United States Patent

[11] **3,571,986**

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[45] Patented **Mar. 23, 1971**

[54] **SHOE FOR RUBBING MACHINE**
9 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **51/368,** 51/384, 51/392
[51] **Int. Cl.** **B24b 21/04**
[50] **Field of Search** ..... 51/358, 367, 368, 375, 376, 377, 382, 384, 391, 392, 170 (MT), (.3), 170 (TL), (.5)

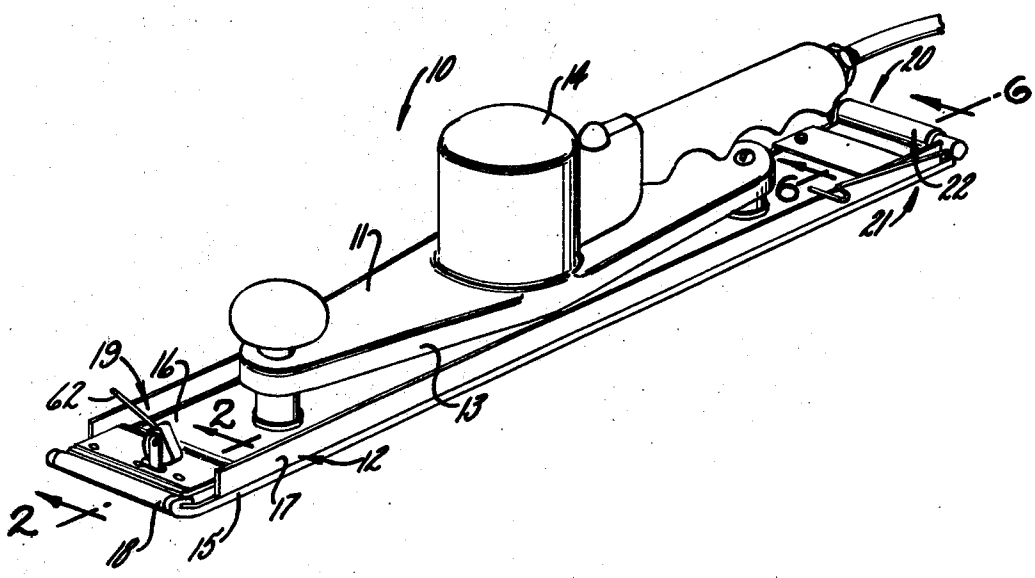
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ABSTRACT: An elongated rubbing shoe mounted for gyratory motion on a rubbing machine. To form the shoe, an elongated support is covered on its bottom and the top of one end portion with a layer of resiliently compressible material. A rubbing sheet underlies the layer, and one end of the sheet is anchored to the support by a clamp mounted on the top of one end portion of the support. A roller mounted on the top of the other end portion of the support is operable to pull the sheet tightly around the resilient layer and hold the sheet tensioned between the clamp and the roller. One end portion of the support is bent upwardly, and the layer of resilient material is curved upwardly around that end portion and along the top of that portion. When the sheet is tensioned by the roller, the resilient material curving around the end portion of the support is radially compressed. As the sheet stretches in use, the resilient material expands to maintain the sheet tensioned between the clamp and the roller.



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SHEET 1 OF 2

Fig. 1

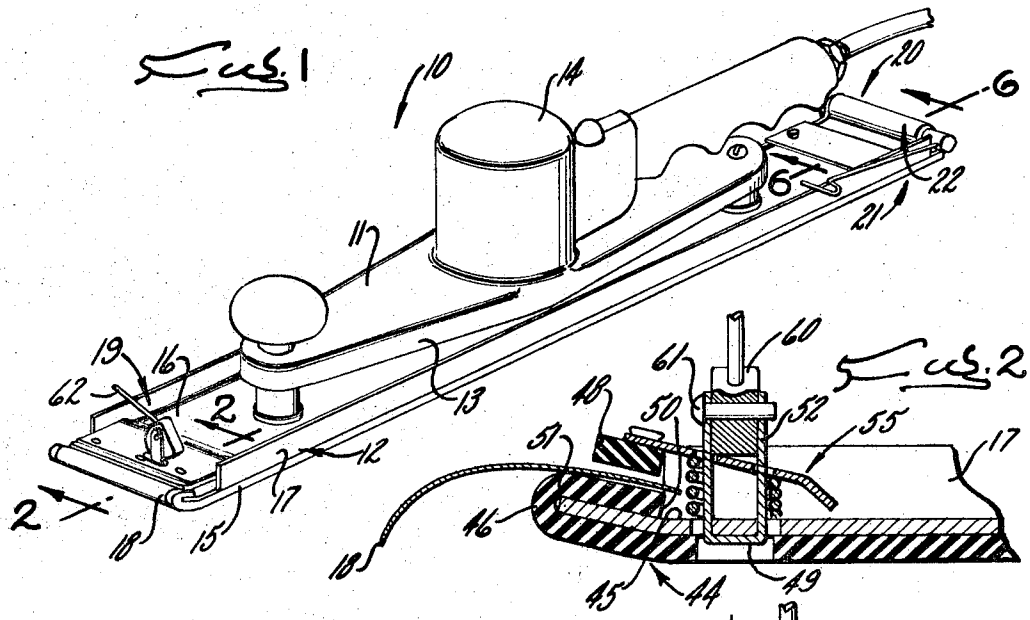


Fig. 2

Fig. 3

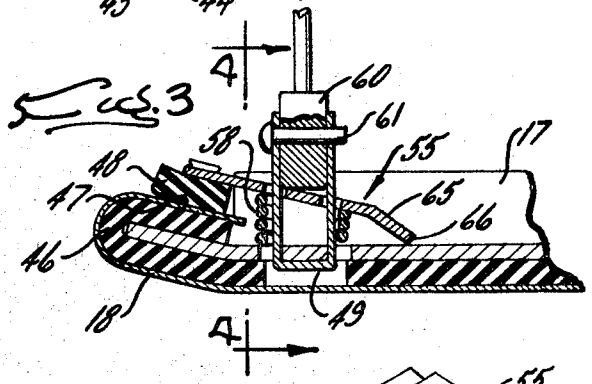
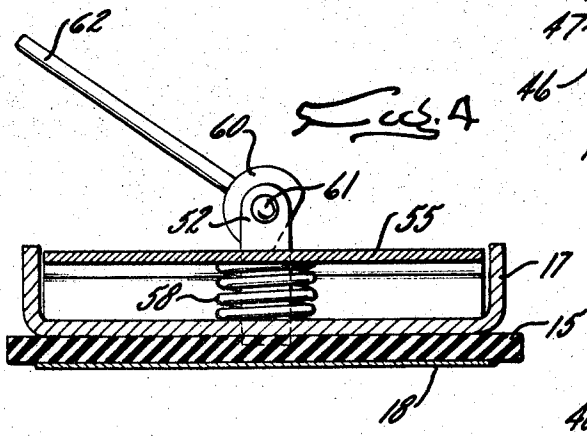


Fig. 4



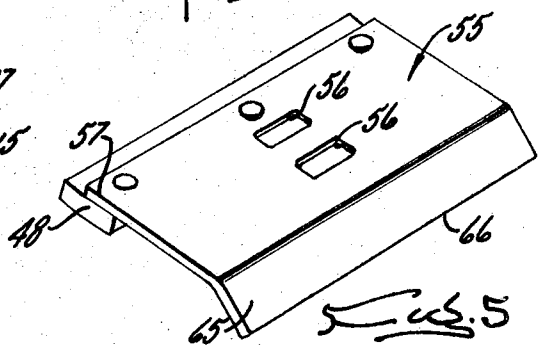
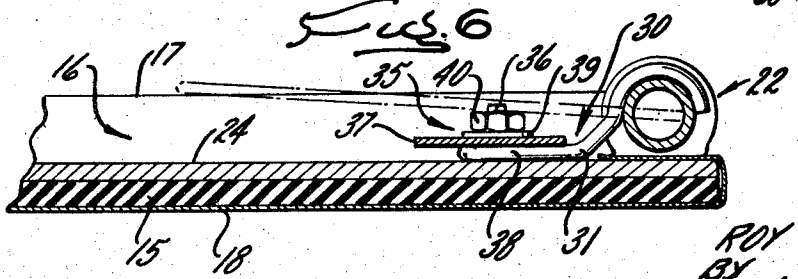


Fig. 5

Fig. 6



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Fig. 7

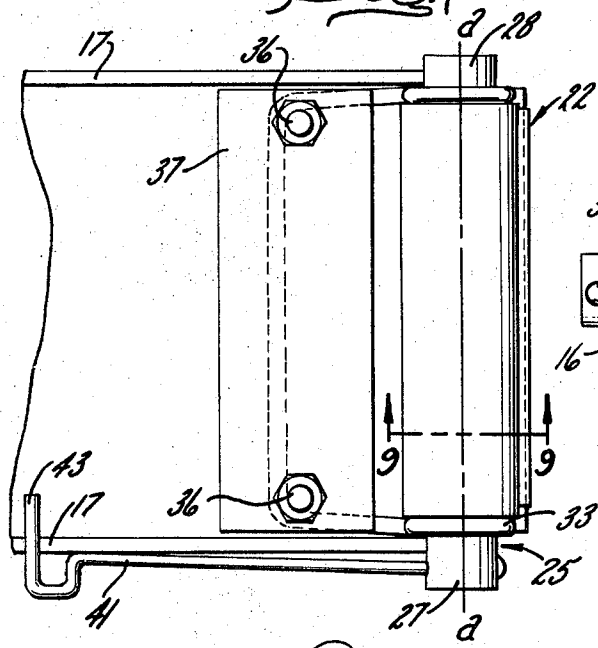


Fig. 8

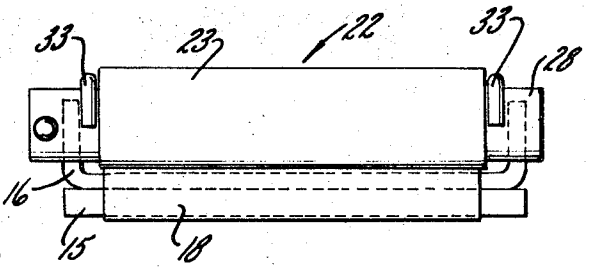


Fig. 9

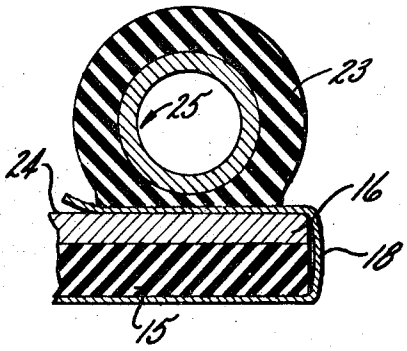


Fig. 10

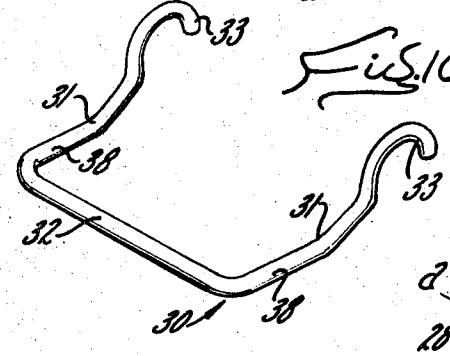


Fig. 11

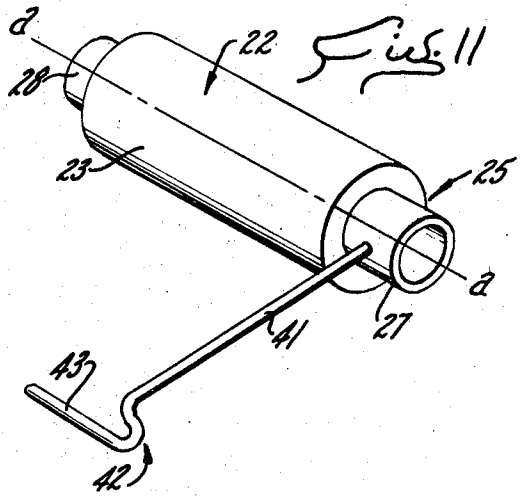
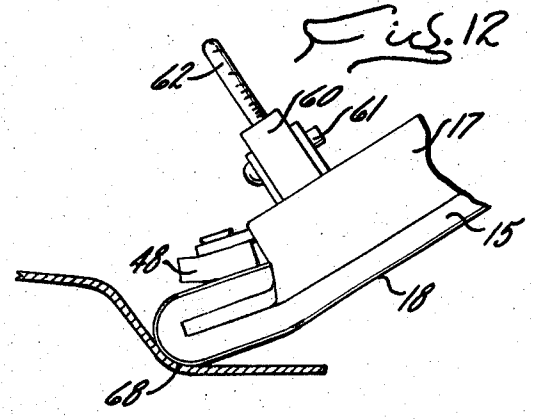


Fig. 12



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SHOE FOR RUBBING MACHINE

BACKGROUND OF THE INVENTION

This invention relates to an elongated rubbing shoe for a rubbing machine of the type in which a rubbing sheet is positioned around the bottom of the shoe, and each end of the sheet is anchored by clamps to a respective end portion of the shoe. The bottom of the shoe is normally covered with a layer of compressible material to back the rubbing sheet.

SUMMARY OF THE INVENTION

It is a primary object to provide on one end portion of the rubbing shoe a novel clamp which is operable to tension the rubbing sheet around the bottom of the shoe and between the clamps as an incident to the initial mounting of the sheet on the shoe and in a quicker, easier and surer manner than has been possible with clamps heretofore available.

It is a related object to accomplish the above by the clamp being formed as a roller covered with a resiliently yieldable material and mounted for rotation on one end portion of the shoe, the roller being biased against the shoe that one end portion of the sheet can be threaded between the roller and the shoe to be gripped by the covering material of the roller thus resulting in the sheet being tensioned when the roller is rotated.

It is a further related object to bias the roller against the shoe and to mount the roller for rotation in a simple and novel manner. More particularly, this is accomplished by a pair of spring arms with one end portion of each being clamped to the shoe and the other end portion being hooked over a portion of the roller to bias the latter downward while permitting the roller to rotate.

It is still another object to provide means which can be used to rotate the roller in one direction to tension the sheet and then used to prevent rotation in the opposite direction to prevent loosening of the sheet. The foregoing object is achieved by providing the roller with a novel handle which in its normal position rests against the support to prevent rotation of the roller in a loosening direction, the handle being flexible laterally of the support so that the handle can be moved laterally to clear the support and used to rotate the roller.

It is a further object to facilitate the rubbing of curved surfaces by bending one end portion of the shoe upward and curving the backing material upwardly around that one end portion and along the upper surface of that end portion to form a rubbing nose that can be eased into the curved surfaces and will fit smoothly against the curved surfaces. It is a primary object of the present invention to maintain tension on the rubbing sheet as it stretches in use by curving the backing material around one end portion of the shoe and radially compressing the curved portion of the material by the initial tension placed on the sheet so that, as the sheet stretches, the backing material expands and maintains the tension on the sheet.

Other objects and advantages of the invention will become apparent from the following detailed description when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a rubbing machine embodying the novel features of the present invention.

FIG. 2 is an enlarged fragmentary cross section taken substantially along line 2–2 of FIG. 1.

FIG. 3 is a cross-sectional view similar to FIG. 2 but showing parts in moved positions.

FIG. 4 is a cross section taken substantially along line 4–4 of FIG. 3.

FIG. 5 is a perspective view of one of the parts shown in FIGS. 2 to 4.

FIG. 6 is an enlarged fragmentary cross section taken substantially along line 6–6 of FIG. 1.

FIG. 7 is an enlarged plan view of the rear end portion of the shoe of the rubbing machine of FIG. 1.

FIG. 8 is an end view of the shoe as seen from the right of FIG. 7.

FIG. 9 is an enlarged fragmentary cross section taken substantially along line 9–9 of FIG. 7.

FIG. 10 is a perspective view of a part shown in FIG. 7.

FIG. 11 is a perspective view of the roller.

FIG. 12 is an enlarged side view of the front end portion of the shoe of the rubbing machine of FIG. 1 and showing the machine being used to rub a curved surface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the drawings for purposes of illustration, the invention is embodied in a portable rubbing machine **10** (FIG. 1) driven by a rotary motor (not shown) mounted on a frame **11** on which a rubbing shoe **12** is supported for bodily gyration. The frame is a horizontal, elongated diamond-shaped member with downturned edges **13** and is spaced from and overlies the rubbing shoe. To support and house the rotary motor, a housing **14** is mounted on the support.

The rubbing shoe **12** comprises a pad **15** of yieldable material adhesively secured to a metal sheet or support **16** whose edges **17** are upturned. One or more rubbing sheets **18**, usually covered with abrasive material, are positioned around the bottom of the shoe and are anchored to the latter at opposite ends thereof by clamps **19** and **20** mounted on top of the support at these opposite ends.

In accordance with one aspect of the present invention, the clamp **20** on the end portion **21** of the support **16** comprises a roller **22** which presses the rubbing sheet **18** against the support so that the roller can grip the sheet and, during initial mounting of the sheet on the shoe, tensions the sheet around the bottom of the shoe and between the clamp **19** and the roller in a simple, easy and effective manner. For these purposes, a covering **23** (FIG. 9) of resiliently yieldable material is formed on the roller, the roller being mounted on the upper surface **24** (FIG. 6) of the rear end portion **21** of the support for rotation about an axis *a* (FIG. 7) extending transversely of the support and being biased against the upper surface of the support with sufficient force to compress a portion of the covering. During initial mounting of the sheet **18** to the shoe **12**, the sheet is placed around the bottom of the shoe with one end portion of the sheet being anchored to the support by the clamp **19** and with the other end portion of the sheet being threaded between the roller and the upper surface **24**. The roller then is rotated to cause the compressed material of the cover of the roller to grip the sheet and pull the latter until a predetermined tension is applied to the sheet. The roller than may be locked against rotation in the opposite direction to prevent loosening of the sheet.

As best shown in FIGS. 7 and 11, the core of the roller **22** is a metal tube **25** with a length slightly longer than the width of the support **16**. The cover **23** of resiliently yieldable material, herein hard rubber, is tubular in shape with a length less than that of the metal tube, and the cover is positioned to cover the central portion on the metal tube leaving exposed end portions or trunnions **27** and **28**. The roller is mounted on the rear end portion of the support to rotate about the axis *a* which extends transversely of the support. As seen most clearly in FIG. 7, the upturned edges **17** of the support terminate short of the rear end portion **21** of the support, and the metal tube extends from one side of the support to a point beyond the other side. That is, the roller is longer than the support is wide but is positioned to overhang on only one side.

Advantageously, the roller **22** is both mounted on the support **16** for rotation and is biased against the upper surface **24** of the support by a spring clip **30** (FIGS. 6 and 10). In this instance, the clip is formed as a U-shaped member (FIG. 10) by a pair of spaced apart, generally parallel arms **31** joined together at their rear ends (FIG. 10) by a connecting member **32** which spaces the arms apart a distance greater than the length of the covered area of the roller. Herein, the clip preferably is made of a single piece of spring steel wire bent

into the U-shape. The free ends of the arms are bent into arcuate portions 33 each with a radius slightly larger than the radius of the metal tube 25 of the roller. To mount the roller for rotation, the clip is clamped at its rear end (FIG. 6) to the support 16, and the arms are bent upwardly with the arcuate portions of the arms hooked over the exposed trunnions 27 and 28 of the roller. Because the rear ends of the arms are clamped to the support and because the arms are made of spring material, the roller is biased downwardly against the upper surface 24 of the support to compress the rubber layer 23 as shown in FIG. 9.

To clamp the rear ends of the arms 31 to the support 16 and allow the amount of downward pressure exerted on the roller to be adjusted, a vertically adjustable holddown 35 (FIG. 6) is used. The holddown comprises a pair of spaced, upwardly extending screws 36 (FIG. 7) fixed to the support and an elongated horizontal plate 37 mounted on the screws for vertical movement. After the roller 22 is placed on the support, the clip 30 is placed on the support with the arcuate portions 33 of the arms 31 hooked over the trunnions 27 and 28 of the roller. Next, the plate 37 is mounted on the screws and moved downwardly into contact with the rear end portions 38 (FIG. 6) of the arms. Washers 39 and nuts 40 are placed on the screws over the plate, and the nuts are tightened down on the screws forcing the plate downwardly. This downward movement of the plate pushes the rear end portions of the arms down toward the support and causes the arms to bias the roller downwardly against the plate. The amount of downward bias exerted on the roller by the arms can be controlled by the extent the plate is forced downwardly by the nuts. Accordingly, the biasing force on the roller can be adjusted by tightening or loosening the nuts.

With the plate 37 being movable to adjust the bias on the roller 22, the arms 31 of the clip 30 are not always held in a manner which will prevent longitudinal movement. Therefore, the roller, which is subject to stresses tending to pull it rearwardly when tension is placed on the rubbing sheet 18, must be held against rearward displacement in another manner. For this purpose, the screws 36 are spaced longitudinally on the support 16 a distance from the location of the roller equal to the length of the arms. The connecting member 32 is placed on the opposite side of the screws from the roller (FIG. 7) such that any rearward stress placed on the roller is passed through the arms to the connecting member to pull the latter against the screws. Since the screws are fixed to the support, the connecting member is prohibited from moving rearwardly and thus rearward movement of the roller is prevented.

An arm or handle 41 (FIG. 11) is connected to the roller 22 and is arranged advantageously to be used both in rotating the roller in one direction to tension the rubbing sheet 18 and in locking the roller against rotation in the opposite direction to prevent loosening of the sheet once the latter has been tensioned. The handle is connected rigidly at one of its ends to the roller perpendicular to the axis *a* of rotation of the latter and is connected to the roller on the end portion 27 which extends beyond the upturned side edge 17 of the support 16 at a point beyond the side edge (FIG. 7). With this arrangement, the free end 42 of the handle may be grasped by the operator and moved about the axis of rotation of the roller to rotate the latter. The roller is turned clockwise (FIG. 6) to tension the sheet and counterclockwise to loosen it. So that the roller may be locked against undesired rotation in the loosening direction, the free end of the handle is bent to form a projection 43 which extends laterally in the direction of the support 16. As best shown in FIG. 7, this projection extends laterally a sufficient distance that, when the handle is moved counterclockwise, the projection will come into contact with the upturned edge 17 of the support and prevent further counterclockwise movement of the handle. The handle is made of a material flexible enough to allow the handle to be sprung laterally of the support a distance sufficient for the projection to clear the support and the roller can then be rotated in either direction by rotating the handle. After the handle has been moved clockwise to tension the sheet 18 and after sufficient tension has been placed on the sheet, the handle is allowed to spring back to its normal position perpendicular to the axis *a* and to rest against the upturned edge 17 of the support thereby effectively locking the roller against counterclockwise or loosening rotation.

So that the roller 22 can grip the rubbing sheet 18 to tension the latter, the rubber cover 23 must be compressed against the upper surface 24 of the support 16 as shown in FIG. 9. To mount the sheet on the shoe 12, one end portion of the sheet is held by the clamp 19 (FIG. 1) on the forward end portion of the shoe. The sheet is then passed around the bottom of the shoe, and the other end portion (FIG. 9) is threaded between the roller and the upper surface 24 of the support The handle 41 is pulled laterally and then moved clockwise causing the roller to rotate and causing the compressed portion of the rubber cover to grip and pull the sheet. As the roller continues to rotate, the sheet is drawn between the roller and the support until the sheet is pulled tightly and tensioned between the clamp 19 and the roller. Continued rotation of the roller will exert a greater and greater tension on the sheet until, at some amount of tension, the gripping ability of the roller will fail and the roller will slip on the sheet as the former rotates. This slipping will keep tension on the sheet but will not add additional tension, and the point at which the grip of the roller will slip can be controlled by the amount of downward bias exerted on the roller. The amount of gripping can also be controlled by the type of resiliently yieldable material used, and hard rubber has been found to be satisfactory when the rubbing sheet is covered with abrasive material. Because the roller slips on the sheet after a predetermined amount of tension has been placed on the sheet, the roller can continue to be turned after the sheet is tensioned and until the handle 41 is positioned adjacent the upturned edge 17 of the support. At that point, the handle is allowed to spring back to its normal position, and the projection 43 comes into contact with the upturned edge to prevent counterclockwise or loosening rotation of the roller.

In accordance with another aspect of the invention, the rubbing sheet 18, which normally stretches some in use, is automatically kept tensioned around the bottom of the shoe 12 as the sheet stretches. For these purposes, the pad 15 covering the bottom of the support 16 is made of a resiliently compressible material and is curved upwardly around the forward end portion 44 (FIG. 2) of the support and along the upper surface 45 of that end portion. With this arrangement, the portion 46 of the pad which is curved upwardly around the support is compressed when the sheet 18 is first placed on and tensioned around the bottom of the shoe and, as the sheet stretches, the portion 46 expands keeping tension on the sheet.

In this instance, the resiliently compressible material of the pad 15 is hard rubber. As shown most clearly in FIG. 1, the pad is curved upwardly around and along the upper surface 45 of the forward end portion 44 of the support 16. The forward end portion of the rubbing sheet 18 is held by the clamp 19 and, after the sheet has been placed around the bottom of the shoe, tension is applied to the sheet by rotating the roller 22. This tension which is applied as an incident to initial mounting of the sheet is sufficient to radially compress the portion or nose 46 of the pad which is curved upwardly around the support. When the sheet subsequently stretches due either to its use or to the constant tension, the nose 46 expands keeping the sheet tensioned around the shoe.

The clamp 19 at the forward end of the support 16 is designed to hold the rubbing sheet 18 so that the latter lies flat against the upper surface 47 (FIG. 3) of the pad 15 as the latter extends along the upper surface 45 of the support. To accomplish this, the forward end of the sheet is clamped between the upper surface 47 of the pad and the bottom surface of a hard rubber clamping member 48 mounted for vertical movement. To mount the clamping member, a U-shaped member 49 (FIG. 2) is rigidly joined to the support 16 along

the longitudinal centerline of the support at a point just rearwardly of the end 50 of the portion 51 of the pad 15 which extends along the upper surface 45 of the support. The U-shaped member is joined to the support with its legs 52 extending upwardly and with the open end of the U facing upwardly. A clamping plate 55 with a width slightly less than the width of the support between the upturned edges 17 of the support is fitted on the U-shaped member in a manner which allows the plate to move vertically relative to the support. This is accomplished by a pair of spaced holes 56 (FIG. 5) which are larger in size than the cross-sectional area of the legs of the U-shaped member, being formed in the clamping plate, and the clamping plate is slipped down over the U-shaped member with the legs 52 extending through the holes. Because the holes are larger than the cross-sectional area of the legs, the plate can rock about the U-shaped member as well as move vertically. The clamping member 48 is mounted on the underside of the forward edge portion 57 (FIG. 5) of the plate.

Before the clamping plate 55 is placed on the U-shaped member 49, a coiled compression spring 58 (FIG. 4) is placed around the U-shaped member, and this spring biases the plate upwardly. The plate is positioned on the U-shaed member such that the clamping member 48 extends above the upper surface 47 of the pad 15 as it extends along the upper surface 45 of the support 16. Between the upper end portions of the legs 52 and over the plate 5, a cam 60 (FIG. 4) is mounted on the legs by a pin 61 to rotate about the pin. A handle 62 is fixed to the cam to rotate the latter. To clamp one end portion of the rubbing sheet 18 and anchor it to the shoe 12, the cam is rotated forcing the plate 55 downwardly against the force of the spring 58 clamping the sheet between the upper surface of the pad and the clamping member. The rear end portion 65 (FIG. 3) of the plate is bent downwardly so that it comes into contact with the upper surface 45 of the support as the plate is forced downwardly by the cam. Once the edge 66 (FIG. 5) of the rear edge portion of the plate contacts the support, further downward force exerted by the cam causes the plate to pivot about the edge 66 thus rotating the clamping surface into a strong clamping engagement with the sheet and the portion 51 of the pad.

The forward end portion of the shoe 12 is arranged in an advantageous manner to facilitate the rubbing of curved surfaces such as those shown at 68 in FIG. 12. This is accomplished by the forward end portion 44 of the support 16 being bent upwardly and by the pad 15 being bent upwardly around the end portion to form the curved nose 46. This upward bend allows the gyrating shoe to be eased into a curved surface, and the curved nose allows the rubbing surface of the rubbing sheet to be applied evenly to the curved surface.

From the foregoing, it will be evident that the roller 22 covered with a resiliently yieldable material and mounted for rotation on the end portion 21 of the support 16 while being biased against the upper surface 24 of the end portion is a particularly advantageous arrangement for placing tension on the rubbing sheet 18 during its initial placement on the shoe 12. Also, the provision of the laterally flexible handle 41 on the roller is an extremely simple and inexpensive way both to rotate the roller in one direction to tension the sheet and to lock the roller against rotation in the opposite direction to prevent loosening of the sheet. Another simple and inexpensive arrangement that is particularly useful is the use of the spring clip 30 both to journal the roller for rotation and to bias the latter against the support. The nose 46 of resiliently compressible material serves to keep tension on the sheet once the roller has placed the sheet under tension. Moreover, the nose, in conjunction with the upwardly bent end portion 44 of the support, is advantageously utilized to rub curved surfaces.

I claim:

1. A rubbing shoe comprising an elongated horizontal support, a layer of resiliently compressible material attached to the bottom of said support and curving upwardly around one end portion of the support and along the top of said portion, a flexible rubbing sheet underlying said resilient material, a clamp on one end portion of said support for gripping one end of the rubbing sheet and anchoring said one end to said support, means at the other end portion of said support for drawing and tensioning the rubbing sheet between said clamp and said means and tightly against said resilient material to radially compress the material curving around said end portion as an incident to clamping the sheet in place whereby the resilient material expands as the sheet stretches thereby to maintain the rubbing sheet tensioned between said clamp and said means.

2. The rubbing shoe of claim 1 in which said one end portion is bent upwardly thereby facilitating the rubbing of curved surfaces.

3. In a rubbing machine, the combination of, an elongated rubbing shoe, a flexible rubbing sheet positioned around one side of said shoe and over the ends of said shoe, a clamp at one end of said shoe for anchoring one end of said sheet to the shoe, a roller mounted at the other end of said shoe for rotation about an axis extending transversely of the shoe, said roller being biased against said shoe, means on said roller for turning the latter in one direction about said axis to pull said sheet between the roller and the shoe and thereby draw the sheet snugly against said one side of the shoe, and means for locking the roller against rotation in a direction opposite said one direction to prevent loosening of the sheet on the shoe.

4. An abrading shoe comprising an elongated horizontal support, a flexible abrasive sheet positioned around the bottom and over the ends of said support, a clamp on one end portion of said support for anchoring one end of said sheet to said support, a roller mounted on the other end portion of said support on the upper side thereof for rotation about an axis extending transversely of the support, said roller being covered with a resiliently yieldable material and being biased downwardly against said support so that a portion of said material in contact with said support is compressed radially, the other end of said sheet being threaded between said roller and said upper side, means on said roller for rotating the latter in one direction about said axis causing the resiliently yieldable material of said roller to grip and pull said sheet tightly across the bottom of said support, and means operable to lock said roller against rotation in a direction opposite said one direction to hold said sheet positioned tightly across said bottom.

5. The rubbing shoe of claim 4 in which a layer of resiliently yieldable material is mounted on the bottom of said support to provide a backing for said sheet and is curved upwardly around said one end portion and along the upper surface of said one end portion, said curved portion of said layer being radially compressed when said sheet is pulled by said roller whereby the layer expands as the sheet stretches to maintain the rubbing sheet tightly stretched between said clamp and said roller.

6. The rubbing shoe of claim 4 in which said means for rotating the roller and for locking the roller against rotation is a resiliently yieldable handle which is connected to said roller for rotation with the latter and which extends radially from said roller near one end of the roller, said handle normally being positioned to contact said support to prevent rotation of said roller in said opposite direction and being laterally yieldable whereby said handle may be moved laterally to avoid contact with said support and may be rotated about said axis to rotate said roller and effect the pulling of said sheet.

7. The rubbing shoe of claim 6 in which said handle lockingly contacts said support in only one angular position during rotation of said roller, and in which said roller slips on said sheet once said sheet is pulled to a predetermined tension whereby said roller may continue to be rotated until said handle reaches said one position.

8. The rubbing shoe of claim 4 in which said roller comprises a cylindrical tube having two end portions and having a central portion connecting the end portions with said layer of resiliently yieldable material covering the central portion, a pair of elongated resilient arms each formed with arcuate end

portions, said arcuate portions being hooked over a respective end portion of said roller to support said roller for rotation, and the other end portions of said arms being clamped toward said support to bias said roller against said support.

9. The rubbing shoe of claim 4 in which said roller comprises a cylindrical central portion covered with said layer of resiliently yieldable material and includes cylindrical trunnions projecting axially from the ends of said central portion and smaller in diameter than the combined diameters of said central portion and said layer, a generally U-shaped spring having arms formed with downwardly curved end portions hooked over and journaling said trunnions for rotation on said support, said spring including a connecting member anchored to said support and interconnecting said arms with the latter projecting upwardly from said connecting member and being biased downwardly against said trunnions.