Nov. 2, 1937. A. DE MARCHI ET AL 2,097,655

SURFACE GRINDER

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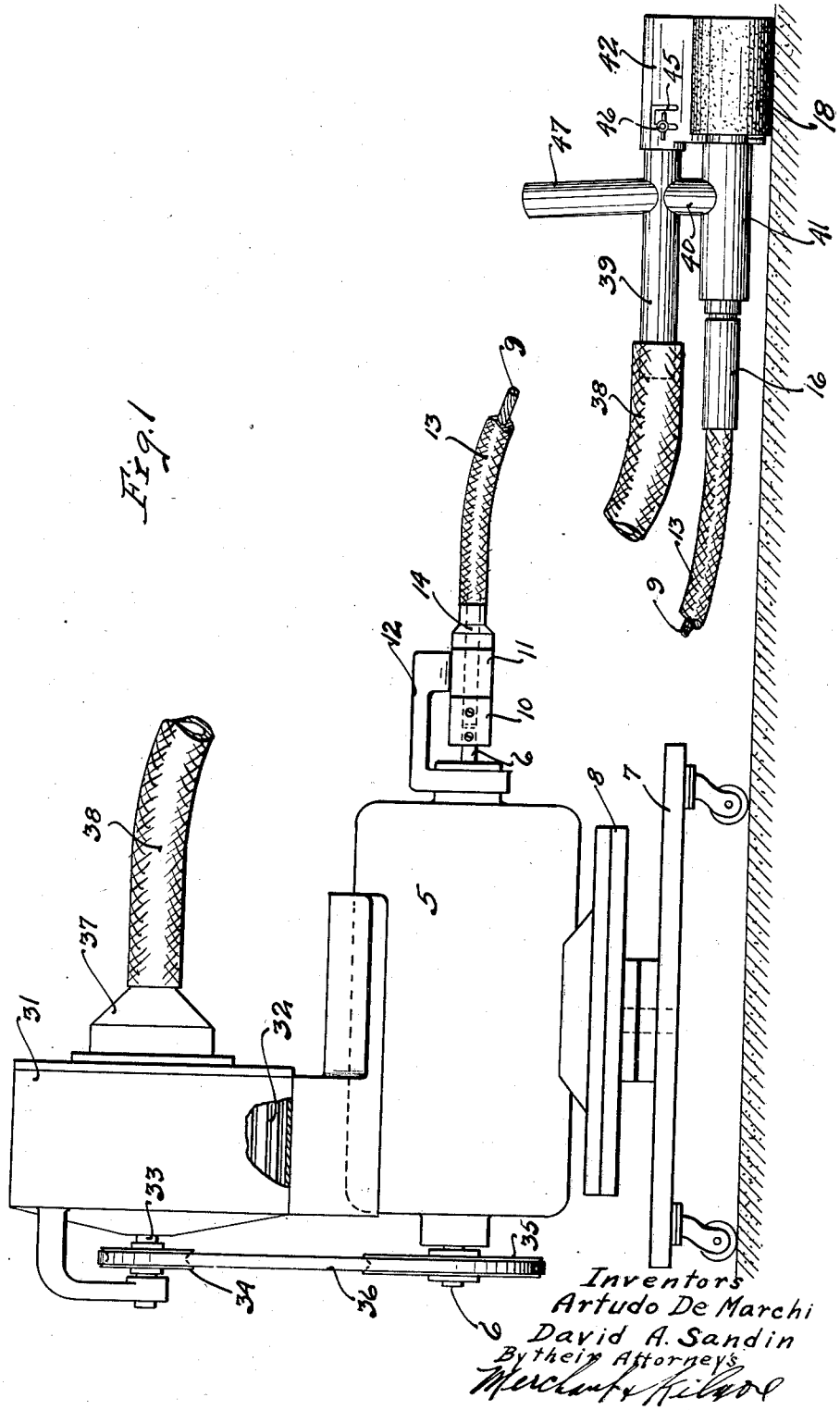


Fig. 1

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Fig. 2

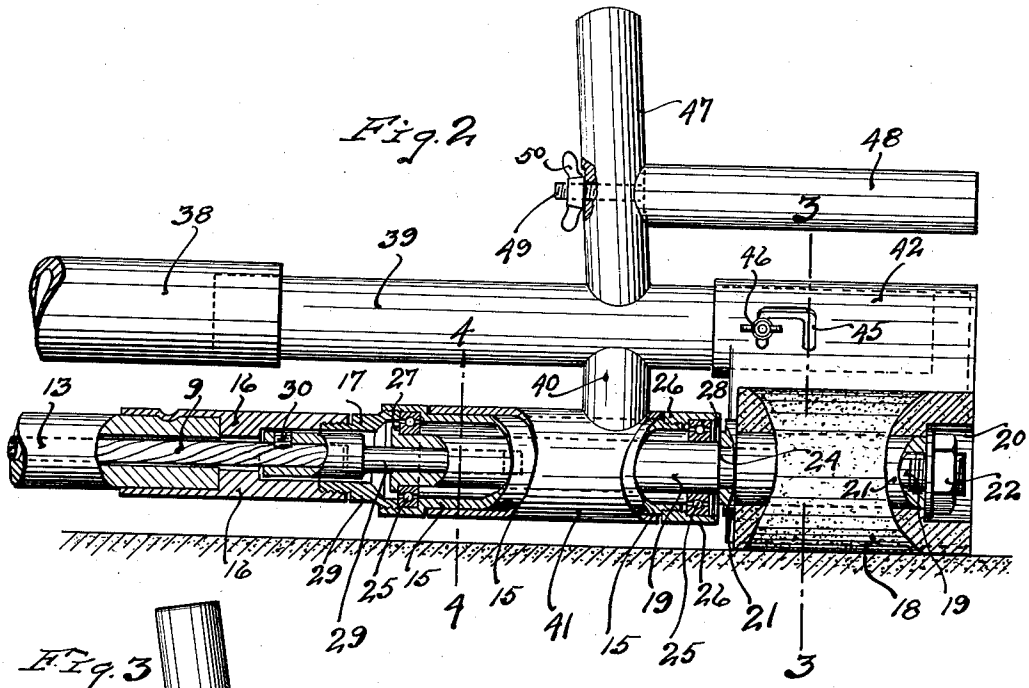



Fig. 3

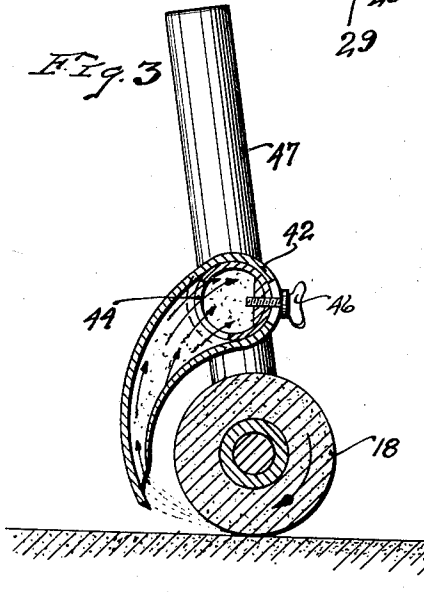
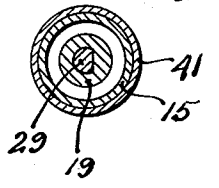



Fig. 4

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# UNITED STATES PATENT OFFICE

2,097,655

## SURFACE GRINDER

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Application January 16, 1937, Serial No. 120,922

9 Claims. (Cl. 51—170)

This invention relates to surface grinding machines such, for example, as used in finishing floors, walls, and the like laid in terrazzo or similar materials. Particularly the invention provides an improved grinding machine for simultaneously grinding, collecting and carrying away the dust produced in the grinding and finishing action in the carrying out of grinding or finishing under the dry process as distinguished from the wet process, where water is employed in the grinding action.

Generally stated, the invention consists of the novel devices, combinations of devices, and arrangement of parts hereinafter described and defined in the claims.

In a sense the present invention is in the nature of an improvement on or a modification or refinement of the device or machine disclosed in the De Marchi Patent No. 1,936,449, issued of date November 21, 1933, and entitled "Terrazzo grinder".

In the accompanying drawings, there is illustrated a commercial form of the improved grinder which embodies what is at present considered the most approved form or embodiment of the invention.

Referring to the drawings, wherein like characters indicate like parts throughout the several views:

Fig. 1 is a side elevation, with some parts broken away, showing the complete grinding machine;

Fig. 2 is an enlarged view partly in side elevation, but partly in vertical axial section, showing the grinding and suction head portions of the improved machine, some parts being broken away;

Fig. 3 is a section taken on the line 3—3 of Fig. 2; and

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

The power device illustrated and preferably employed is an electric motor, the fixed or body portion of which is indicated by the character 5 and the rotor shaft thereof by the character 6. This motor may be supported in various ways but preferably and, as shown, is mounted on a truck-like carrier 7, through the intervention of a turntable structure 8. As a means for transmitting power from the rotor of the motor to the grinding tool or wheel, a flexible transmission shaft 9 is connected to the rotor 6 of the motor by a suitable coupling such as that indicated at 10. At a point close to the coupling 10 the shaft 9 extends through and is journaled in a non-rotary bearing 11 that is rigidly connected to the fixed part of the motor frame 5, by a yoke 12 or other suitable means.

The extended portion of the flexible shaft 9 is extended through and journaled in a flexible casing 13, one end of which is anchored to the fixed bearing 11 by a suitable coupling, such as that indicated at 14. The flexible shaft 9 and flexible casing 13 are of well-known commercial form, and hence, the details thereof require no further explanation. The length of the said elements 9 and 13 may vary to suit the requirements of any particular work. At its extended end the casing 13 is coupled to a bearing tube 15 which, by movements of the flexible casing, is made portable and capable of large range of shifting movement, not only with, but irrespective of movements of the motor. In accordance with this invention the connection between the free or extended end of the casing 13 and the bearing tube 15 is made as follows: a metallic end tube 16 is clinched or otherwise secured to the end of the casing 13, and has screw-threaded engagement with an intermediate tubular coupling 17 which, in turn, has screw-threaded engagement with the somewhat enlarged rear end of the bearing tube 15.

The grinding wheel or tool shown is illustrated as and may be assumed to be a carborundum wheel 18 of drum-like form that is detachably secured to a driving spindle 19. This grinding wheel, at one end, has an enlarged recess 20 and in its bore there is inserted a metallic bushing 21 which, in turn, is directly mounted on the somewhat reduced outer end of the spindle 19. By means of a nut 22 applied to the outer end of the spindle 19, the inner end of grinding wheel 18 will be tightly pressed against shoulder-forming rib 23 of the bushing, and the bushing will be pressed against a shoulder 24 of the spindle 19.

The spindle 19 extends through and is journaled within the bearing tube 15, by suitable means such as ball bearings 25. The fixed elements of the outer end of the ball bearing devices 25 are directly applied in a collar 26 that is screwed onto the adjacent end of the bearing tube 15. The fixed element of the inner end of ball bearing device 25 is applied in the somewhat enlarged end of the bearing tube 15 and is clamped between the coupling element 17 and the adjacent shoulder of said tube. At its inner end the spindle 19 has an outstanding flange 27 against which the rotary element of the inner end ball bearing device 25 engages. Of course, the rotary elements of the ball bearing devices 25 are rigidly applied on the spindle 19 for rotation

therewith. The bearing tube 15 is intended to contain grease or lubricant, and hence, its outer end is shown as closed against the leakage of grease, by a washer 28.

The extended end of the flexible shaft 9 is passed from the flexible casing 13 proper into the end or terminal tube 16 of said casing, and its end is coupled to the wheel spindle 19 for rotation of the latter and of the grinding wheel, by means of a coupling in the form of a rigid metallic terminal shaft 29. This shaft 29 is formed with a socket into which the end of the flexible shaft 9 is telescoped and there secured by a set-screw 30 or some other suitable means. The reduced end of the shaft 29 is angular in cross-section and is telescoped into a correspondingly formed axial seat of the spindle 19. In this way the flexible shaft and wheel spindle 19 are connected for common rotation under power transmitted from the motor, and wear or any slight axial movement of the connected parts is compensated for by possible sliding movements of the shaft 29, in respect to the spindle 19.

As already indicated, means is provided for picking up the dust produced by the grinding wheel and conveying the same to a suitable point of discharge. As a most efficient means for accomplishing this result, there is provided a suction fan mounted on the motor frame. This suction fan may be of any approved or suitable type and, as shown, consists of a fan casing 31 directly secured on top of the motor frame and provided with a discharge spout 32 that may lead to any suitable point or place of discharge, either at the exterior of the room or to a dust-collecting bag, such as frequently employed for similar purposes. The rotor shaft 33 of this suction fan is shown as provided with a pulley 34, over which, and a pulley 35 on the motor shaft 6, runs a driving belt 36. The axial intake 37 of this fan is connected to a flexible air tube 38, the extended end of which is connected to a metallic suction tube 39.

This suction tube 39 extends parallel to the common axis of the elements 15—19 and by a coupling, preferably in the form of a short tube 40, is spaced from but rigidly connected to a long sleeve 41 that is journaled on the bearing tube 15 and is held against axial movements between the end tube 26 and a shoulder of the tube 15. Adjustably mounted on the front end of the suction tube 39 is a suction-acting nozzle 42, the sleeve-like upper portion of which quite closely fits the projecting end of the tube 39 and the depending portion of which is of segmental form and provided, at its extreme lower edge, with a long intake port 43 that is adapted to be positioned close to the floor and close to the grinding surface of the wheel 18. The suction nozzle 42, at its outer end, is entirely closed by an end wall and at its inner end, it is closed, except for the passage that permits the same to be telescoped onto the tube 39. By reference to Fig. 3, it will be noted that the tube 39 is provided with a segmental port 44 that opens the nozzle always to the interior of the tube 39, irrespective of its various adjustments.

For holding the nozzle in its different adjustments, it is shown as provided with a channel-shaped slot 45 through which a cap screw 46 is passed into threaded engagement with the tube 39.

By reference to Fig. 2, it will be noted that the distance between the parallel end portions of the slot 45 are spaced approximately the distance represented by the length of the recess 20 in the outer end of the grinding wheel 18. In practice, it is found that the reduced outer end portion of the grinding wheel will sometimes be broken off, thereby shortening up the grinding wheel to the extent represented by the depth of the recess 20. When the grinding wheel is complete, the adjustment of the nozzle 42 will be as shown in Fig. 2, but if the reduced end of the grinding wheel be broken off, as above indicated, then the nozzle will be slid toward the left, in respect to Fig. 2, to a position in which the screw 46 will be in the right-hand prong of the slot 45. It will be further noted that when the nozzle is adjusted with the screw in either one of the prongs of the slot 45, the nozzle is capable of oscillatory adjustments to properly position the same in respect to the grinding wheel.

The body of the tube 39 affords a handle that may be readily gripped by one of the hands of the operator, while the other hand is engaged with an extended handle piece 47 that is rigidly secured to the tube 39 and radiates therefrom. When the device is thus held by the two hands, it is evident that the grinding wheel can be moved over the floor or other surface, at will, and by oscillatory movements, the nozzle can be held in proper position, in respect to the floor or surface being ground.

Of course, the flexibility of the driving shaft and its casing permit the grinding wheel to be moved over considerable surface without imparting movement to the motor and its truck. The motor and the truck are always free to follow the grinding wheel under pulling action produced through the flexible connections; and with the motor mounted on a wheel truck, the travelling movements of the latter are very easily accomplished. However, with the turn-table connection between the motor and the truck, it is possible, without producing any turning movements of the truck itself, to cause the motor to follow the grinding wheel in making complete travelling movements of the grinding wheel around a circle; and from this point of view, the pivotal or turn-table connection between the truck and motor, and parts supported therewith, has, in practice, been found highly important.

The improved device is not only of simple construction, strong and durable, but is capable of the various required manipulations performed with the greatest ease and work-producing accuracy, both on floors, walls, coves, cornices, ceilings and the like.

From the foregoing, it will be understood that the preferred form of the device illustrated in the drawings is capable of modification within the spirit of the invention herein disclosed and claimed.

In practice we have found that for some work it is highly desirable that very considerable pressure be produced on the grinding wheel. To provide convenient device for manually accomplishing this pressure, there is provided an auxiliary or additional handle 48 spaced from but located just above the nozzle 42 and provided with a threaded stem 49 passed through a perforation in the hand piece 47 and provided with a nut 50. This auxiliary handle 48 may be applied, as shown in Fig. 2, it may be reversed and applied in the opposite direction over the body of the suction tube 39, or it may be entirely removed. It should be either removed or reversed, as in-

dicated, whenever the grinding wheel has to be passed under an object that would be engaged if the said hand piece 48 be applied, as shown in Fig. 2.

What is claimed is:

1. In a device of the kind described, a truck, a motor mounted on said truck for horizontal swivelling movements, an extended flexible transmission shaft driven from said motor, a grinding wheel connected to and driven from the extended end of said flexible shaft, a suction fan mounted on said motor for oscillatory movements therewith, means driving the rotor of said fan from the rotor of said motor, a suction tube associated with the extended end of said transmission shaft and connected to the intake of said fan, by a flexible air tube, and a nozzle head swivelled to the end of said suction tube and closely associated with said grinding wheel.

2. In a device of the kind described, a rotary motor, a rotary suction fan mounted on and driven from said motor, a flexible tubular casing anchored to and extended from the frame of said motor, a bearing tube connected to the extended end of said casing, a grinding wheel having a spindle journaled in said bearing tube, a flexible shaft extended through said flexible casing and having one end connected to the rotor of said motor and its extended end connected to the spindle of said grinding wheel, a sleeve mounted on said bearing tube for oscillatory movements, a suction tube extended parallel to but spaced from and rigidly connected to said sleeve, a flexible air tube connecting said suction tube to the intake of said fan, and a nozzle head applied to the end of said suction tube and closely associated with said grinding wheel, said nozzle head being mounted on said suction tube for oscillatory adjustments toward and from said grinding wheel.

3. The structure defined in claim 2 in which said suction tube serves as one hand piece and is provided with a radially extended arm that affords another hand piece.

4. The structure defined in claim 2 in which said grinding wheel is of drum-like form having an enlarged recess at its outer end, and said spindle is provided with a nut located within said recess, and in which said nozzle head is mounted on said suction tube for oscillatory and axial adjustments, said nozzle head having a sleeve-like portion formed with a channel-shaped slot and said suction tube having a clamping bolt working in said slot, the extremities of said slot being circumferential of said tube and being spaced approximately the axial depth of the enlarged recess in the end of said grinding wheel.

5. The structure defined in claim 2 in which the suction tube is provided with an auxiliary handle spaced from but applied over said nozzle head.

6. The structure defined in claim 2 in which the suction tube is provided with an upstanding handle and with an auxiliary hand piece applied to the latter in a position spaced above but overlying said nozzle head.

7. The structure defined in claim 2 in which the suction tube is provided with an upstanding handle and with an auxiliary hand piece applied to the latter in a position spaced above but overlying said nozzle head, said auxiliary handle having a nut-equipped stem passed through a perforation in said upstanding handle and thereby made removable and reversible.

8. The structure defined in claim 2 in which said nozzle head is also mounted for axial adjustments on said suction tube.

9. In a device of the kind described, a truck, an electric motor, the frame of which is mounted on said truck by a turn-table swivel, a flexible casing anchored to said motor frame and extended therefrom, a tubular bearing anchored to the free end of said casing, a grinding wheel having a spindle journaled in said tubular bearing, a flexible transmission shaft extended through said flexible casing with one end connected to the rotor of said motor and with its other end connected to the spindle of said grinding wheel for rotating said grinding wheel, in further combination with a suction fan mounted on the frame of said motor, means for driving the rotor of said fan from the rotor of said motor, a sleeve mounted on said bearing tube for oscillatory movements, a suction tube spaced from but rigidly connected to said sleeve, a flexible air tube connecting said suction tube to the intake of said fan, and a nozzle head swivelled to the end of said suction tube and closely associated with said grinding wheel.

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