June 7, 1955 C. L. OLSON 2,709,878

GROOVING MACHINE

Filed May 7, 1953 2 Sheets-Sheet 1

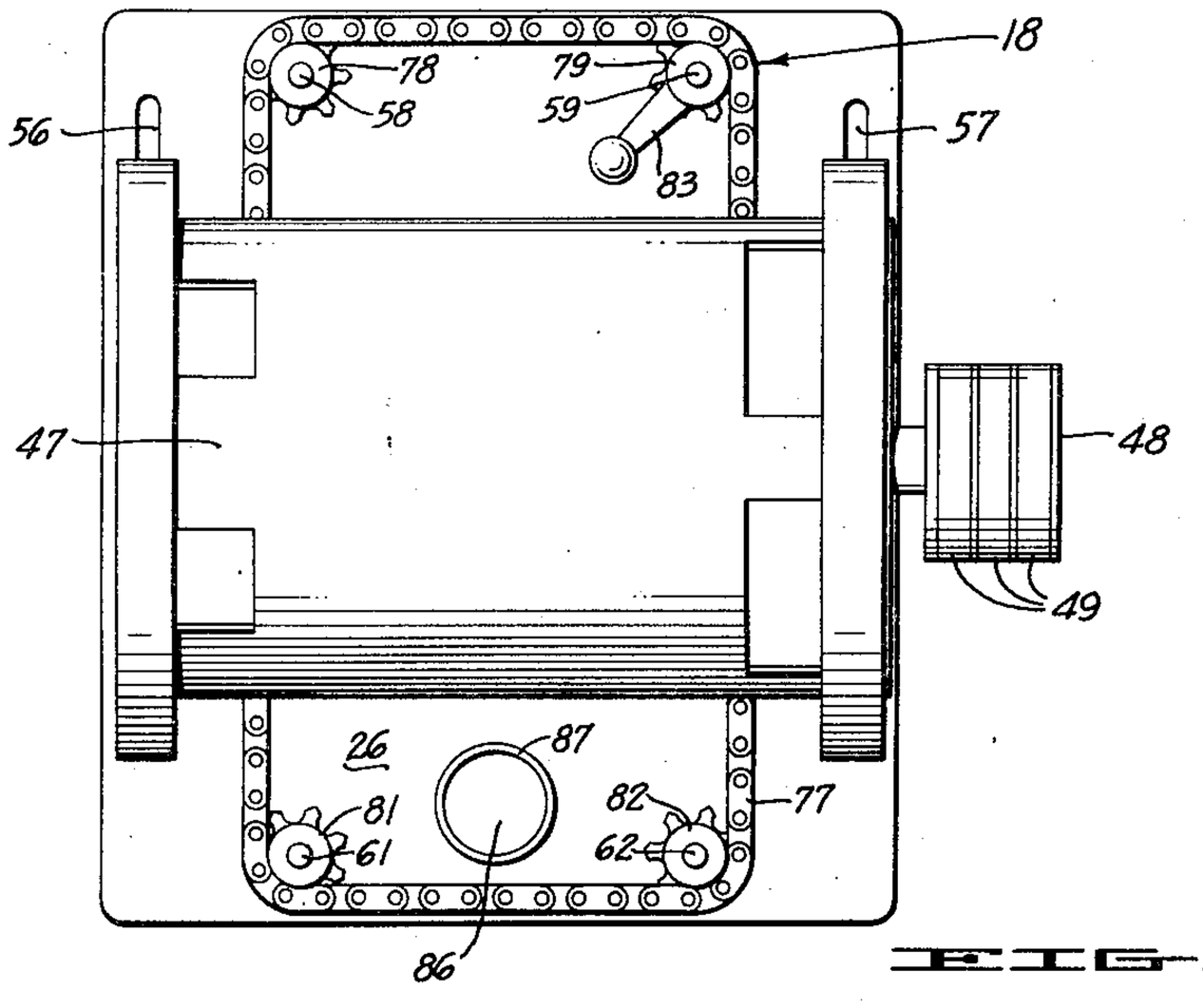

FIG. 1

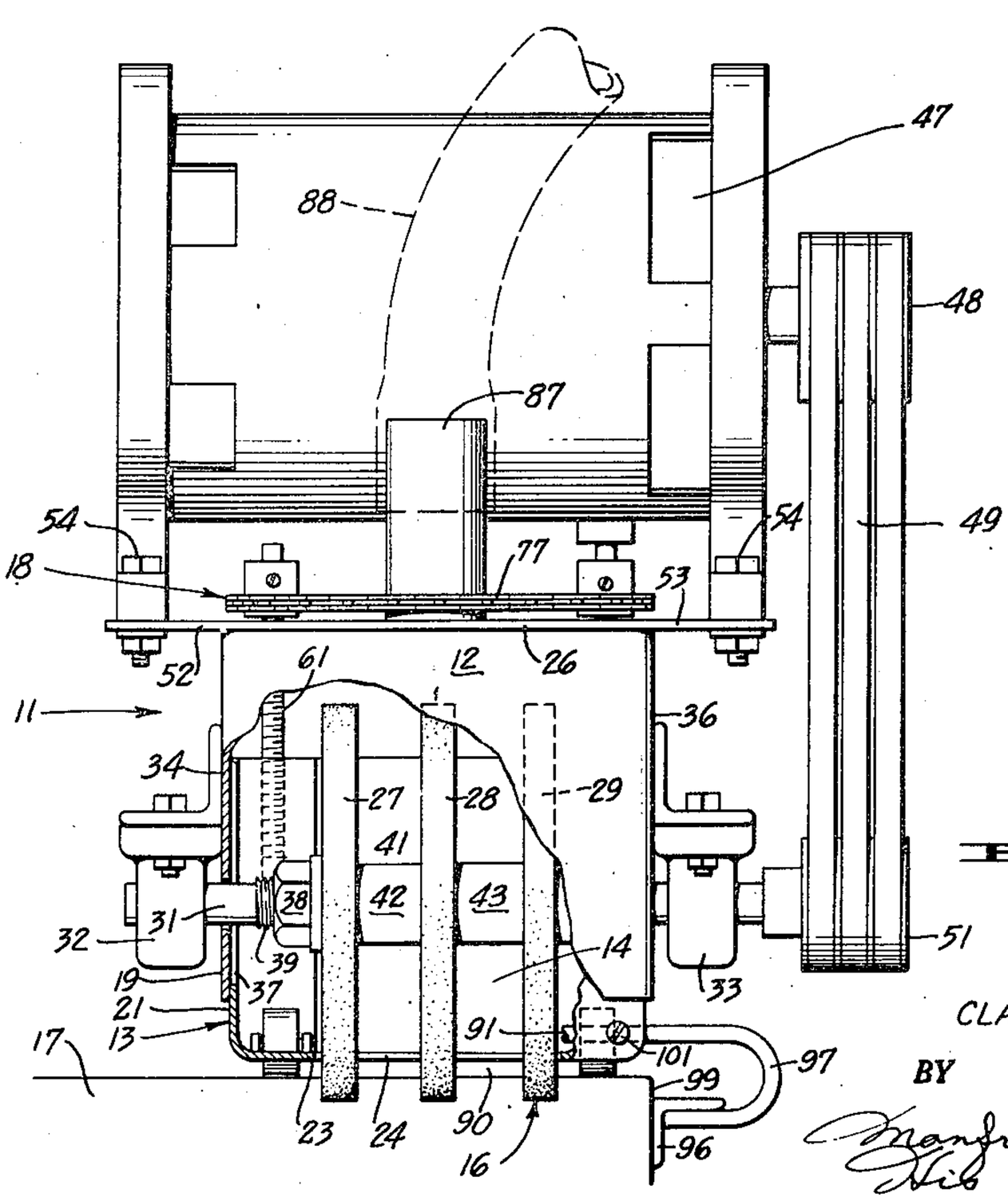

FIG. 2

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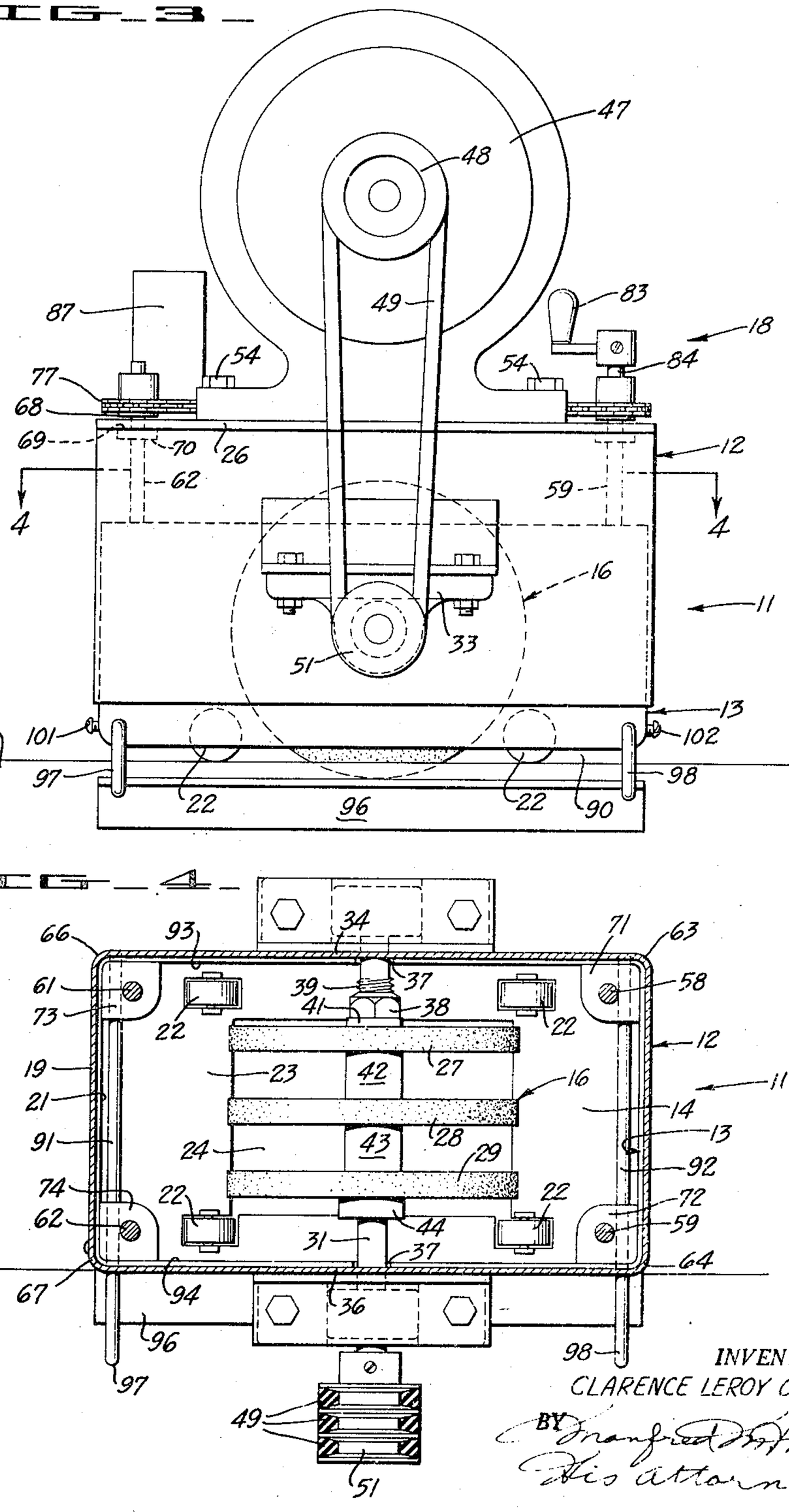
June 7, 1955 C. L. OLSON 2,709,878

GROOVING MACHINE

Filed May 7, 1953 2 Sheets-Sheet 2

FIG. 3



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GROOVING MACHINE

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5 Claims. (Cl. 51—176)

The invention relates to devices for forming grooves in floors, steps, stair treads, and other walking surfaces of various materials, for the inclusion in such grooves of ornamental and/or non-slip materials and compounds.

An object of the present invention is to provide a grooving machine, of the character described, which will be readily portable, self-contained and easily positionable upon and movable over the surface to be grooved, such as a step or other walking surface, and which will rapidly and cleanly cut a uniform groove at precise positions desired for insertion of a friction or an ornamental material in the groove to provide a non-slip or decorative area on the step or walking surface.

Another object of the present invention is to provide a machine of the character above, which may be easily and precisely adjusted at the end of each pass along the surface to be grooved to increase the depth of cut by the desired increment, and in which the groove cutting means may be rapidly removed to a safeguarded, protected position completely enclosed within the machine when the grooves are completed and the machine is ready to be moved on to the next step or to remove it from the job.

A further object of the present invention is to provide a machine of the character described having an improved casing construction providing, for the cutting means, an enclosed work chamber which is vertically extensible to afford the adjustments above noted and which may be conveniently evacuated by suction means so as to remove dust and grit generated by the cutting means, in the interests of providing increased comfort and good, clean breathing air for the operator and cleanliness of the premises.

Yet another object of the present invention is to provide a machine, of the character described, which combines sturdy and simply formed mechanisms in a unitary assembly of high strength and rigidity and of lightness of weight for easy portability.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following descriptions of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a top plan view of a grooving machine constructed in accordance with the present invention.

Figure 2 is a side elevational view of the machine of Figure 1 with portions broken away and shown in section to reveal the internal structure of the machine.

Figure 3 is an end elevational view of the machine.

Figure 4 is a plan sectional view of the machine taken substantially on the plane of line 4—4 of Figure 3.

The grooving machine of the present invention, and as illustrated in the accompanying drawings, consists briefly of a body or casing 11 adapted for positioning on and movement over the surface to be grooved (here step 17) and composed of relatively movable upper and lower sections 12 and 13 cooperating to define a vertically expansible work chamber 14 opening at its bottom to the step 17 and in which is positioned a rotary grooving means 16, carried by the upper section 12 for movement therewith upon relative displacement of the sections so as to extend through the bottom of the casing and into cutting engagement with the step 17 being grooved, the relative displacement of the sections being effected by a manually operable means 18 mounted on the casing. In accordance with the present invention, the casing sections 12 and 13 are provided with interfitting side walls 19 and 21, here of rectilinear form, which are slidably engaged with each other to permit vertical telescopic movement between the sections, while maintaining a substantially sealed condition of the chamber 14.

As here shown, the lower casing section 13 is formed with a horizontal bottom wall 23 having an opening 24 formed therein in registry with the rotary grooving means 16 to permit extension of the latter therethrough and into cutting engagement with the step 17 upon the above described telescopic movement of said sections. A plurality of rollers 22 are journalled to the section 13 and protrude through the bottom wall 23 and into supporting engagement with the step 17 to facilitate movement of the machine thereover. As may best be seen in Figure 2 of the drawing, the upper casing section 12 is proportioned so that its side wall 19 encompasses the lower section side wall 21, and is provided with an integral top plate or horizontal top wall 26 from which the side wall 19 depends.

The rotary grooving means 16 preferably consists of one or more circular cutting disks, here provided in the form of grinding wheels 27, 28 and 29, which are mounted in parallel spaced arrangement on a shaft 31 extending across the chamber 14 and journalled in bearings 32 and 33 secured to the external sides of opposed portions 34 and 36 of the side wall 19. As may be seen in Figures 2 and 4, the lower casing side wall 21 extends upwardly past the shaft 31 and suitable slots 37 are provided in the wall 21 to accommodate the relative movement of the shaft upon telescoping movement of the sections. The grinding wheels 27, 28 and 29 are secured to the shaft for rotation therewith and as here shown, a nut 38 is engaged with a threaded portion 39 of the shaft 31 and bears against a washer 41 abutting the outer side of the grinding wheel 27. Any desired spacing of the grinding wheels axially along the shaft 31 is accomplished by the provision of spacer sleeves 42 and 43 of the desired length mounted on the shaft between adjacent grinding wheels. Securing of the grinding wheels to the shaft is effected by clamping the wheels and spacer sleeves between the nut 38 and a suitable collar 44 formed on the shaft 31 in abutting engagement with the outer side of the grinding wheel 29. If desired, the grinding wheels may be additionally held against rotational slipping on the shaft by splining or keying the wheel hubs to the shaft.

Motor means for driving the shaft 31 and associated grinding wheels is here provided by an electric motor 47 carried on the top plate 26 of the upper housing section 12 and having its drive shaft connected by pulley 48 and belts 49 to a pulley 51 on the end of shaft 31. As will be noted, the motor 47 and the grinding means 16 are both carried by and supported on the upper casing section 12 and are movable upwardly and downwardly therewith as a unit, that is, with the motor and drive shaft at a constant spacing from each other. Take-up of any slack in the belt which may be caused by stretching or the like under long use is here conveniently effected by

securing the motor to overhanging portions 52 and 53 of the top plate 26 by means of bolts 54 passing through slots 56 and 57 formed in the top plate overhang at right angles to the shaft 31. In this manner, take-up of any slack in the belt 49 may be effected by merely loosening the bolts 54 and sliding the motor along the slots 56 and 57 until the slack is eliminated, whereupon the bolts may be retightened to hold the motor securely to the plate 26.

As an important feature of the invention, the above noted means 18 for accomplishing the telescoping displacement of the casing sections 12 and 13 is adapted to provide a straight up and down movement of the upper section 12, whereby the telescoping action is obtained without relative cocking or binding between the sections. In accordance with the present invention, the means 18 includes a plurality of vertically oriented and horizontally spaced screw members 58, 59, 61 and 62, which provide a threaded connection between the sections and which are jointly operable to provide the above described uniform telescoping displacement between the sections. The screw members are arranged in substantially evenly spaced positions along the side walls 19 and 21 to provide a substantially uniform weight distribution on each of the screw members. As here shown, the screw members 58 and 59, 60 and 61 are preferably mounted adjacent the corners 63, 64, 66, and 67 of the casing 11. Each of the screw members is journalled for rotation in the top plate 26 and is held against axial displacement relative thereto by a pair of confronting shoulders 68 and 69 provided on the screws on opposite sides of the plate 26. The screws extend downwardly through the chamber 14 and into threaded engagement with nut members 71, 72, 73 and 74 attached to the lower casing section side wall 21. The threads on all of the screws are of the same pitch and, accordingly, a simultaneous equal rotation of the screws will serve to raise and lower each portion of the upper section 12 by the same amount relative to the lower section 13.

Means is provided for interconnecting the screw members 58 and 59, 61 and 62 for the above described simultaneous equal rotation. As here shown, this means comprises a continuous roller chain 77 engaged around sprockets 78, 79, 81 and 82 secured to the upper ends of the screw members 58, 59, 61 and 62 respectively, externally of the plate 26. In this connection it will be noted that the sprockets many conveniently provide the shoulders 68 while the shoulders 69 may be provided by collars 70 formed on the screw members. Means for driving the roller chain 77 to effect simultaneous rotation of the screw members here consists of a manually engageable crank 83 secured to an upward extension 84 of one of the screw members, here screw member 59.

The above described structure of the casing 11 is designed to achieve a more efficient removal of dust and grit from the grinding wheels to prevent contaminating the air and dirtying the surrounding area. As shown in Figures 1, 2 and 3 an opening 86 is formed in the top plate 26 and is surrounded by an upwardly extending member 87 adapted for connection to a hose 88, leading to a suitable vacuum device (not shown). This vacuum device may be of any suitable form and good results can be achieved by the use of a centrifugal dust separator or even by a conventional vacuum cleaner. As will be noted from Figures 2 and 4 of the drawing, the opening 24 provided in the bottom wall 23 is only slightly larger than is necessary for passing the grinding wheels into their desired cutting engagement with the step 17. Also the bottom wall 23 of the casing is supported by the rollers 22 relatively close to the step 17 so that a confined passage 90 is provided under the wall 23 leading to the suction opening 24 and around the grinding wheels through which air is rapidly drawn to most effectively remove the grit and dust generated by the grinding action.

Another feature of the present device is the provision of improved guide means for use with the grooving machine when cutting grooves along the edge of a step, the guide means functioning to engage the edge of the step being grooved and to thereby precisely determine the positioning of the grooves on the step. As here shown, such means includes a pair of elongated members 91 and 92 slidably mounted for horizontal reciprocation through opposite portions 93 and 94 of the lower casing section side wall 21, see Figure 4. The members 91 and 92 are arranged in spaced parallel relation to each other and preferably pass through the lower casing section adjacent its opposite ends, as shown in Figures 3 and 4. The members 91 and 92 are also arranged in parallel relation to the shaft 31 and extend to the outside of the casing section 13 on the same side as the drive belts 49. An elongated guide member 96, here a length of angle iron, is affixed to the outer ends 97 and 98 of members 91 and 92 which, as may be seen in Figure 2, are bent in a U-shape so as to position the guide member 96 below the bottom wall 23 and rollers 22 in position for sliding engagement with the edge or vertical face 99 of the step 17. Setscrews 101 and 102 carried by sidewall 21 and bearing upon members 91 and 92 afford convenient means for adjustably fixing the position of guide member 96 for controlling the location of the cutting wheels on the step.

In operation the machine is positioned on the step or other surface to be grooved. Where grooves are to be cut in the tread of a step parallel to the edge of the step in the manner illustrated in Figure 2 of the drawing, the guide 96 is adjusted so as to locate the cutter wheels 27, 28 and 29 at the desired location on the top surface of the step. The suction hose 88 is connected to the fitting 87 and to a suitable vacuum source. The electric motor 47 is then energized and the crank 83 rotated so as to lower the grinding wheels through the open bottom of the casing and into contact with the surface of the step and to a depth into such surface desired for a first pass over the surface. The machine may then be easily moved by hand across the surface on the rollers 22 with the guide 96 maintained in contact with the face 99 of the step. Upon completion of the pass in one direction, lengthwise of the step, the crank may be rotated to further lower the rollers for a second pass. Several passes may thus be successively taken to obtain a desired depth of the groove. Meanwhile all of the grit and dust generated by the grinding operation is rapidly sucked away from the grinding area and through the chamber 14 and into the suction hose 88. The machine may be used for grooving all types of material into which the grinding wheels will cut when the machine is operated in the manner outlined above, and is especially effective on materials of the type commonly used in steps and flooring and including cement, terrazzo, marble, and the like. After forming of the grooves, as above described, they may be filled with a suitable friction non-slip material of a character providing good traction under foot or, alternatively, a material of contrasting color or texture to provide an ornamental and decorative effect.

I claim:

1. A grooving machine of the character described comprising, a casing adapted for positioning upon and for movement over a surface to be grooved and composed of upper and lower telescoping sections having side walls slidably engaged to define a vertically extensible chamber opening at its bottom to said surface, rotary grooving means carried by said upper section and movable therewith upon relative telescoping movement of said sections through the bottom of said chamber and into cutting engagement with said surface, means carried by said casing for connection to a suction device for evacuating said chamber, and manually operable means for effecting relative telescoping movement of said sections to control the depth of cut of said disk in said surface.

2. A grooving machine of the character described comprising, a casing adapted for positioning on a surface to be

grooved and composed of upper and lower telescoping sections having side walls slidably engaged to define a vertically extensible chamber opening at its bottom to said surface, rollers carried at the lower end of said lower section for supporting engagement with said surface to facilitate movement of said machine thereover, a cutting disk journalled for rotation by said upper section in position for extending through the bottom of said chamber for cutting engagement with said surface, a motor carried on said upper section and connected to said disk for rotation thereof, means carried by said casing for connection to a suction device for evacuating said chamber, and manually operable means for effecting relative displacement of said sections to control the depth of cut of said disk in said surface.

3. A grooving machine of the character described comprising, a casing including an upper section having a top wall and depending side wall and a lower section having a bottom wall and upstanding side wall telescopically engaged with said depending side wall, rollers carried by said bottom wall for supporting said machine upon a surface to be grooved for movement thereover, a shaft carried by said depending side wall within said casing, a motor carried by said top wall and connected to said shaft for effecting rotation thereof, a cutting disk carried by said shaft, said bottom wall being formed with an opening in registration with said cutting disk to permit extension of the latter therethrough into cutting engagement with said surface upon telescoping displacement of said sections, and manually engageable means for effecting said telescoping displacement.

4. A grooving machine comprising, a casing including an upper section having a top wall and depending rectangularly arranged side walls and a lower section having a bottom wall and upstanding rectangularly arranged side walls telescopically engaged with said depending side walls, rollers carried by said bottom wall for supporting said machine upon a surface to be grooved for movement thereover, a shaft carried by said depending side wall within said casing, a motor carried by said top wall and connected to said shaft for effecting rotation thereof, a cutting disk carried by said shaft, said bottom wall being formed with an opening in registration with said cutting disk to permit extension of the latter therethrough into cutting engagement with said surface upon telescoping displacement of said sections, a plurality of vertically disposed screw members positioned in the corners of said rectangular telescopically engaged side walls and connecting said sections and arranged upon rotation to effect said telescoping displacement of said sections, manually engageable means for rotating one of said screw members, and chain and sprocket means connecting said screw members for simultaneous rotation.

5. A step grooving machine comprising, a casing adapted for positioning upon for movement over a step to be grooved and including an upper section having a top wall and depending opposite side walls and a lower section having a bottom wall and upstanding opposite side walls telescopically engaged with said depending side walls to define a vertically extensible chamber, a shaft supported for rotation upon oppositely related side walls of said upper section in horizontally spanning relation across the interior of said chamber, a plurality of cutting disks carried by said shaft in axially spaced relation thereon and for rotation therewith, a motor mounted on said upper wall and connected to said shaft for effecting rotation thereof and said cutting disks, said bottom wall being formed with an opening in registration with said cutting disks to permit extension of the latter therethrough into cutting engagement with said step upon telescoping displacement of said sections, a plurality of screw members providing a threaded connection between said sections for effecting upon rotation said telescoping displacement and being arranged in substantially evenly spaced positions around said side walls, manually operable means for simultaneously rotating said screw members, a pair of elongated members slidably mounted for horizontal reciprocation through oppositely related side walls of said lower section and arranged in spaced parallel relation and parallel to said shaft, a guide member fixed to outer ends of said elongated members in perpendicular relation thereto exteriorly of one side of said casing and positioned below said bottom wall for engagement with an edge of said step, and means for fastening said elongated members to said lower section in adjustable positions for determining the position of said disks for grooving the step at desired distances from said step edge engaged by said guide members.

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