to the previous forms of the invention. The platen assembly **100** is mounted onto the top support plate **32** which has depending brackets **33** that mount a platen base plate **101**. The base plate **101** is utilized for supporting and mounting a resilient member **102** which is substantially identical in construction to the resilient members **37** and **83**. The resilient member **102** is held in place with the clamps **38** and **39** as previously explained. The end plugs **40** and **41** and the means for inflating the resilient member **102** are the same. In addition, the backbone member **43** is positioned within the resilient member **102** and held by the end plugs and clamps. A pair of depending side walls **103, 103** are integral with the base plate **101** and are spaced apart. The resilient member **102** is positioned between the side walls **103, 103**. In order to provide lateral support and compression for the resilient member **102** in this form of the invention, the following structure is utilized.

A plurality of opposed pairs of pressure foot members **105, 105** are provided. The pairs of foot members are regularly spaced along the length of the resilient member **102**, or, in other words, extend in direction transverse to the direction of movement of the pew seat or curved work piece being sanded.

As many pairs of foot members **105** as is necessary to accomplish the desired compression of the resilient members can be used. The foot members **105** can be of greater vertical height where the resilient members bulge downwardly more. The feet **105, 105** are pivotally mounted as at **106, 106** (see FIG. 12) onto rods **107, 107**. The rods in turn are pivotally mounted at **108** to the lower portions of rocker arms **111, 111**. The rocker arms **111, 111** forming each opposed pair are positioned on opposite ones of the walls **103, 103**. The rods **107, 107** can be adjusted in longitudinal direction with respect to the rocker arms **111, 111** by providing a plurality of pivot holes for fastening the rods to the rocker arms.

The rocker arms **107, 107** are each pivotally mounted as at **112**, to a separate pair of ears **113, 113** which are in turn fixed to side walls **103, 103** adjacent the top portions thereof. The upper portions **114, 114** extend above the base plate **101**.

A separate cylinder assembly **115** is fixedly attached to base plate **110, 110** and aligned with each of the opposed pairs of rocker arms **111, 111**. As can be seen in FIG. 12 cylinder assembly has two internal slidably mounted piston members **116, 116** which in turn have attached rods **117, 117** extending outwardly from opposite ends of the cylinder assembly and each engaging the upper portions **114, 114** of one of the rocker arms **111, 111**. The rods **117, 117** can be attached to the rocker arms **111, 111** through ball joints **120** or other suitable connection means. The ball joints **120** will permit the rocker arms to pivot about **112** within its intended range of movement without causing undue stress in the piston rods **117, 117**.

A separate conduct **121**, is open to the center portion of each of the cylinder assemblies **115** and opens at position between the pistons **116, 116**. Each of the conducts **121** is open to a separate pressure regulator illustrated schematically and typically at **112**, which in turn is open to a suitable source of fluid under pressure **123**. The fluid under pressure could be either air or hydraulic fluid and the pressure regulator **122** would be designed to accommodate the particular fluid used.

Thus, by admitting fluid under regulated pressure to the interior of cylinder assembly **115** so that the pressure acts against the pistons **116, 116** it will be seen that the rods **117, 117** will bear against the upper portions of the rocker arms **111, 111** and move the rocker arms about their pivots **112, 112**. This in turn will exert a force through rods **107, 107** against the foot members **105, 105** which will then tend to laterally compress the resilient member **102**, causing a downward bulge of the resilient member in substantially the same portion. If a greater

bulge is desired more pressure is supplied by adjusting the pressure regulator and thereby exerting more pressure on the pistons **116, 116** and further squeezing down the sides of the resilient member through the associated foot members **105, 105.**

Inasmuch as the cylinder assembly **115, 115** are single acting, the resilient force of member **102** will move the foot members outwardly when the pressure in the cylinder is reduced. Also, the ball joints **120** will not become disengaged in the normal usage because the joints will always be under slight compressive force. Again, with this form of the invention the adjusting of the lateral support means for the resilient member **102** is greatly simplified and made much quicker acting than use of the screws illustrated in the first form of the invention. The cylinder can be individually adjusted so that the downward bulge can be adjusted at different positions along the platen.

It is to be understood that the other details of construction of the platen is substantially the same as that shown in the first form of the invention including the clamps for holding the resilient member in place and utilization of the presser foot. The platen assembly **100** will fit into the sanding machine as the other platens will and the sanding belt will conform to the bottom surface of the resilient member **102** thus giving accurate transversely contoured sanding.

The sanding belt **23** will be operated as previously explained, and will be oscillated back and forth during operation. The adjustment of the compression devices shown in the second and third forms of the invention can be accomplished while the machine is working so that accurate settings compensating for all variables can be made.

It is now possible to have a belt sander, grinder or polisher which will sand transversely curved surfaces in a continuous operation without having a plurality of individual operations on the various portions of the curved member or using hand machines.

The example illustrates the invention as used with a belt sanding machine for making wooden pew seats. The platen can be used with any belt type abrasion machine wherein transversely curved work pieces are to be shaped or abraded. Grinding of metal parts can be done as well as polishing or buffing. All of these applications are intended to be within the concept of the invention.

What is claimed is:

1. A platen for holding an abrading member in engagement with a curved work piece movable relative to the abrading member, said platen comprising:
- a frame,
- a base plate,
- means to mount said base plate on said frame,
- an inflatable member mounted on said base plate and positioned to exert pressure on the surface of said abrading member opposite said work piece,
- lateral support means on the sides of said inflatable member to reduce the width of said member in certain portions and increase the heighth thereof in the same portions, and
- means to permit gas under pressure to be introduced in said inflatable member.

2. The combination as specified in claim **1** and a backbone member within said inflatable member, said backbone member having the edge surfaces thereof curbed to correspond to the surface of the work piece being abraded.

3. The combination as specified in claim **2** wherein said lateral support means for said inflatable member is comprised as a flexible strip positioned on each side of said inflatable member and a plurality of adjusting screws threadably mounted with respect to the base of said platen and adapted to engage said flexible strips and force them against said inflatable member.

4. The combination with an abrading machine having a work support table, means on said table to permit a work piece having a transversely curved upper surface to be moved longitudinally therealong, and a power driven endless abrading belt mounted over a pair of spaced substantially coplanar rollers positioned above and spaced from said support table, of: a platen to hold said abrading belt in engagement with a transversely curved work piece being moved longitudinally along said work support table, said platen comprising:
- a platen base plate mounted on said abrading machine,
- a tubular inflated member having a substantially non-stretchable cover mounted on said base plate and positioned to engage the inner surface of said belt, and
- side support members fixed to said base plate and positioned on opposite sides of said inflated member and having means thereon to reduce the width of said inflated member in certain portions thereof and increase the heighth thereof in substantially the same portions, said inflated member being positioned to urge said belt against said transversely curved work piece with a uniform pressure across the upper surface thereof.

5. The combination as specified in claim **4** wherein said work piece is an elongated transversely curved seat having a sharp edge portion at one side thereof, and a presser foot, means to pivotally mount said presser foot on said base plate, adjustment means on said presser foot, said adjustment means being positioned so that the presser foot can be moved to exert pressure on said inflated member and lift said inflated member away from said sharp corner portion of said seat.

6. The combination as specified in claim **4** and a backbone member within said tubular inflated member, said backbone member having edge surfaces thereof curved to correspond to the upper surface of said work piece and being of size corresponding to the cross section of two curved work pieces placed back to back.

7. The combination with an abrading machine having a work support table, means on said table to permit a work piece having a transversely curved upper surface to be moved longitudinally therealong, and a power driven endless abrading belt mounted over a pair of spaced rollers positioned above and spaced from said support table, of:
- a platen assembly mounted on said abrading machine within said belt and adapted to engage the inner surface of the lower portion of said belt and to force it into engagement with a transversely curved work piece being abraded, said platen comprising:
- a support member comprising a base plate having a pair of fixed downwardly depending walls,
- an air tight tubular member made of resilient substantially non-stretchable material filled to a predetermined pressure,
- a backbone support mounted inside said tubular member,
- means for fastening said backbone support and said tubular member to said base plate between said walls,
- a pair of longitudinally extending flexible members positioned between said tubular member and the adjacent wall of said base plate, and
- means for forcing said flexible members inwardly against said tubular member.

8. The combination with an abrading machine having a work support table, means on said table to permit a work piece having a transversely curved upper surface to be moved longitudinally therealong, and a power driven endless abrading belt mounted over a pair of spaced rollers positioned above and spaced from said support table, of: a platen assembly mounted on said abrading machine within said belt and adapted to engage the inner surface of the lower portion of said belt and

to force it into engagement with a transversely curved work piece being abraded, said platen comprising:

a support member comprising a base plate having a pair of fixed downwardly depending walls,

a resilient tubular member,

a backbone support mounted inside said tubular member,

means for fastening said backbone support and said tubular member to said base plate between said walls, and

adjustable lateral support means positioned to exert a lateral force between the depending walls of said base plate and the corresponding side wall of said tubular member, said tubular member being of sufficient resiliency to bulge downwardly in substantially the same sections as the section to which lateral force is applied and in proportion to the amount of the lateral force.

9. The combination as specified in claim **8** wherein the lateral support means are comprised as a plurality of oppositely disposed pairs of members supported by the depending walls of the platen assembly, each pair of members being individually actuatable with fluid under pressure to bear against the sides of said resilient member with a force proportional to the fluid pressure applied to the members.

10. The combination as specified in claim **8** wherein the lateral support means is comprised as a plurality of transversely aligned pairs of resilient bags, the bags forming each pair being open to each other, and separate means to introduce fluid under pressure to each pair of bags.

11. The combination as specified in claim **8** wherein the lateral support means includes a plurality of foot members arranged in transversely aligned pairs, said foot members being transversely slidably mounted on the depending walls, a plurality of separate rocker arms pivotally mounted on the depending walls, each rocker arm being aligned with and connected to control one foot member, separate cylinder means for simultaneously actuating the rocker arms controlling the two foot members forming each transversely aligned pair, and means to selectively introduce fluid under pressure to the separate cylinder means.

12. The combination with an abrading machine having a work support table, a transversely flexible abrading member mounted on the machine and including a section adjacent the table, and means for obtaining relative longitudinal movement between a transversely curved work piece on the table and the abrading member, of: a platen assembly mounted on said abrading machine adapted to engage a surface abrading member opposite from the work piece and to force the abrading member into engagement with a transversely curved work piece being abraded, said platen comprising:

a support member comprising a base plate having a pair of fixed downwardly depending walls,

a resilient member engaging the abrading member,

a backbone support mounted at the side of said resilient member opposite the side thereof that engages the abrading member,

means for fastening said backbone support and said resilient member to said base plate between said walls, the lateral edges of said backbone support being shaped to correspond to the curve of the work piece being abraded, and

adjustable lateral support means positioned to exert a lateral force between each of the depending walls of said base plate and the corresponding side wall of said resilient member, said resilient member being of sufficient resiliency to bulge in direction against the abrading member in substantially the same sections as the section to which lateral force is applied and in proportion to the amount of the lateral force.

13. A platen for holding a moving belt type abrading member in engagement with a work piece engaging a surface of the abrading member, said platen comprising:

a frame,

a resilient deformable member mounted on said frame in position to exert abrading pressure on the surface of said abrading member opposite said work piece, said resilient deformable member being comprised as a hollow tube closed at the opposite ends thereof,

a rigid backbone for said hollow tube positioned to rigidly hold one portion of said tube against said frame, said backbone having an edge thereof substantially conforming in shape to the transverse cross section shape of the abraded surface of the work piece.

14. The combination as specified in claim **13** and a presser foot mounted on said frame adjacent one end of said resilient deformable member, and means to adjust said presser foot so it can be moved to exert a force on said resilient member in direction away from said abrading member at position substantially aligned with one edge of the work piece.

15. A platen for holding a trasnversely flexible abrading member in engagement with a curved work piece engaging a surface of the abrading member, said platen comprising:

a frame,

a resilient deformable member mounted on said frame and positioned to exert abrading pressure on the surface of said abrading member opposite said work piece,

a backbone member supporting said resilient deformable member, said backbone member having the edge surfaces thereof curved to correspond to the surface of the work piece being abraded, and

lateral support means on the frame and engaging the sides of said resilient deformable member said lateral support means comprising a flexible strip positioned on each side of said resilient member, and a plurality of adjusting screws threadably mounted on the frame adapted to engage said flexible strips and force them against said resilient member.

16. A platen for holding a transversely flexible abrading member in engagement with a curved work piece engaging a surface of the abrading member, said platen comprising:

a frame,

a resilient deformable member mounted on said frame and positioned to exert abrading pressure on the surface of said abrading member opposite said work piece, and

lateral support means on the frame and engaging the sides of said resilient member to reduce the width of said member in certain portions and increase the height thereof in substantially the same portions, said lateral support means comprising a plurality of oppositely disposed pairs of support members supported by the frame, each pair of support members being individually actuable with fluid under pressure to bear against the sides of said resilient member with a force proportional to the pressure applied to the support members.

17. A platen for holding a transversely flexible abrading member in engagement with a curved work piece engaging a surface of the abrading member, said platen comprising:

a frame,

a resilient deformable member mounted on said frame and positioned to exert abrading pressure on the surface of said abrading member opposite said work piece, and

lateral support means on the frame and engaging the sides of said resilient member to reduce the width of said member in certain portions and increase the height thereof in substantially the same portions, said lateral support means comprising a plurality of

transversely aligned pairs of resilient bags, the bags forming each pair being open to each other, and separate means to introduce fluid under pressure to each pair of bags.

18. A platen for holding a transversely flexible abrading member in engagement with a curved work piece engaging a surface of the abrading member, said platen comprising:

a frame,

a resilient deformable member mounted on said frame and positioned to exert abrading pressure on the surface of said abrading member opposite said work piece,

lateral support means on the frame and engaging the sides of said resilient member to reduce the width of said member in certain portions and increase the height thereof in substantially the same portion, wherein the lateral support means includes a plurality of foot members arranged in transversely aligned pairs, said foot members being transversely slidably mounted on the frame, a plurality of separate rocker arms pivotally mounted on the frame, each rocker arm being aligned with and connected to control one foot member, separate cylinder means for simultaneously actuating the rocker arms controlling the two foot members forming each transversely aligned pair, and means to selectively introduce fluid under pressure to the separate cylinder means.

19. The combination with an abrading machine having a work support table, means on said table to permit a work piece having a transversely curved upper surface to be moved longitudinally therealong, and a power driven endless abrading belt mounted over a pair of spaced rollers positioned above and spaced from said support table, of:

a platen assembly mounted on said abrading machine within said belt, said platen comprising:

a frame,

a resilient member mounted on said frame on a side of said abrading belt opposite from the transversely curved surface of the work piece and positioned to exert pressure onto said abrading member to engage the abrading member with the curved surface, and

lateral support means positioned along the sides of said resilient member, said lateral support means compressing said resilient member in direction substantially parallel to the direction of motion of the work piece in at least two transversely spaced portions on the same side thereof to increase the height of the resilient member and cause a bulge towards the abrading member in substantially the same portions, the general profile of said resilient member on at least one side thereof, as supported by said lateral support means substantially corresponding to the cross sectional configuration of the transversely curved surface of the work piece.

20. The combination with an abrading machine having a work support table, means on said table to permit a work piece having a transversely curved upper surface to be moved longitudinally therealong, and a power driven endless abrading belt mounted over a pair of spaced rollers positioned above and spaced from said support table, of:

a platen assembly mounted on said abrading machine within said belt and adapted to engage the inner surface of the lower portion of said belt and to force it into engagement with a transversely curved work piece being abraded, said platen comprising:

a frame,

a resilient deformable member mounted on said frame in position to exert pressure across the width of said belt, and

lateral support means on the frame and engaging the sides of said resilient deformable member to reduce the width of said member in certain portions and increase the height thereof in substantially the same portions, thereby increasing the distance of said belt away from a reference plane in those portions, said lateral support means being adjusted so that the increase in height of the resilient deformable member from its normal position substantially corresponds to the amount that the curved surface of the work piece is depressed from its high points with respect to the reference plane.

References Cited by the Examiner

UNITED STATES PATENTS

2,458,217 1/1949 Staggs ..... 51—375

ROBERT C. RIORDON, *Primary Examiner.*

L. S. SELMAN, *Assistant Examiner.*