Nov. 19, 1957 R. F. PENDERGAST 2,813,382

SANDING MACHINE HAVING MEANS FOR PREVENTING BELT CREEPING

Filed Jan. 14, 1955 2 Sheets-Sheet 1

Fig. 1.

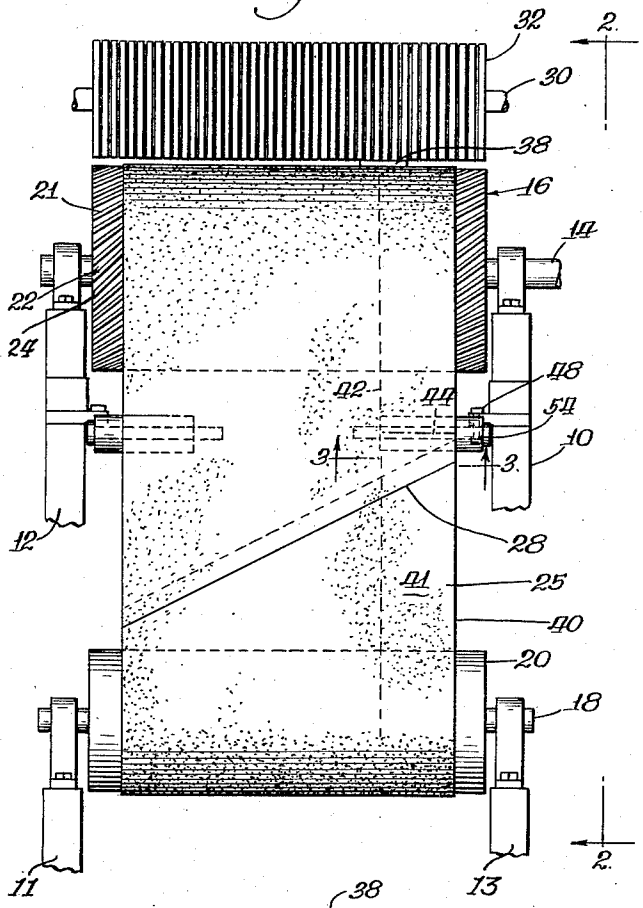
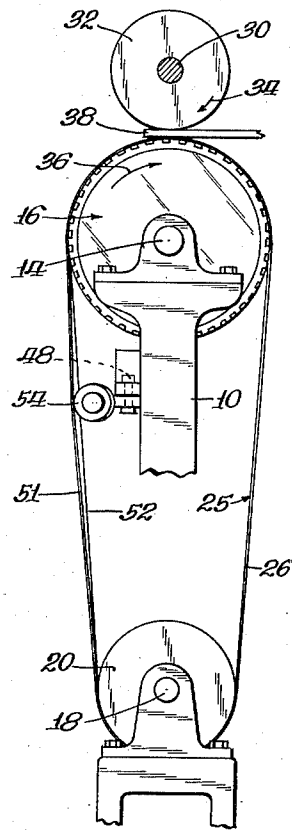


Fig. 2.



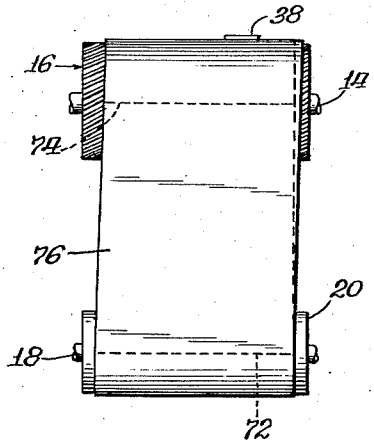


Fig. 4.

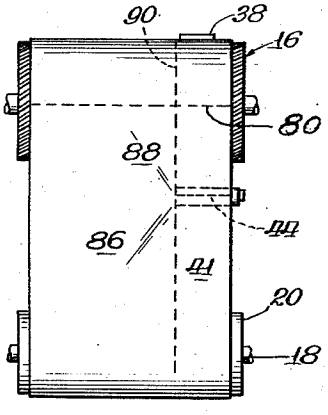


Fig. 5.

INVENTOR.

Raymond F. Pendergast

BY

Wilfred S. Stone

Atty.

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SANDING MACHINE HAVING MEANS FOR PREVENTING BELT CREEPING

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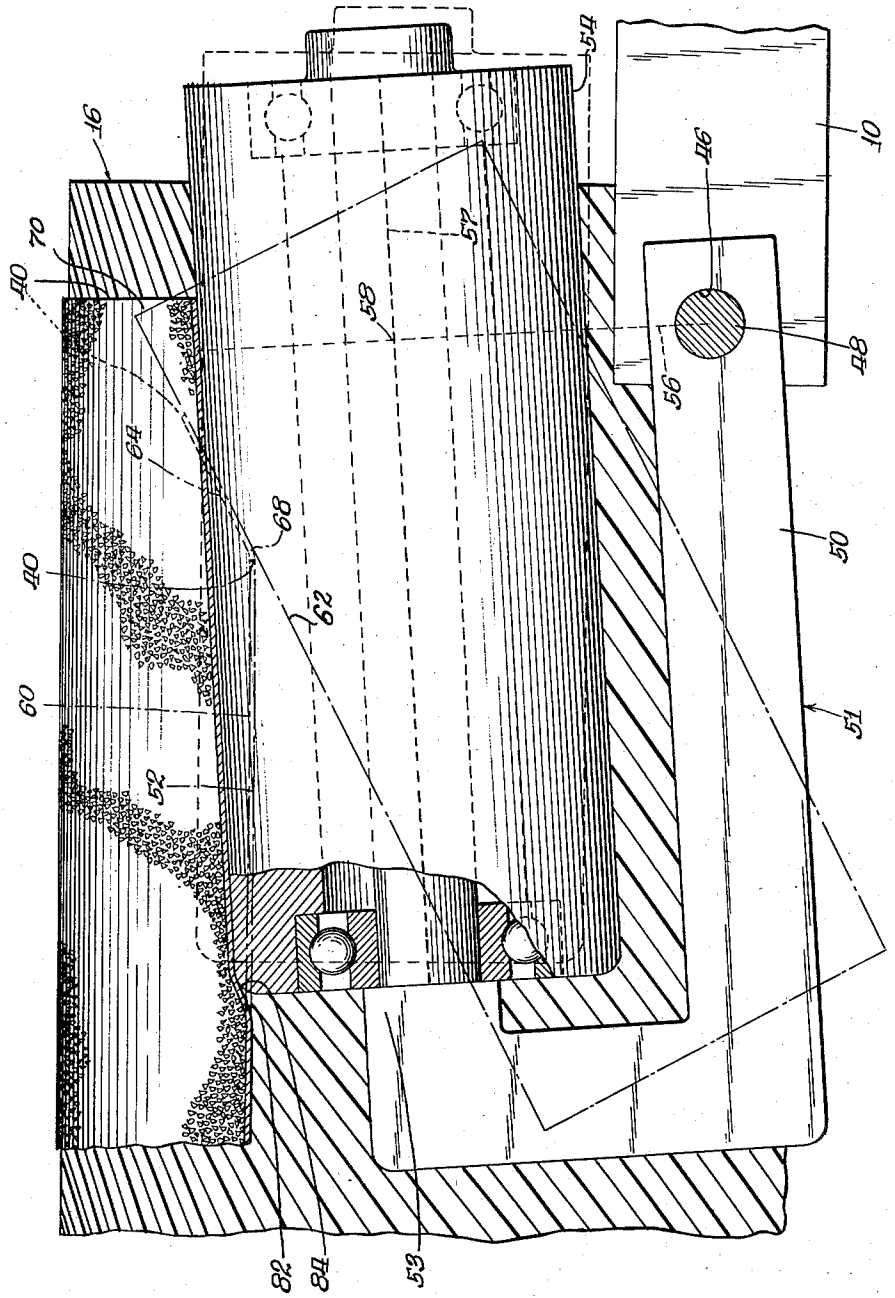


Fig. 3

INVENTOR.
Raymond F. Pendergast
BY
Wayne S. Stevens
Atty.

United States Patent Office

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SANDING MACHINE HAVING MEANS FOR PREVENTING BELT CREEPING

Raymond F. Pendergast, Robinsdale, Minn.

Application January 14, 1955, Serial No. 481,808

5 Claims. (Cl. 51—135)

This invention relates to a method of preventing a sanding belt from creeping and to a sanding machine that practices the method.

In order to appreciate the problem solved by applicant, his type of sanding machine and the conditions under which it operates will first be described. Referring to Figures 1 and 2 of the drawings, which are schematic front and side elevations of applicant's sanding machine, there appears a pair of frame members **10** and **12** which support at their upper ends a shaft **14** carrying a contact roll **16**. The shaft **14** is the power shaft and is driven by means not shown. Mounted on the frame members **11** and **13** is an idler shaft **18** which carries a slightly smaller drum **20**. The frame members **11** and **13** hang from a member not shown which carries both frame **10** and **12** and **11** and **13** in such a manner as to allow the belt to be slipped over the contact roll **16** and the idler drum **20**. The face of the roll **16** is encased in a rubber sleeve **21** whose outer surface carries wales **22** spaced by grooves **24**, which grooves are about one-half to two-thirds the width of the wales. The surfaces of the wales are flat, that is, they all lie in a common cylindrical surface and the surfaces of the wales constitute from 50 to 70 percent of the total surface of the rubber sleeve. The wales are straight and are at an angle of 45 degrees with a plane at right angles to the axis of the drum **16**.

Entrained over the drums **16** and **20** is a belt **25** which is formed from a strip of sandpaper that has been spliced along the line **28**. For purposes of definition, the flight bearing the numeral **26** in Figure 2 is called the departure flight, and the flight bearing the numeral **51** is called the approach flight. While the line bearing the numeral **52** is the far side of the belt, it also indicates the uninterrupted path of the belt which is called the approach flight path. Usually, and for applicant's sleeve, desirably, the sandpaper is as defined, namely, it has a paper backing. The thickness of the paper backing may vary with the coarseness of the grid carried by glue or other adhesive on the abrasive surface. In general, the stiffness of the paper does not contribute as much to the stiffness of the belt as does the hardened glue which holds the grit to the paper. There are some sanding belts made of woven materials, i. e., cotton, but which have little body. These belts do not function on applicant's apparatus as well as those having the paper backing, as will be explained hereinafter.

Mounted above the roll **16** is a feed roll shaft **30** carrying a plurality of rubber-surfaced feed rollers **32**. This shaft **30** is driven at a selected speed in the direction of the arrow **34**, see Figure 2. The shaft **14** and the roll **16** are turning in the direction of the arrow **36**. In a sanding operation, a piece of wood **38** (or other material including metal) is fed into the bight of the feed roll **32** and the roll **16**. That is, the workpiece is advanced by the rolls **32** against the sanding surface of the belt **26**.

The mounting of the idler shaft **18** is not shown in detail, but it is standard. By manual means, the shaft

18 can be raised at one end and lowered at the other, or vice versa, so as to increase the tightness of the belt at one side over its tightness on the other side. In belt operation, the belt always travels toward the high point. With the apparatus as thus described, the belt **26** may be caused to ride on center when not under load.

With the application of the load, such as workpiece **38**, or with an uneven splice, the balance of the system is upset, and the belt will tend to crawl laterally either to the right or to the left as viewed in Figure 1. The rate of crawling may be very high. The belt may move from center against the operating machinery to the right or the left and destroy itself within a few seconds. This crawling is aided by the deep grooves **24** between the wales **22** on the rubber sleeve **21**. These rubber sleeves have greatly changed woodworking practices because operators can lower the shaft **30** and exert such pressure on the piece that on one pass, one-sixteenth of an inch of wood can be removed, without tearing the sanding surface. Applicant is the first to utilize this rubber sleeve in a machine employing a wide and short sanding belt and operating at speeds between 3,000 and 6,000 linear feet per minute. The machine illustrated in Figure 1 is the only belt sander having a rubber sleeve on the contact roll which is on the market today. It will make a much deeper cut than will the drum around which sandpaper is drawn.

The major object of this invention, therefore, is to prevent the belt **26** from moving laterally off the roll in either direction without further adjustment of the idler shaft **18** and irrespective of load. All attempts to utilize existing belt conveyor centering devices are valueless. These are devices in which pulleys engage the edge such as **40** of the belt **26**, see Figure 1, and by yielding to the pressure from the edge, cause a change in a shaft such as the idler shaft **18**. Not only will the paper or heavy cloth edge **40** fray or crumble, but strains are placed upon the seam **28** which cause it to open. As stated, the destruction of the belt may be a matter of seconds. The R. P. M. of the shaft **14** is 1000, and this gives a linear speed on the belt of 75 feet per second.

Applicant's method is based upon lengthening the path of a substantial portion of the belt along one edge and doing this at a point close to the contact roll. Referring to Figure 1, consider that part of the belt between the dotted line **42** and the edge **40** as an edge strake **41**. Applicant lengthens the path of the entire strake at a series of points such as along the dot-dash line **44** which is substantially parallel to the axis of the shaft **14**. When the requisite pressure is applied, the belt stops creeping to the right. This seems to be in direct conflict with the long established principle that the belt moves toward the high point.

These and such other objects as may hereinafter appear are attained by the embodiment of the invention shown in the accompanying drawings, wherein:

Figure 1 is a front schematic elevation of the working parts of applicant's sanding machine;

Figure 2 is a side elevation taken on the lines **2—2** of Figure 1;

Figure 3 is a view taken on the line **3—3** of Figure 2;

Figure 4 is a schematic front elevation showing in exaggerated form how the belt creeps under the action of the work;

Figure 5 is a schematic front elevation showing in exaggerated form how the pulley re-directs the belt.

Continuing to refer to the drawings, particularly Figures 1 and 2, mounted by any suitable means on the frame member **10** at a point close to the contact roll **16** is a journal **46** (see Figure 3) in which is rotatably mounted a pin **48** upon which is pivoted an arm **50** of a U-shaped member **51**. The axis of the pin **48**, referring

to Figure 1, is at right angles to the axis of the shaft **14** and is parallel to a line connecting the centers of the shafts **14** and **18**. This right angle relationship to the axis of the shaft **14** in parallel relationship to a line connecting the axes of the shafts **14** and **18** is important, but a variation from the perfect position by 10 or 15 degrees in certain directions is not too critical. What is important is that the pulley, shortly to be described, should entrain the belt without excessive slippage.

Referring to Figure 2, the normal flight of the belt, i. e., the approach flight path, is indicated by the line **52**. See this numeral also in Figure 3. This last figure shows the axis of the pin **48** located one inch inside the plane containing the outside edge of the drum **16**. The arm **50** mounted on the pin **48** is U-shaped and its second leg **53** carries rotatably a pulley **54**. This pulley is seven inches long and the radius **56** which intersects the axis **57** of the pulley at right angles does so at a point **58** which is two inches from the outer end of the pulley.

The pulley is three inches in diameter. The position of the flight of the belt when not touched by the pulley is indicated by the cross section **60**. The roll **16** is 25 inches wide and the belt in this case is 19 inches wide. The angle of the axis of the pulley **54** to the approach flight path **52** is about 30 degrees because a stop prevents further counter-clockwise movement of the U-shaped member **50**.

When the belt **26** commences to move to the right, it engages the roller **54** which is in the position **62** and climbs up its surface as indicated by the dash line **64**. As the belt climbs the surface of the roller **54**, it tends to rotate the U-shaped member **51** in a clockwise direction. Applicant has shown the belt as having climbed a considerable distance on the pulley, forming a sharp valley at the point **68**. This is not exactly what happens. Actually, the pulley mounted on the arm **50** commences to rotate clockwise around the pin **48** very slowly shortly after the belt engages the pulley. When the edge **40** of the belt reaches the point indicated by the numeral **40** in Figure 3, there is sufficient pressure on the entire pulley and U-shaped member assembly to throw it into the solid-line position shown in Figure 3. This does not occur gradually. When the critical point is reached, the pulley assembly moves into the solid line position and in so doing what applicant has referred to as the strake **41** is suddenly supported throughout its width by the pulley. In reaching this position, it will be noted that the edge **40** of the belt which is quite close to the edge **70** of the pulley slips away from the edge as the pulley moves into the solid-line position. The surface of the pulley is made of steel and its surface is smooth.

When the belt reaches the position shown in Figure 3, it ceases to creep to the right. Several theories may explain this. Applicant's theory is, referring to Figures 1 and 2, that the work, moving against the direction of movement of the belt, tends to push the belt to one side or the other depending on the straightness of the belt or upon the angle of the work as it enters the bight between the pulleys **32** and the belt and depending upon the direction of the wales **22** on the rubber sleeve. The result is the the belt moves toward that side of the assembly toward which its grains push it. This is possible because of the comparatively long flight between the take-off line **72**, referring to Figure 4, where the belt leaves the idler roller **20**, and the landing line **74** where it contacts the drive roller. The distance is such that the paper of the belt can be distorted along the comparatively long flight **76**, particularly with the aid of the rubber wales of the sleeve **21**.

The interposition of the pulley **54** has the effect of causing the belt to move at a true right angle relationship to the work shaft **14**. The distance between the take-off landing line **44** and the landing line **80** is so short that the belt will not distort under the action of the work. In short, the pressure exerted by the work tending to cause the belt to move to the right, in this instance, is overcome by the slope of the pulley which seems to give the right edge of the belt a slight redirection in the opposite direction.

Attention is invited to the wrinkle **82**, see Figure 3. This wrinkle is slightly exaggerated. The inner edge **84** of the pulley **54** is beveled so as not to cut the under side of the belt. There is a pull by the balance of the belt, indicated by the numeral **86**, see Figures 3 and 5, to the left. This pull opposes the pulley which moves the belt out of the approach flight path **52**, see Figure 2. This wrinkle spreads into a sort of valley indicated by the numeral **88** in Figure 5.

No adverse effect is noticed when paper-backed sandpaper is used. However, the thin textile-backed paper develops a permanent wrinkle along the dotted line **90** in Figure 5, and this leads to the belief that the foregoing explanation is sound. It suggests that the sandpaper or sand textile outside the strake **26**, and referring to Figure 1, and bearing general number **86**, resists stretching and tends to pull the strake **41** to the left. This in conjunction with a re-direction of the edge **40** of the pulley probably accounts for the success of the arrangement. There is no fraying of the edge of the paper and the distortion at any point is not sufficient to damage the seam **28**.

Returning to Figure 1, applicant has a similar pulley **92** in reverse position, on the left-hand edge of the belt.

In operation, the device functions admirably. A workman may insert a workpiece such as **38** at any point, transversely of the belt. This is important from the standpoint of speed of operation. For example, in running four- to six-inch wide skees through the machine, the workman may feed them one beside the other as fast as he can pass them in. It is self-evident that the belt goes from no load to maximum load almost instantly or from no load to a selected partial load. The transverse thrust placed upon the belt varies greatly. The belt moves up on one pulley and stops. A moment later, it may move across the roll up onto the opposite pulley. The operators are able to put a maximum pressure on the feed roll shaft **30** so as to effect a maximum cut.

While the device has been described in connection with a sanding machine for wood, the machine shown is also used for polishing metal. The tendency to creep is less, but the pulleys function just as effectively.

Having thus described his invention, what applicant claims is:

1. A machine for surfacing articles comprising a frame, two substantially parallel spaced rolls mounted on said frame, a belt having an outer abrasive surface entrained over said rolls, and means mounted on the frame engageable with a flight of said belt and responsive to lateral creeping thereof for pressing a surface against the underside of a comparatively broad strake of the belt adjacent either edge thereof.

2. The machine of claim 1 wherein the means for pressing outwardly the belt is positioned close to the roll toward which the belt is moving.

3. The machine of claim 1 wherein the means for pressing the belt outwardly has a shoulder inwardly of the edge of the belt and the means is moved outwardly sufficiently far so as to create a valley in the belt sloping toward the longitudinal center of the belt.

4. A machine for surfacing articles comprising a frame, two substantially parallel spaced rolls mounted on said frame, a belt having an outer abrasive surface entrained over said rolls, a shaft positioned at right angles to the axis of one roll and parallel to the plane containing the axes of both rolls, and an arm pivotally mounted on said shaft, said arm including a surface intercepting the laterally projected inner surface of the approach flight of the belt at an obtuse angle, whereby when the belt creeps laterally it increasingly engages said surface until it pivots the arm so as to push outwardly a comparatively broad strake of the belt adjacent an edge thereof.

5. A machine for surfacing articles comprising a frame,

two substantially parallel spaced rolls mounted on said frame, a belt having an outer abrasive surface entrained over said rolls, a shaft positioned at right angles to the axis of one roll and parallel to the plane containing the axes of both rolls, an arm pivotally mounted on said shaft, an elongated cylindrical pulley rotatably mounted on the arm so that a line on its surface parallel to its axis intercepts the laterally projected inner surface of the approach flight of the belt at an obtuse angle, whereby as the belt creeps laterally, it increasingly engages the surface of the pulley until it pivots the arm so as to push outwardly a comparatively broad strake of the belt adjacent an edge thereof.

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