Dec. 7, 1926. 1,609,508

R. CAVICCHI

SURFACING MACHINE AND SURFACING TOOL

Filed August 26, 1924

Fig. 1.

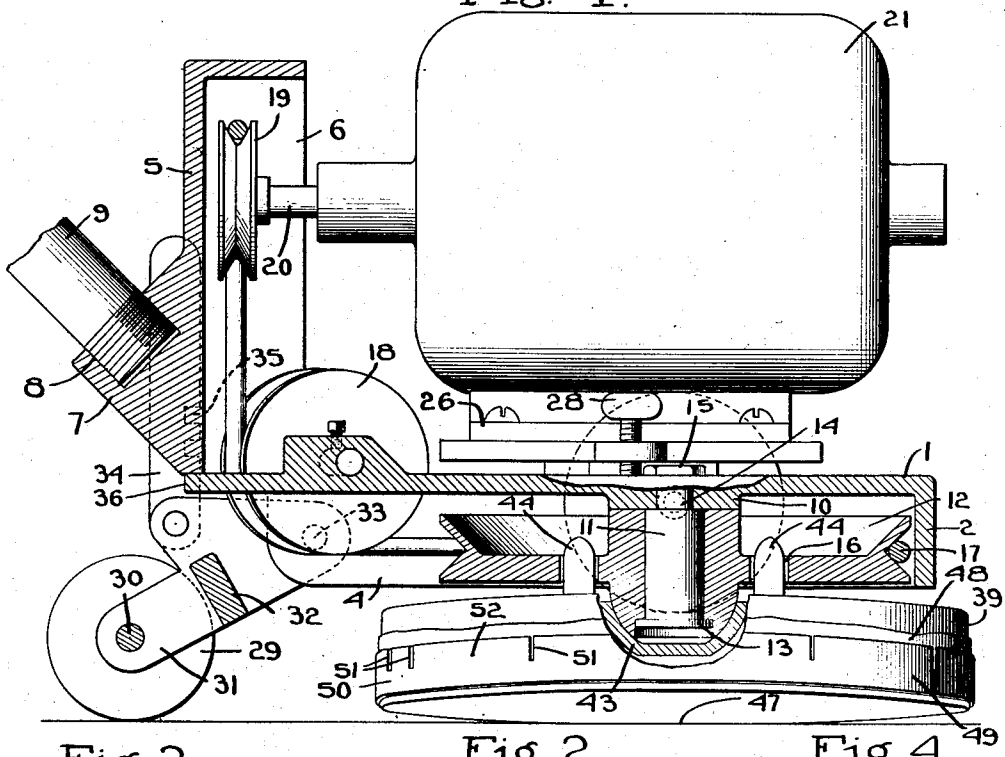


Fig. 3.

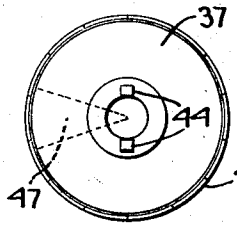
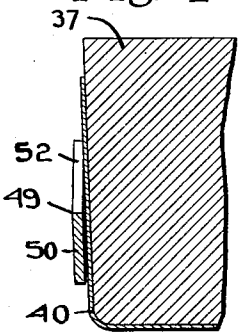


Fig. 2.

Fig. 4



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UNITED STATES PATENT OFFICE.

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SURFACING MACHINE AND SURFACING TOOL.

Application filed August 26, 1924. Serial No. 734,231.

This invention relates to improvements in surfacing machines and the object thereof is to provide an improved surfacing tool which will produce a more even surface upon the work and which will also be self-clearing of the material which is removed from the surface of the work.

The invention more particularly relates to improvements in abrading or polishing tools for wood surfacing machines, such as, floor surfacing machines. Usual surfacing machines are of two types, those having cylindrical abrading or surfacing tools in which the periphery of the rotating cylinder engages the work, and those having abrading or surfacing tools in the form of disks, the flat faces of which engage the work. The operation of machines of the cylinder type is objectionable for the reason that the abrading cylinder contacts with the work in substantially a single line and the vibration of the cylinder toward and from the work causes the tool frequently to grind more deeply into the work in some places than others thereby leaving a rippled surface upon the work; or if the tool is not moved across the work with absolutely uniform speed the longer contact of the rotating surface with the work in one place than in another will cause the deeper grinding into the surface of the work, thus producing depressions which leave a more or less uneven surface.

In machines of the disk type the material which is moved from the surface of the work by the abrading action together with such quantity of abrasive as gradually wears from the tool accumulates beneath the disk and renders the tool more or less ineffective particularly where the tool is used upon soft material such as wood in which a considerable amount of abraded material accumulates beneath the disk.

The principal object of the present invention is to avoid these objections and this is accomplished by providing a rotatable abrading tool having a conoidal work-engaging face and by providing the grinding machine with means for causing a narrow sector of the tool to engage the surface of the work. As this conoidal tool is rotated about the axis of the cone the peripheral speed of movement of successive elements upon the work-engaging face increases from the center or axis toward the periphery and as the force with which the tool is caused to engage the work is distributed over this sector, parts of which are moving at different relative speeds, the tool is prevented from the digging in resulting from vibration of the machine or uneven movement thereof across the work. Thus these objectionable features of the cylindrical type of tool are avoided.

By reason of the fact that but a narrow sector of the tool engages the work, the material which is removed by abrasion beneath this sector is discharged into the space between the remainder of the tool and the work and a great deal of it is discharged from the field of the tool by centrifugal action and none of it is enabled to accumulate in such a manner as to interfere with the proper engagement of the working face of the tool with the work. Furthermore, as the abrading elements of the work-engaging face of the tool are removed from engagement with the surface of the work during rotation of the tool any material which may have adhered to the abrading surface will drop off or be thrown off before this particular portion of the surface again engages the work. Thus the work-engaging face of the tool remains clean and fresh and the efficiency of the tool is therbey greatly increased.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which,

Fig. 1 is a side elevation of a surfacing machine embodying the invention, a portion of the frame, the rotatable actuating member for the tool and a portion of the tool being shown in vertical section;

Fig. 2 is a view, partially in transverse section, of the grinding machine illustrated in Fig. 1 showing particularly the manner in which a narrow sector of the tool is held in engagement with the surface of the work;

Fig. 3 is a plan view of the surfacing tool showing in dotted lines an exaggerated illustration of the narrow sector which engages the work; and,

Fig. 4 is a detail vertical sectional view of a portion of the body of the abrading tool with a sheet of abrading material secured thereto by a clamping band embodying the present invention.

The grinding machine which is illustrated herein is substantially identical in general construction with the grinding machine disclosed in my prior application Number

676,069, filed November 21, 1923. The surfacing machine comprises a base 1 having at its front end a downwardly projecting flange 2 preferably of substantially semi-circular form, the flange desirably having slightly converging extensions 3 and 4 extending nearly to the front end of the base and providing a housing for the power transmitting mechanism which will hereinafter be more fully described. The rear end of the base is provided with an upwardly extending standard 5 having a forwardly extending peripheral flange 6 which provides a hood or housing for the power transmitting mechanism. The standard has a rearwardly extending boss 7 provided with a screw threaded socket 8 to receive the end of a preferably tubular handle member 9 for steering the surfacing machine.

The under face of the base is provided with a downwardly extending boss 10 in which a stub shaft 11 is rigidly mounted and upon which a power transmitting pulley 12 is rotatably mounted. The lower end of the stub shaft 11 is provided with an enlarged head 13 which engages a shoulder upon the under surface of the hub of the pulley and the stub shaft 11 is provided at its upper end with a screw threaded extension 14 of smaller diameter than that of the stub shaft which passes through the boss 10 and base 1 and is secured rigidly in place by a nut 15. The lower end of the hub of the pulley is of spherical form and the web of the pulley is provided with apertures 16 to receive suitable studs which extend upwardly from the upper face of the abrading tool. The rotatable pulley 12 desirably is provided with a preferably V-shaped groove to receive a round driving cable or belt 17 which passes over suitable guiding pulleys 18 and a similarly grooved pulley 19 which is fixedly secured upon the shaft 20 of an electric motor 21 which is supported upon the base 1 of the machine. In order to take up the slack in the driving belt the motor desirably is so mounted as to be adjustable relatively to the base.

In the preferred construction illustrated one of the sides of the base is provided with an upwardly extending boss or ear 22 in which a pintle 23 is mounted and upon which the ears 24 of a platform 25 are pivotally mounted. The base 26 of the motor frame is secured by suitable screws or bolts to the platform 25. The opposite end of the platform is provided with an extension 27 in which an adjusting screw 28 is seated. The lower end of the adjusting screw abuts against the upper face of the base. By unscrewing the adjusting screw 28 platform, and the motor which is secured thereto, may be lowered relatively to the base, thus enabling the driving belt to be readily placed upon the driving pulley 19 of the motor, the guide pulleys 18 and the power transmitting pulley 12, and then by actuating the screw 28 in the opposite direction the platform 25 may be raised relatively to the base until the proper tension is placed upon the belt. As the belt stretches further actuation of the screw 18 will take up the slack in the belt, thus enabling the driving mechanism for the tool to be easily maintained in a condition of maximum efficiency.

The relative size of the motor pulley 19 and the power transmitting pulley 12 may be such as to enable the tool to be driven directly from the motor through the mechanism described at the desired speed without the necessity of interposition of numerous reducing gears as in usual constructions Obviously any desired speed of rotation of the surfacing tool may be obtained by supplying pulleys of properly proportioned size.

The rear end of the base of the machine desirably is supported upon wheels to enable it to be guided properly. As illustrated a pair of wheels 29 are rotatably mounted upon an axle 30 which is carried by arms 31 of a yoke-shaped bracket having a transverse connecting bar 32, the upper ends of the arms 31 of the bracket being pivotally mounted upon studs 33 secured to the front portions of the flanges 3 and 4. Rack bars 34 pivotally mounted to the arms 31 of the wheel-supporting bracket, are provided with teeth 35 adapted to engage the front end 36 of the base 1. Thus by raising or lowering the base 1 until the proper tooth 35 is engaged with the end 36 of the base the rear end of the frame may be held in any desired position to cause the tool properly to engage the work and also to provide for tools of different thickness.

The surfacing tool which constitutes the principal feature of the present invention comprises a disk-like body portion 37 which may be made of wood, or any other suitable material, provided with a conoidal work-engaging surface 38. The peripheral wall 39 of the tool desirably is of circular form and tapers slightly outwardly from the periphery 40 of the work-engaging surface of the tool. The upper surface 41 of the tool desirably is flat, but provided centrally with a spheroidal socket 42 to receive the spheroidal end of the hub of the rotatable power transmitting member or pulley 12. Where the body 37 of the surfacing tool is of wood or similar soft material an anti-friction bushing 43 of metal desirably is provided. A metal stud or preferably a pair of metal studs 44 extend upwardly from the upper face of the surfacing tool usually through the aperture 16 in the rotatable driving member or pulley 12, thus establishing a driving connection between the rotatable driving member and the tool which will cause the tool to rotate with the

driving member or pulley. The universal connection, however, between the end of the pulley hub and the tool will permit the tool to rock freely in any direction.

Suitable means are provided for forcing the surface of the conoidal face of the tool into engagement with the work-supporting surface. This is conveniently accomplished by mounting a wheel or roller of proper diameter upon the frame in such a manner that the cylindrical periphery of the wheel will engage the upper face of the tool at a distance from the axis thereof and preferably adjacent to the periphery of the tool.

In the particular construction illustrated the pressure wheel 45 is mounted upon a stub shaft 46 which is screwed into the downwardly extending flange 4 of the base, the wheel being of such diameter that the portion of the tool 47 between the apex of the conical surface and the periphery immediately beneath the wheel is retained in a horizontal position. Theoretically the contact thus caused between the portion 47 of the tool and the surface of the work is a line, but where a slightly conoidal tool such as that illustrated is employed the area of contact is in the form of a sector 47 as is shown in exaggerated illustration in Fig. 3.

Any suitable tool formed of abrading or polishing material or presenting a surface of abrading or polishing material may be employed. In surfacing wooden floors the tool usually preferably comprises a body portion of wood having a facing of sand paper, cloth, or other suitable abrading or polishing material.

Another feature of the invention consists in providing means for detachably securing a sheet of abrading or polishing material upon the body of the tool, the means for thus securing the sheet upon the tool preferably being adapted to tension the sheet upon the face of the tool. In the preferred embodiment of the invention illustrated a sheet of sand paper 48, cloth, or other suitable material, of considerably greater diameter than the diameter of the face of the polishing tool is employed. The edge portion 49 of the sheet is carried up around the circular peripheral surface of the body and is clamped thereupon by a ring 50 of sufficient diameter to fit upon the circular peripheral surface of the tool. Desirably the ring 50 is of resilient material and is provided with slots 51 extending from its upper edge part way across the ring, thus providing a series of resilient tongues 52 which, when the ring is forced upon the body of the tool with the extended portion 49 of the sheet therebetween, will tightly clamp the sheet upon the tool and as the ring is forced into position will stretch the sheet tightly over the conoidal face of the tool.

In the operation of the device power is transmitted from the motor shaft through the pulley 19 and the belt 17 to the pulley 12, thus rotating the latter and consequently rotating the tool which is connected therewith by the lugs 44 which enter the slots 16 in the pulley. The tool is thereby rotated and the abrading face of the tool caused to engage the work through the sector 47 as above described. The machine is moved over the work by the operator pushing or pulling upon the handle 9. As the tool rotates, the material which is abraded from the surface of the work together with any dust or débris which may be present upon the surface of the work is delivered at the rear of the sector into the space 53 which intervenes between the under face of the tool and the work since the narrow sector of the face of the tool is the only portion thereof which is in engagement with the work. Thus the tool automatically discharges the abraded material and débris as the machine is passed over the work. Centrifugal action also serves to disengage any particles which may adhere to the abrading surface of the tool so that as the successive elements of the tool again engage the work they are clear of all such débris and operate at their maximum efficiency. Furthermore, the present invention prevents any accumulation of material beneath the tool which will interfere with the proper operation thereof.

Inasmuch as the surface speed of the elements composing the working surface of the tool travel at different speeds in proportion to their distance from the axis of the tool, the tool is prevented from digging in by reason of vibration or by reason of unequal rate of movement over the work and the surface which is produced by the tool is smooth and free from ripples and other imperfections which characterize the work of other surface machines of the types above described.

It will be understood that the particular embodiment of the invention disclosed herein is of an illustrative character and is not restrictive and that various changes in form, construction and arrangement of parts may be made within the scope of the invention, and that the tool may itself be formed of any suitable material and may be of any desired form of construction either integral or sectional and that any desirable conicity may be provided for the working face of the tool within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A surfacing machine comprising a rotatable surfacing tool presenting a conoidal work-engaging face, actuating means having a universal connection to said tool and means acting upon said tool at a distance

from its axis to force a narrow sector of the work-engaging face of the tool into engagement with the work.

2. A surfacing machine comprising a frame, a motor mounted thereupon, a vertical stub shaft extending downwardly from said frame, a rotatable member mounted upon said stub shaft, means for transmitting rotation thereto from said motor, a surfacing tool presenting a conoidal work-engaging surface having a universal connection relatively to said stub shaft and provided with means engaging said rotatable member and a pressure wheel mounted upon said frame engaging said tool at a distance from its axis and operable to force a narrow sector of the work-engaging face of said tool into engagement with the work.

3. A surfacing machine comprising a supporting frame, a motor mounted thereupon, a vertical stub shaft extending downwardly from said frame and having a spheroidal end, a rotatable member mounted upon said stub shaft, means for transmitting rotation thereto from said motor, a surfacing tool presenting a slightly conoidal work-engaging surface and having upon its opposite side a spheroidal socket to receive the spheroidal end of said stub shaft and provided with studs engaging apertures in said rotatable member and a pressure wheel mounted upon said frame to rotate about an axis substantially normal to the axis of said stub shaft and engaging the peripheral portion of said tool, whereby a narrow sector of the work-engaging face of said tool will be forced into engagement with the work.

4. A rotatable surfacing tool presenting a slightly conoidal work-engaging face and having a circular wall expanding slightly from the periphery of the work-engaging face and a detachable clamping ring of resilient material fitting upon said circular wall and having slots extending from the upper edge thereof partway across said ring, whereby a series of resilient tongues are provided which are operable to clamp a sheet of polishing or abrading material upon said circular wall and to tension said sheet upon the conoidal face of the tool.

In testimony whereof, I have signed my name to this specification.

ROLAND CAVICCHI.