Oct. 20, 1942. L. R. WILLIAMS 2,299,198

GROOVING MACHINE

Filed Aug. 7, 1940 2 Sheets-Sheet 1

Fig. 1.

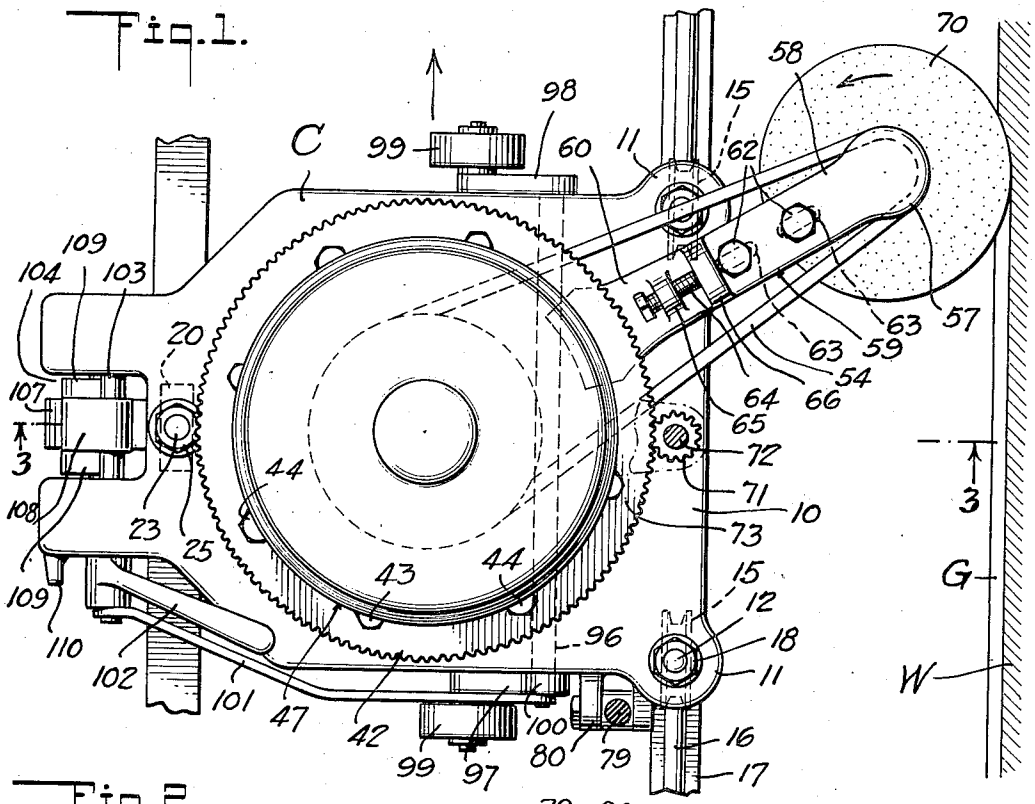
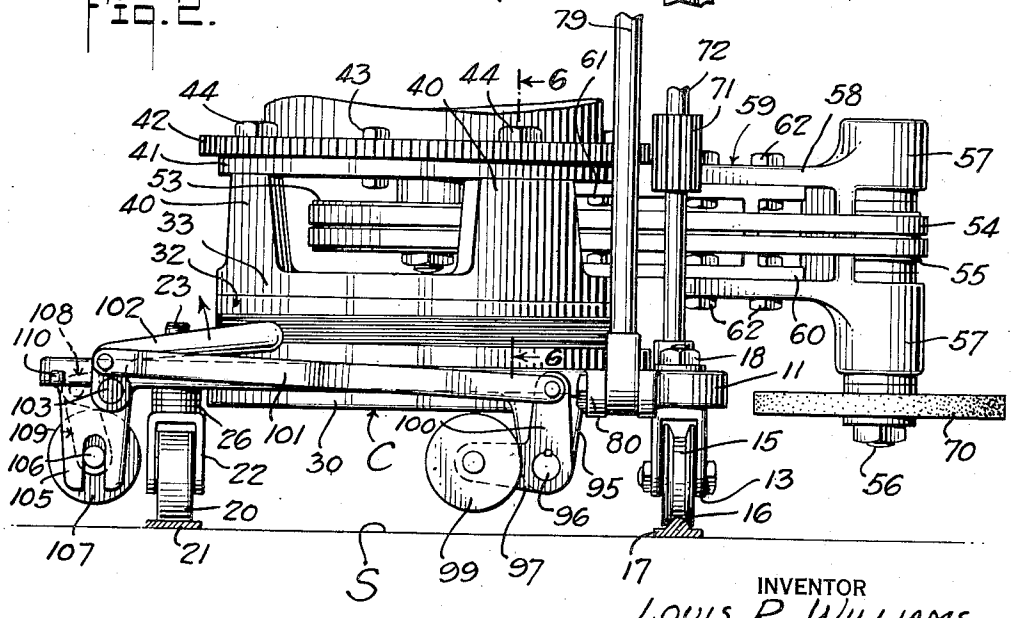


Fig. 2.



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Fig. 3.

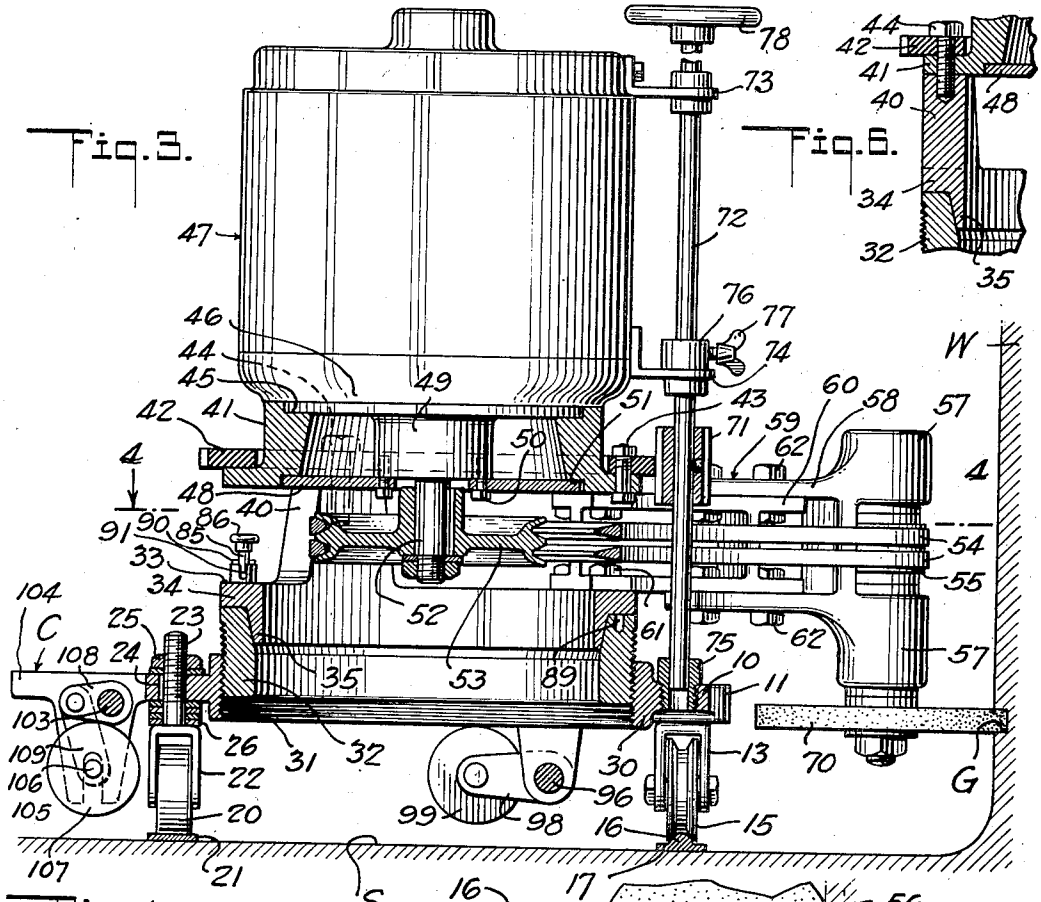


Fig. 6.

Fig. 4.

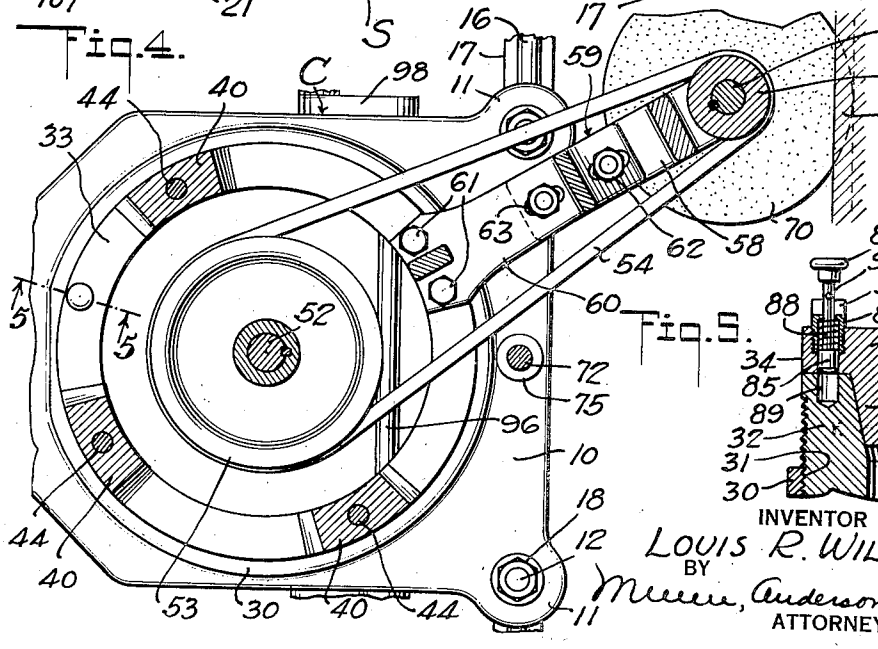


Fig. 5.

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UNITED STATES PATENT OFFICE

2,299,198

GROOVING MACHINE

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18 Claims. (Cl. 51—180)

This invention relates generally to the art of grooving surfaces of floors, walls and roofs of brick, cementitious and other materials for utilitarian and ornamental purposes.

An object of this invention is to provide a machine particularly adapted, although not necessarily for use in the forming of a groove or grooves in vertical surfaces such as parapet walls, fire walls, curtain walls, building walls and other walls above and adjoining floors and roofs, as well as sloping roof surfaces confronting oppositely sloping roof surfaces, such grooves when formed above a roof, being adapted to receive roof flashing and caulking materials to produce a watertight joint between the upper edges of the roofing materials under the flashing, and the adjoining wall or roof, as the case may be.

Another object of the invention is to provide a machine of the above described character which traverses a supporting surface such as a floor or roof while operating on a surface above the supporting surface by forming a groove therein which will be parallel to the line defining the junction of the two surfaces, as well as by forming a continuation of the groove parallel to such junction around corners and across changes in grade of the supporting surface.

A further object of the invention is to provide a grooving machine structurally characterized by its relatively light weight; inherent stability insuring rigid mounting of the machine and ease of manipulation to effect accurate grooving of a surface; simple and positive means of feeding the cutting element to rapidly form a groove to a predetermined depth; its capability of being easily and quickly adjusted vertically to form a groove at any desired height above the supporting surface; and its tiltable adjustment to compensate for the angularity of a roof surface from the horizontal and/or the angularity from the vertical, of the surface in which the groove is to be formed.

With these and other objects in view, the invention resides in the combinations and arrangements of elements as set forth in the following specification and particularly pointed out in the appended claims.

In the accompanying drawings,

Figure 1 is a plan view of the grooving machine embodying this invention;

Figure 2 is a fragmentary view of the lower portion of the grooving machine in side elevation;

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 1, with the motor of the machine in elevation;

Figure 4 is a horizontal sectional view taken on the line 4—4 of Figure 3;

Figure 5 is an enlarged fragmentary sectional view taken on the line 5—5 of Figure 4;

Figure 6 is a fragmentary sectional view taken on the line 6—6 of Figure 2.

Referring specifically to the drawings, the invention, in its present embodiment, comprises a carriage C composed of a flat plate 10 having ears 11 in which are mounted vertical spindles 12 on yokes 13 carrying two alined grooved wheels 15 adapted to travel on the head 16 of a track 17. The spindles 12 are secured to the ears 11 by nuts 18 and are sufficiently free in the ears to allow the wheels to rotate about the axes of the spindles to conform to curved portions of the track at corners of a vertical wall W in which a groove G is to be formed as the machine rolls on the front wheels 15 and on a single rear wheel 20 over a horizontal or sloping supporting surface S such as a floor or roof.

The rear wheel 20 rolls on a flat track 21 and is mounted in a yoke 22 having a spindle 23 keyed at 24 in an opening in the plate 10 and provided with a nut 25 for clamping one or more shims 26 on the spindle between the underside of the plate 10 and the yoke 22 to enable the height of the carriage above the surface S at the wheel 20 to be varied and thus have the effect of tilting the carriage, all for the purpose of varying the direction of the cut with respect to the horizontal, to be later described.

The plate 10 is provided between the three rollers 15 and 20 with a collar 30 internally threaded at 31 to receive a bearing element 32 in the form of an externally threaded annulus on which is mounted a connector element 33 also in the form of an annulus having a radial flange 34 resting on the upper edge of the element 32, and an axial flange 35 entering the element 32. The external surface of the axial flange 35 is a portion of a cone frustum, and the opposed internal surface of the element 32 is complementary thereto, as shown in Figure 3, so that the element 33 will be self-centering, and a snug rotary working fit in the element 32 insured.

The element 33 is provided with three posts 40 equally spaced circumferentially within an angular distance of approximately 180°, (Figure 4), on which rests a second bearing element 41 in the form of an annulus having a ring gear 42 secured thereto by bolts 43. Other bolts 44 pass through the ring gear and the bearing element 41 into the posts 40 to secure such parts to the posts, so that for all practical purposes the connector ele-

ment 33, bearing element 41 and ring gear 42 become a single unit rotatably mounted in the bearing element 32.

Rotatively seating in an upward facing annular recess 45 of the bearing element 41 is the lower end of the shell 46 of a vertical type electric motor 47 which is confined against upward displacement from the bearing element 41 by a disk 48 secured to the lower hub 49 of the motor by screws 50 and having its peripheral portion rotatively seating in a downwardly facing annular recess 51 of the bearing element 41.

The depending shaft 52 of the motor, which is co-axially related to the bearing element 41, has fixed thereto a drive pulley 53 for a double belt 54 trained over a relatively small driven pulley 55 fixed to a vertical shaft 56 journaled in spaced bearings 57 on the outer section 58 of an extensible arm 59, the inner section 60 of which fits snugly between the bearing element 41 and the flange 34 of the connector element 33 and is rigidly secured thereto by screws 61. The extensibility of the arm 59 is provided by bolts 62 in one section passing through longitudinal slots 63 in the other section, and enables the belts 54 to be properly tensioned and removed from the pulleys as desired. In order to prevent slipping of one section on the other, due to the pull exerted by the belts when in operation, an adjustable stop screw 64 is threaded through an ear 65 on the inner section 60 and abuts a lug 66 on the outer section 58.

Fixed to the lower end of the shaft 56 is a grooving element 70 in the form of an abrading wheel which is fed against the surface of the wall W by rotation of the ring gear 42 through the medium of a driving pinion gear 71 constantly meshing with the ring gear and fixed to a shaft 72 journaled in bearings 73 and 74 on the motor shell 46 and in a foot bearing 75, the shaft being supported by a collar 76 adjustable on the shaft and clamped thereto by a thumb screw 77 so as to rest upon the bearing 74. The upper end of the shaft is provided with a handwheel 78 to enable the shaft to be conveniently rotated by an operator. A handle 79 is pivotally mounted in ears 80 projecting from the carriage C to enable the operator to shift the machine along the tracks 17 and 21.

A latching pin 85 (Figure 5) having a knob 86 is mounted vertically in a sleeve 87 in the flange 34 of the connector element 33 and is urged by a spring 88 to enter any one of a circular series of openings 89 in the bearing element 32 to latch the element 33 to the element 32 for a purpose to be later described. A diametric holding pin 90 in the pin 85 is adapted to rest upon the upper end of the sleeve 87 or to enter an axial slot 91 in the latter according as the pin 90 is to be maintained in the non-latching position shown in Figure 5 or released for movement to latching position when registered with one of the openings 89.

Subtending from opposite sides of the plate 10 are bosses 95 in which is journaled a rock shaft 96 to the ends of which are fixed arms 97 and 98 carrying wheels 99, the axes of which are in right angular relationship to the axes of the wheels 15. The arm 97 is in the form of a bell-crank to provide a vertical lever 100 to which is pivoted one end of a link 101, the other end of which is pivoted to an actuating lever 102 fixed to a second rock shaft 103 journaled in bearings in the plate 10 and spanning a slot 104 in the latter.

Mounted for rising and lowering movement in vertically slotted extensions 105 below the plate 10 is an axle 106 carrying a wheel 107 and actuated by an arm 108 on the shaft 103, through the medium of links 109. The axis of the wheel 107 is parallel to that of the wheels 99, and, in the raised position of these wheels shown in Figure 2, the point of connection of the link 101 to the actuating lever 102 is above the axis of the rock shaft 103, and is maintained in this position by the weight of the lever. However, by moving the lever 102 in the direction of the arrow in Figure 2 until the lever abuts a stop 110 on the carriage, the link 101 will be moved beyond a dead center position so as to maintain the wheels 99 and 107 in a lowered position wherein the wheels 15 and 20 are raised from the tracks 17 and 21 sufficiently for the machine to be rolled away from the wall W on the wheels 99 and 107.

The operation of the invention is as follows: With the machine mounted for movement as shown in the drawings, and the motor 47 supplied with current to drive the grooving disk 70 at high speed in the direction of the arrow in Figure 1, the handwheel 78 is rotated to rotate the ring gear 42 and hence the bearing element 41, connector element 33, and arm 59 as a unit about the axis of the motor and in a direction to advance the disk 70 against the wall W so as to effect grooving of the latter as the machine is rolled forward on the tracks by the handle 79. This revolving movement of the disk 70 is accomplished due to the fact that the motor 47 is prevented from rotating by the connection of the shaft 72 to the foot bearing 75, such movement of the disk being limited by the disposition of the shaft 72 in the path of the arm, and being sufficient to cut a groove of any depth required in practice.

Any slight adjustment of the grooving element 70 vertically can be readily accomplished by releasing the latching pin 85 for operation in connecting the connecting element 33 and the bearing element 32 to rotate as a unit. Thus, with the arm 59 swung through a large angle in a counterclockwise direction in Figure 4, followed by engagement of the pin 88 in one of the openings 89, rotation of the arm 59 will cause the threads of the bearing member 32 to co-act with those of the collar 30 in vertically adjusting the grooving disk in one direction. Opposite rotational movement of the arm 59 will vertically adjust the grooving disk in the opposite direction. Any major vertical adjustment of the grooving disk is effected by raising the shaft 72 clear of the foot bearing 75 and maintaining the shaft raised by the collar 76 followed by the desired rotation of the arm 59 in one direction or the other with the machine backed away from the wall W.

By removing or adding shims 26 to the spindle 23, the machine can be readily tilted to cause grooving of the wall at an upward or downward angle to the horizontal, as desired.

It is to be understood that in the interpretation of the claims, the terms "vertical" and "horizontal" as used therein are to be broadly construed, as they are intended to refer only to the relative positions of the elements when the machines are operating on a true horizontal and are adjusted to cut a true horizontal groove in a vertical wall. It will be obvious that these positions will vary to a greater or less extent, depending on the slope of the roof or wall in

cutting a groove parallel to the junction of the roof and wall. Furthermore, the term "vertical wall" shall be considered inclusive of steeply sloping surfaces, in which grooves may be desired for the insertion of roof flashing and caulking materials.

What is claimed is:

1. A machine of the class described comprising: a carriage; a grooving element; means mounting said element from the carriage for rotation about a vertical axis and for pivotal adjustment about a second vertical axis on the carriage; means on the carriage and said mounting means co-acting to adjust said element to effect grooving of a vertical surface by the element when rotated as the carriage is advanced along the length of the surface; means supported by the carriage and operatively connected to the grooving element to drive the latter; and means coactable with the carriage and said mounting means by which pivotal adjustment of the grooving element will effect vertical adjustment thereof to vary the height of the groove above a supporting surface on which the carriage travels.

2. A machine of the class described comprising: a carriage; a bearing element; means mounting said element on the carriage for vertical adjustment in response to rotational movement of the element; a grooving element; means mounting the grooving element on the bearing element for revolving adjustment about the axis of the latter and for rotation about a vertical axis; a prime mover supported by said mounting means and having a drive shaft co-axially related to the bearing element; means operatively connecting the drive shaft with the grooving element to rotate the latter; and means by which the bearing element can be connected to said mounting means for rotation therewith in response to revolving adjustment of the grooving element so as to effect vertical adjustment of the grooving element relative to the carriage.

3. A machine of the class described comprising: a carriage; a bearing element; means mounting said element on the carriage for vertical adjustment in response to rotation movement of the element; a grooving element; means mounting the grooving element on the bearing element for revolving adjustment about the axis of the latter and for rotation about a vertical axis; a prime mover supported by said mounting means and having a drive shaft co-axially related to the bearing element; means operatively connecting the drive shaft with the grooving element to rotate the latter; and a latching pin carried by said mounting means; the bearing element having openings adapted to be entered by the latching pin to connect the bearing element to the mounting means for rotation therewith in response to revolving adjustment of the grooving element so as to effect vertical adjustment of the grooving element relative to the carriage.

4. A machine of the class described comprising: a carriage; a bearing element; means mounting said element on the carriage for vertical adjustment in response to rotational movement of the element; a grooving element; means mounting the grooving element on the bearing element for revolving adjustment about the axis of the latter and for rotation about a vertical axis; a gear fixed to said mounting means coaxially of the bearing element; means mounted on the carriage and co-actable with said gear to effect said revolving adjustment of the grooving element by rotating the mounting means; a prime mover supported by said mounting means and operating connected to the grooving element to drive the latter; and means by which the bearing element can be connected to said mounting means for rotation therewith in response to revolving adjustment of the grooving element so as to effect vertical adjustment of the grooving element relative to the carriage.

5. A machine of the class described comprising: a carriage; a bearing element; means mounting said element on the carriage for vertical adjustment in response to rotation movement of the element; a grooving element; means mounting the grooving element on the bearing element for revolving adjustment about the axis of the latter and for rotation about a vertical axis; a prime mover supported by said mounting means and having a drive shaft co-axially related to the bearing element; means operatively connecting the drive shaft with the grooving element to rotate the latter; means by which the bearing element can be connected to said mounting means for rotation therewith in response to revolving adjustment of the grooving element so as to effect vertical adjustment of the grooving element relative to the carriage; a gear fixed to said mounting means co-axially of the bearing element; an actuating shaft journaled vertically on the carriage and prime mover; and means on said shaft co-actable with the gear to rotate the latter while the prime mover remains stationary, so as to effect rotation of the mounting means and hence revolving adjustment of the grooving element.

6. A machine of the class described comprising: a carriage; a bearing element; means mounting said element on the carriage for vertical adjustment in response to rotational movement of the element; a grooving element; means mounting the grooving element on the bearing element for revolving adjustment about the axis of the latter and for rotation about a vertical axis; a prime mover supported by said mounting means and having a drive shaft co-axially related to the bearing element; means operatively connecting the drive shaft with the grooving element to rotate the latter; means by which the bearing element can be connected to said mounting means for rotation therewith in response to revolving adjustment of the grooving element so as to effect vertical adjustment of the grooving element relative to the carriage; a gear fixed to said mounting means co-axially of the bearing element; an actuating shaft journaled vertically on the carriage and prime mover; means on said shaft co-actable with the gear to rotate the latter while the prime mover remains stationary, so as to effect rotation of the mounting means and hence revolving adjustment of the grooving element; said actuating shaft being axially shiftable upwardly from the carriage sufficiently to disengage the latter so as to enable said mounting means to be rotating with the bearing element through more than a revolution.

7. A machine of the class described comprising: a carriage; a bearing element threadedly mounted on the carriage for vertical adjustment when rotated; a connector element mounted on the bearing element for rotation about a vertical axis and having a plurality of circumferentially spaced posts; a second bearing element fixed on said posts; an arm fixed to said elements to project radially therefrom; a grooving wheel rotatably mounted on the arm; an electric motor having a vertical drive shaft and mounted on the

second bearing element with the latter free to rotate while the motor remains stationary; means operatively connecting said drive shaft to the grooving element to drive the latter; and means co-acting with the carriage and with said elements by which revolving adjustment of the grooving wheel about the axes of the elements can be effected as the motor is being operated to drive the grooving wheel.

8. A machine of the class described comprising: a carriage; a bearing element threadedly mounted on the carriage for vertical adjustment when rotated; a connector element mounted on the bearing element for rotation about a vertical axis and having a plurality of circumferentially spaced posts; a second bearing element fixed on said posts; an arm fixed to said elements to project radially therefrom; a grooving wheel rotatably mounted on the arm; an electric motor having a vertical drive shaft and mounted on the second bearing element with the latter free to rotate while the motor remains stationary; means operatively connecting said drive shaft to the grooving element to drive the latter; means co-acting with the carriage and with said elements by which revolving adjustment of the grooving wheel about the axes of the elements can be effected as the motor is being operated to drive the grooving wheel; and means by which the connector element can be operatively connected to the first bearing element for rotation of such elements as a unit in order to effect vertical adjustment of the grooving wheel.

9. A machine of the class described comprising: a carriage; a bearing element threadedly mounted on the carriage for vertical adjustment when rotated; a connector element mounted on the bearing element for rotation about a vertical axis and having a plurality of circumferentially spaced posts; a second bearing element fixed on said posts; an arm fixed to said elements to project radially therefrom; a grooving wheel rotatably mounted on the arm; an electric motor having a vertical drive shaft and mounted on the second bearing element with the latter free to rotate while the motor remains stationary; means operatively connecting said drive shaft to the grooving element to drive the latter; a gear fixed to the second bearing element; a vertical actuating shaft journaled on the motor and carriage; a gear fixed to the actuating shaft and meshing with the first mentioned gear to rotate the latter and effect revolving adjustment of the grooving wheel.

10. A machine of the class described comprising: a carriage; a bearing element threadedly mounted on the carriage for vertical adjustment when rotated; a connector element mounted on the bearing element for rotation about a vertical axis and having a plurality of circumferentially spaced posts; a second bearing element fixed on said posts; an arm fixed to said elements to project radially therefrom; a grooving wheel rotatably mounted on the arm; an electric motor having a vertical drive shaft and mounted on the second bearing element with the latter free to rotate while the motor remains stationary; means operatively connecting said drive shaft to the grooving element to drive the latter; means co-acting with the carriage and with said elements by which revolving adjustment of the grooving wheel about the axes of the elements can be effected as the motor is being operated to drive the grooving wheel; and a latching member mounted on the connector element; the first bearing element having a plurality of circumferentially arranged openings in any one of which the latching member is adapted to be received to operatively connect such elements for the purpose described.

11. A machine of the class described comprising: a carriage; a grooving element; means mounting said element from the carriage for rotation about one vertical axis and pivotal adjustment about a second vertical axis on the carriage; means supported by the carriage and operatively connected to the grooving element to rotate the latter irrespective of pivotal adjustment of the element; and means co-actable with the carriage and said mounting means by which pivotal adjustment of the element can be utilized to vertically adjust the element relative to the carriage.

12. A machine of the class described comprising: a carriage; a grooving element; means mounting said element from the carriage for rotation about one vertical axis and pivotal adjustment about a second vertical axis on the carriage; means supported by the carriage and operatively connected to the grooving element to rotate the latter irrespective of pivotal adjustment of the element; means co-actable with the carriage and said mounting means by which pivotal adjustment of the element can be utilized to vertically adjust the element relative to the carriage; said last means including a bearing element threadedly mounted on the carriage for vertical adjustment and on which said mounting means is freely rotatable; and means for latching the mounting means to the bearing element for rotation as a unit.

13. A machine of the class described comprising: a carriage; a grooving element; means mounting said element from the carriage for rotary and revolving movements about parallel axes; means for driving the grooving element; and means whereby movement of the grooving element about the axis of revolution will effect adjustment of the element longitudinally of such axis.

14. A machine of the class described comprising: a carriage; a grooving element; means mounting said element from the carriage for rotary and revolving movements about parallel axes; means for driving the grooving element; means whereby movement of the grooving element about the axis of revolution will effect adjustment of the element longitudinally of such axis; and means by which the last means is rendered ineffective to adjust the grooving element when revolved.

15. A machine of the class described comprisin: a carriage; a grooving element; a bearing element; means mounting the bearing element from the carriage for rotational adjustment and for adjustment longitudinally of the axis of rotational adjustment in response to such rotational adjustment; means mounting the grooving element from the bearing element for revoluble and rotary movements; and means operatively connecting the last means to the bearing element for movement as a unit.

16. A machine of the class described comprising: a carriage; a bearing element mounted on the carriage for movement about a vertical axis; a grooving element; means mounting the grooving element from the bearing element for rotation and for revolving movement about the axis of the bearing element; a prime mover supported from the bearing element against rotation and having a drive shaft co-axially related to the

bearing element; and means operatively connecting the drive shaft to the grooving element to drive the latter.

17. A machine of the class described comprising: a carriage; a bearing element mounted on the carriage for movement about a vertical axis; a grooving element; means mounting the grooving element from the bearing element for rotation and for revolving movement about the axis of the bearing element; a prime mover supported from the bearing element and having a drive shaft co-axially related to the bearing element; means by which the prime mover can be confined against rotation or freed for rotation; means for driving the grooving element from said shaft; and means whereby adjustment of the bearing element about its axis will effect vertical adjustment of the bearing element.

18. In a machine for grooving a vertical wall, a carriage; a prime mover having a drive shaft; means mounting the prime mover on the carriage for rotation about the shaft axis with the latter vertically disposed; a grooving element; means rigidly secured to the prime mover, mounting the grooving element for rotation and for revoluble movement with the prime mover as a unit about the axis of said shaft; means operatively connecting the drive shaft to the grooving element to drive the latter; and means by which rotational movement of the prime mover can be effected to cause bodily movement of the grooving element into and out of engagement with the wall.

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