Aug. 8, 1961 W. WROBBEL 2,994,990

GRINDING AND POLISHING MACHINE

Filed May 20, 1958 2 Sheets-Sheet 1

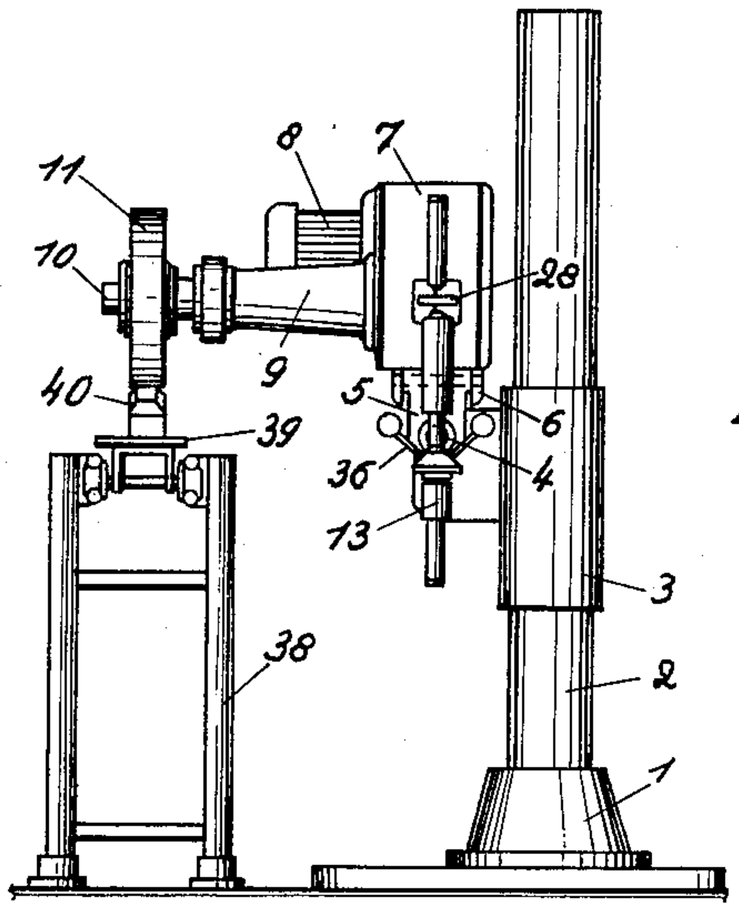

FIG. 1

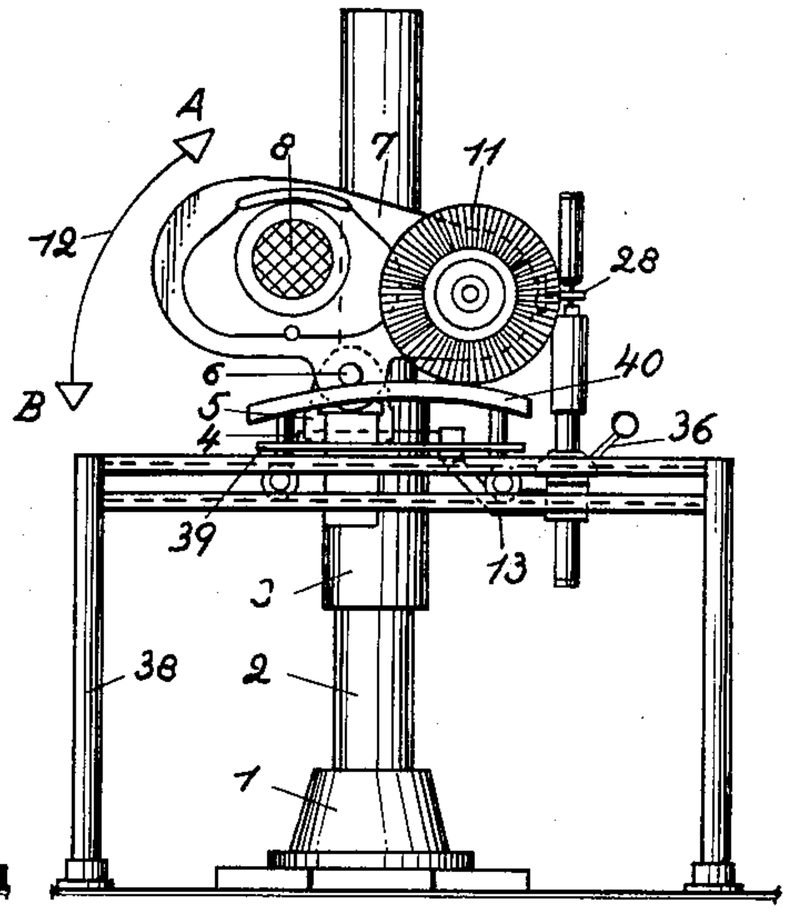

FIG. 2

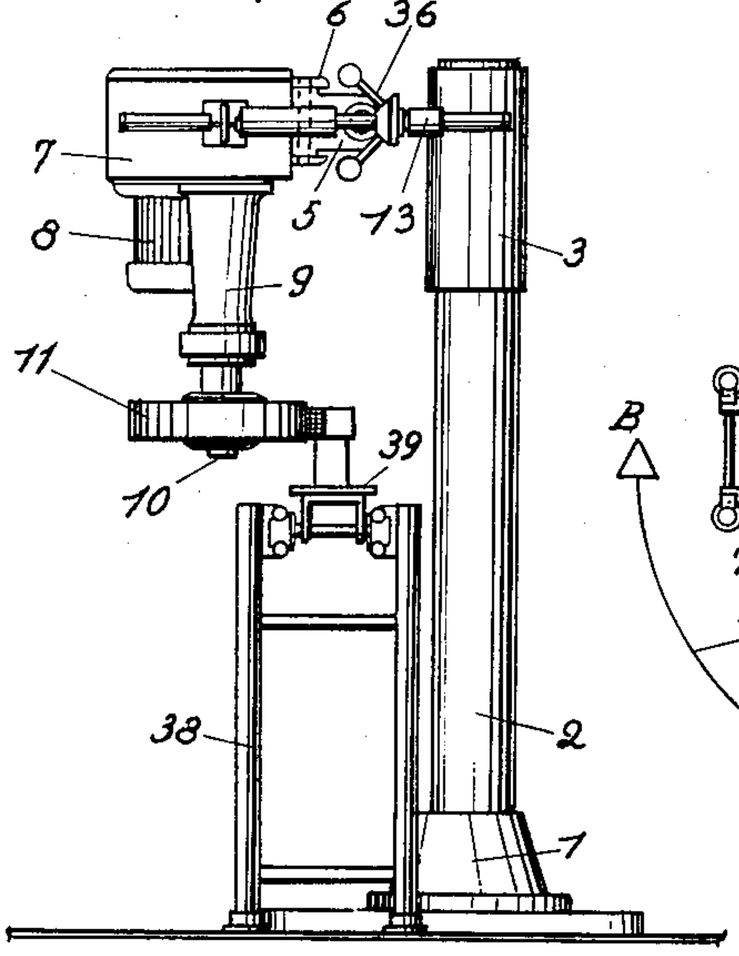

FIG. 3

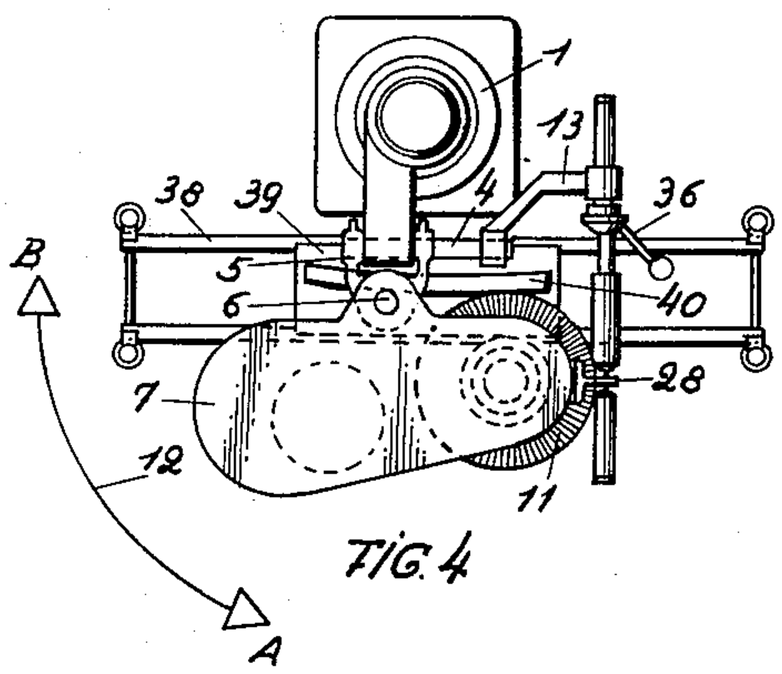

FIG. 4

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GRINDING AND POLISHING MACHINE

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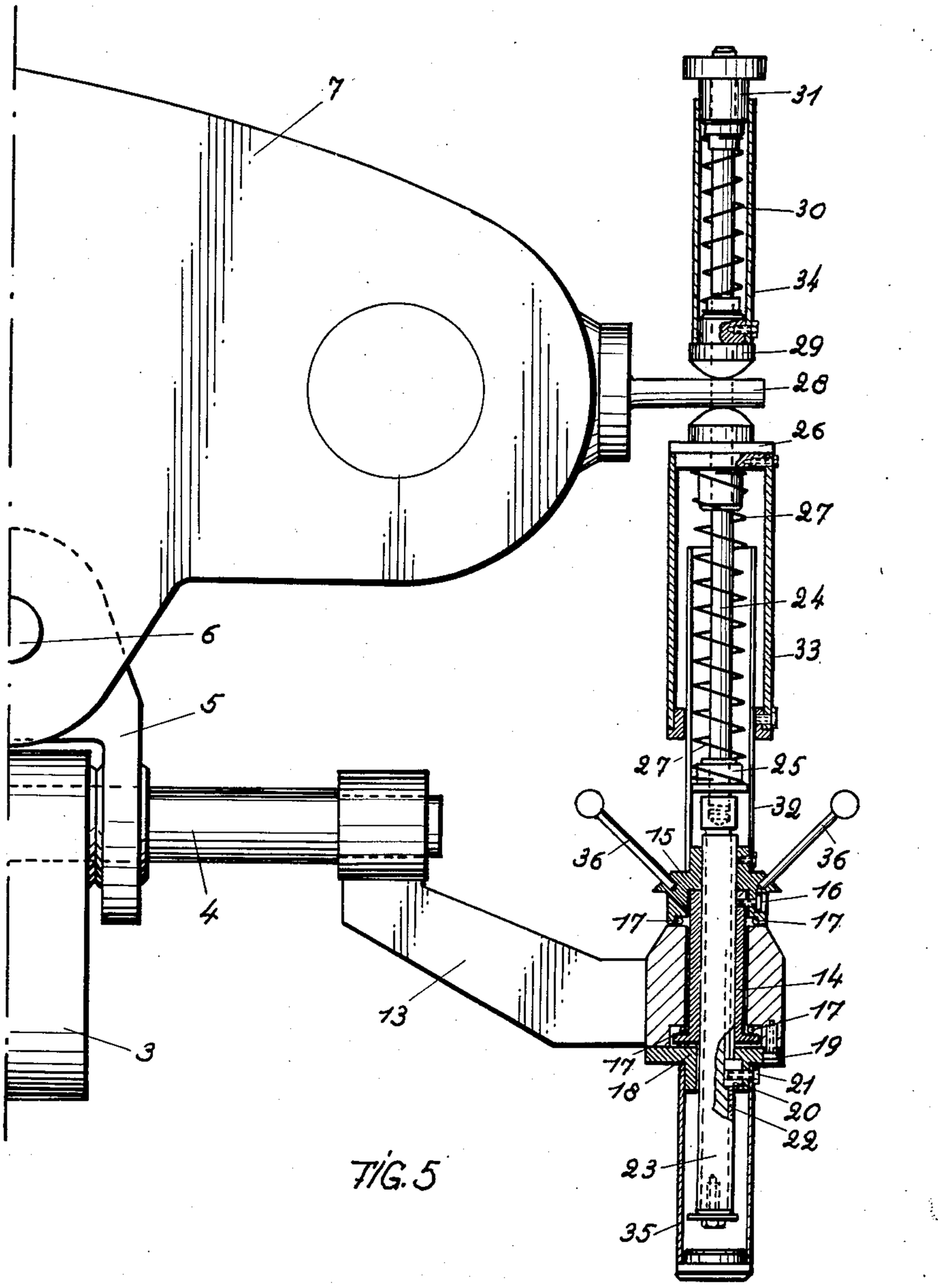

FIG. 5

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2,994,990
Patented Aug. 8, 1961

2,994,990

GRINDING AND POLISHING MACHINE

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Filed May 20, 1958, Ser. No. 736,584
Claims priority, application Germany May 24, 1957
4 Claims. (Cl. 51—92)

This invention relates to a grinding and polishing machine with a stand, a support frame vertically adjustable thereon, and a working head hingedly secured on the support frame and comprising a drive motor and a working spindle operatively connected therewith, with mounting. Grinding and polishing machines of this type have come into use in recent times for the setting up of grinding and polishing trains, wherein the material to be ground and polished is conveyed on a conveyor track past a plurality of grinding and polishing machines. On these grinding and polishing trains predominantly mass-produced parts such as motor bumper bars, decorative strips and other motor vehicle accessories are worked. If here elongated, undomed workpieces such for example as decorative strips are worked, the grinding and polishing wheels can as a rule be rigidly adjusted. When the wheel wears, the entire head of the grinding or polishing machine is shifted on the support column and clamped fast in the new position. With this type of adjustment supervision of the actual bearing pressure of the grinding or polishing wheel in relation to the workpiece surface is not possible. Since however the exact regulation of the bearing pressure, preferably exerted by the weight of the working head, is a very essential factor in the working of the workpieces in relation to the desired nature of the workpiece surface, the adjustment of such an installation remains very time-wasting and complicated.

If workpieces with curved surfaces are to be machined, in the known installations the working head of the grinding or polishing machines is lifted hydraulically or pneumatically over copy rulers, which must be made to imitate the workpiece surface exactly. Since the weight of the lifted head opposes the pressure of the hydraulic or pneumatic linkage, the grinding or polishing machine of this nature works rigidly in the upward direction, since the lifted weight in any case is very much greater than the maximum possible bearing pressure in grinding and polishing. If the copy ruler does not agree exactly with the workpiece surface, or if the workpieces are not similar in form, no uniform surface quality can be achieved. In the case of major deviations between copy ruler and workpiece surface, sections of the surface remain unworked, or discolorations due to material heating occur in the case of workpieces of steel, which, if they are not recognised, render a satisfactory galvanic coating impossible. In such hydraulically or pneumatically controlled grinding or polishing machines the assembly becomes more extensive and more difficult, the more the grinding or polishing spindle is pivoted out of its horizontal position into the vertical position.

Now the invention is based upon the problem of providing a grinding and polishing machine of the stated nature wherein with the aid of a mechanical control arrangement the bearing pressure of the polishing or grinding wheel against the surface of the workpiece can be adjusted immediately and without trouble and regulated in finely sensitive manner, in any pivotal position of the polishing or grinding spindle. This problem is solved in accordance with the invention due to the fact that the working head, constructed as a support, is tiltable about an axis lying beneath its centre of gravity and parallel to the working spindle, this axis is pivotable

about an axis perpendicular to it, and the bearing pressure of the tool is regulable by a mechanical control arrangement, which is stationary in relation to the tilting movement of the working head, but is pivotable with the working head.

In accordance with the invention the grinding and polishing machine can advantageously be so constructed that the mounting of the working head is constructed as a universal joint, and to the support frame there is hinged a fork-shaped mounting piece, in which the tilting spindle of the working head is carried. The control arrangement can expediently be connected in such manner with the working head that the pivot axis of the working head is non-rotatably connected with the mounting piece thereof, and is prolonged beyond the mounting piece towards the working spindle side, and a support arm for the control arrangement is keyed on this projection.

The control arrangement can consist according to the invention of two abutments, at least one of which is displaceable against the effect of a spring, and a control member lying between these abutments. Here either the control member can be arranged on the working head and the abutments on the support arm or the control member can be arranged on the support arm and the abutments on the working head.

In a preferred form of embodiment of the object of the invention the abutment can advantageously be so constructed that the two abutments are mounted on a common guide rod and this is arranged for length adjustment in the support arm. The guide rod may here penetrate the abutments in a central bore in each, and the control member therebetween in a slot. The guide rod can be adjusted in a simple manner due to the fact that a sleeve provided with internal threading is rotatable in the support arm, and in it the similarly threaded end of the guide rod is screwable but non-rotatable in relation to the support arm. The adjustment can be facilitated due to the fact that the sleeve is provided with a rotating handle. The springs of the control arrangement can be so arranged in accordance with the invention that in each case between the two movable abutments and two abutments fixedly mounted on the guide rod there is tensioned at least one helical spring, and at least the one fixed abutment is adjustable on the guide rod.

The control arrangement constructed in accordance with the invention can advantageously be protected against soiling due to the fact that the helical springs and the guide rod are surrounded with protective tubes which may be slidable within one another in telescopic fashion.

The control of the workpiece with the mechanical control arrangement in accordance with the invention has the advantage that the grinding or polishing wheel follows the shape of the workpiece surface without a copy ruler, and bears thereon with the same bearing pressure independently of this shape, at all points of the surface. Further advantages of the mechanical control consist in that it responds immediately, does not work with lag, can deviate upwards, works without attention, and requires no additional installation.

The invention is illustrated by way of example by reference to a form of embodiment of the object thereof in the accompanying drawing, wherein:

FIGURE 1 shows a grinding and polishing machine, constructed in accordance with the invention, with horizontally set grinding or polishing wheel, in a lateral elevation,

FIGURE 2 shows a front elevation thereof,

FIGURE 3 shows the lateral elevation of the same machine, with vertically working polishing or grinding wheel,

FIGURE 4 shows a plan view thereof and

FIGURE 5 shows a section through the control arrangement, on a larger scale.

In the drawings, 1 designates a pedestal, into which a column 2 is fitted. On this column a support frame 3 is longitudinally movably mounted. The latter is provided with a lateral projection and in this there is mounted a shaft 4. Upon this shaft there is mounted a support stirrup 5 of fork-shaped construction, in which there is mounted a shaft 6 perpendicularly to the shaft 4. Upon the shaft 6 a working head 7 with a drive motor 8 and a spindle mounting 9 for the working spindle 10 is rockingly mounted. Upon the free end of the working spindle 10 there is mounted a grinding or polishing tool, for example a grinding wheel 11. The working head 7 can be pivoted limitedly about the spindle 6 in the direction of the arrow 12. Furthermore by a rotation about the spindle 4 it can be brought out of the position illustrated in FIGURES 1 and 2, with horizontally disposed spindle 10, into the position represented in FIGURES 3 and 4 with vertically disposed working spindle 10.

The spindle 4 is non-rotatably connected with the support stirrup 5, and is prolonged on the working spindle 10 side beyond the stirrup 5. Upon this extension there is keyed a support arm 13 having a bore at its free end. A bushing 14 provided with internal threading is rotatably but immovably arranged in this bore. On to the end of the bushing 14 projecting upwards over the support arm 13 there is pushed a sleeve 15, which is firmly connected with the bushing 14 by a screw 16. In order to facilitate the rotational movement the bushing 14 and the sleeve 15 can be mounted on balls 17. A cover 18 is secured, by screws 19 for example, at the lower end of the bore of the support arm 13. In a groove of the cover 18 there is secured an adjusting spring 20, with a screw 21, which spring extends into a groove 22 of a threaded spindle 23. In the head end of this threaded spindle 23 there is seated a guide rod 24 upon which a collar 25 is mounted in vertically adjustable fashion. Between the latter and a displaceable abutment member 26 there lies at least one helical compression spring 27. The abutment member 26 rests against a support or abutment means 28 firmly connected with the head and provided with a slot. Through this slot there extends the guide rod 24, which carries above the head support 28 a further displaceable abutment member 29. At least one helical compression spring 30 abuts with one end against abutment member 29 and with its other end on a threaded sleeve 31 mounted displaceably and securably on the end of the guide rod 24. The entire control and adjusting arrangement is enclosed by tubes 32, 33, 34, 35, which in part can be pushed into one another in telescopic fashion, and protect the enclosed structural parts against dirt. The sleeve 15 is provided with a rotating handle in that a plurality of operating levers 36 are mounted thereon in star form.

Upon a frame 38 a sliding carriage 39 is movably arranged, carrying the workpiece 40 to be machined. In the adjustment of the grinding and polishing machine in accordance with the invention firstly the working height is coarsely set by movement of the support frame 3 on the column 2. For the adjustment of the grinding or polishing wheel 11 the sleeve 15 is rotated about its longitudinal axis. The threaded spindle 23 thereby screws itself upwards or downwards, since it is prevented from a rotational movement by the adjusting spring 20. If the threaded spindle 23 moves downwards, the entire head 7 pivots in the direction A of the arrow 12. Due to the inclination of the head 7 and the increase of weight involved therewith, in the pivoting direction A, the spring 27 is compressed and opposes the increase of weight to the same extent. In place of one spring 27 it would be possible to provide a plurality of springs mounted on a movable and securable lower spring abutment and thus rendering possible an exact balance of weight. If the threaded spindle 23 is moved upwards, the spring 24 is relieved more and more until the position of equilibrium of the head 7. If the latter pivots beyond its position of equilibrium in the direction B of the arrow 12, the spring play of the upper spring 30 or of a corresponding combination is the same as was described previously.

Since the spindle 4 is at the same time the axis of inclination of the head 7 and the mounting of the described control arrangement, the spring play remains the same on every adjustment of the head 7 out of the horizontal position into the vertical position. Since however the weight of the head 7 becomes ever less and finally is completely cancelled by its pivoting into the vertical position (FIGURE 3), the threaded sleeve 31 mounted on the upper end of the guide rod 24 is movably and securably arranged. By shifting of this threaded sleeve 31 the initial tension of the spring can be varied within desired limits and the bearing pressure of the grinding or polishing wheel 11 against the workpiece 40 can be regulated in finely sensitive fashion. The springs 27 and 30 working against one another furthermore have a vibration-damping effect upon the working head 7.

It lies within the scope of the invention that the working head 7 can also be so mounted and securable that it can only be moved in the direction of the arrow 12. In the case of such an arrangement the upper spring 30 or the lower spring 27 can be replaced by a fixed stop. It is here a pre-requisite that the head 7 is so secured in its direction of movement A or B that it does not quite reach its position of equilibrium.

I claim:

1. In a grinding machine or the like, in combination, support means; a working head including a drive motor and a working spindle projecting from one side of said working head, said working spindle being adapted to carry a grinding wheel and being operatively connected to said drive motor to be driven thereby; carrying means for carrying said working head on said support means and including a first shaft substantially normal to said working spindle and turnably carried by said support means, a member fixed to said first shaft for turning therewith about the axis thereof, and a second substantially horizontal shaft carried by said member and extending substantially normal to said first shaft and being turnably connected to said working head for carrying the latter, the axes of said first and second shaft being located laterally from the center of gravity of said working head; and control means operatively connected to said working head and carried in part by said first shaft for turning therewith for resiliently balancing the turning moment of said working head about the other axis and for regulating the contact pressure of the grinding wheel, said control means including first abutment means comprising a pair of abutment members, second abutment means sandwiched between said abutment members, and spring means operatively connected to said abutment members and tending to press said abutment members against said second abutment means, one of said abutment means being carried by said working head and the other by said first shaft.

2. In a grinding machine or the like, in combination, support means; a working head including a drive motor and a working spindle projecting from one side of said working head, said working spindle being adapted to carry a grinding wheel and being operatively connected to said drive motor to be driven thereby; carrying means for carrying said working head on said support means and including a first shaft substantially normal to said working spindle and turnably carried by said support means, a member fixed to said first shaft for turning therewith about the axis thereof, and a second substantially horizontal shaft carried by said member and extending substantially normal to said first shaft and being turnably connected to said working head for carrying the latter, the axes of said first and second shaft being located laterally from the center of gravity of said working head; and control means

operatively connected to said working head and carried in part by said first shaft for turning therewith for resiliently balancing the turning moment of said working head about the other axis and for regulating the contact pressure of the grinding wheel, said control means including first abutment means comprising a pair of abutment members, second abutment means sandwiched between said abutment members, and spring means operatively connected to said abutment members and tending to press said abutment members against said second abutment means, said first abutment means being carried by said first shaft and said second abutment means being fixedly mounted on said working head.

3. In a grinding machine or the like, in combination, support means; a working head including a drive motor and a working spindle projecting from one side of said working head, said working spindle being adapted to carry a grinding wheel and being operatively connected to said drive motor to be driven thereby; carrying means for carrying said working head on said support means and including a first shaft extending substantially normal to said working spindle and turnably carried by said support means, a member fixed to said first shaft for turning therewith about the axis thereof, and a second substantially horizontal shaft carried by said member extending substantially normal to said first shaft and carrying said working head turnable about the axis of said second shaft, the axes of said first and second shaft being located laterally from the center of gravity of said working head; a guide rod connected to said first shaft for rotation therewith and extending substantially normal thereto toward said working head; a pair of abutment members mounted on said guide rods movable in longitudinal direction thereof; an abutment arm projecting fixed to said working head laterally therefrom and being sandwiched between said abutment members; and spring means operatively connected to said guide rod and abutting against said abutment members and tending to press said abutment members against said abutment arm.

4. In a grinding machine or the like, in combination, support means; a working head including a drive motor and a working spindle projecting from one side of said working head, said working spindle being adapted to carry a grinding wheel and being operatively connected to said drive motor to be driven thereby; carrying means for carrying said working head on said support means and including a first shaft extending substantially normal to said working spindle and turnably carried by said support means, a member fixed to said first shaft for turning therewith about the axis thereof, and a second substantially horizontal shaft carried by said member extending substantially normal to said first shaft and carrying said working head turnable about the axis of said second shaft, the axes of said first and second shaft being located laterally from the center of gravity of said working head; a guide rod connected to said first shaft for rotation therewith and extending substantially normal thereto toward said working head; a pair of abutment members mounted on said guide rods movable in longitudinal direction thereof; an abutment arm projecting fixed to said working head laterally therefrom and being sandwiched between said abutment members; means operatively connected to said guide rod for moving said guide rod in longitudinal direction; a pair of coil springs wound about said guide rod and respectively connected at one end thereof to said guide rod and engaging with the other end thereof said abutment members for pressing the same respectively against said abutment arm; and means adjustably carried by said guide rod for adjusting the spring pressure of at least one of said springs.

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