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DEVICE MAKING IT POSSIBLE TO ENSURE THE HORIZONTALITY AND LOCKING OF AN OVER-HANGING ARM MOVING VERTICALLY ALONG A COLUMN

Filed Oct. 16, 1941

Serial No. 415,230

4 Sheets-Sheet 1

Fig. 5

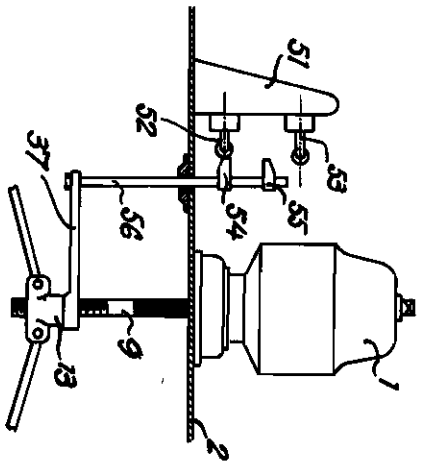
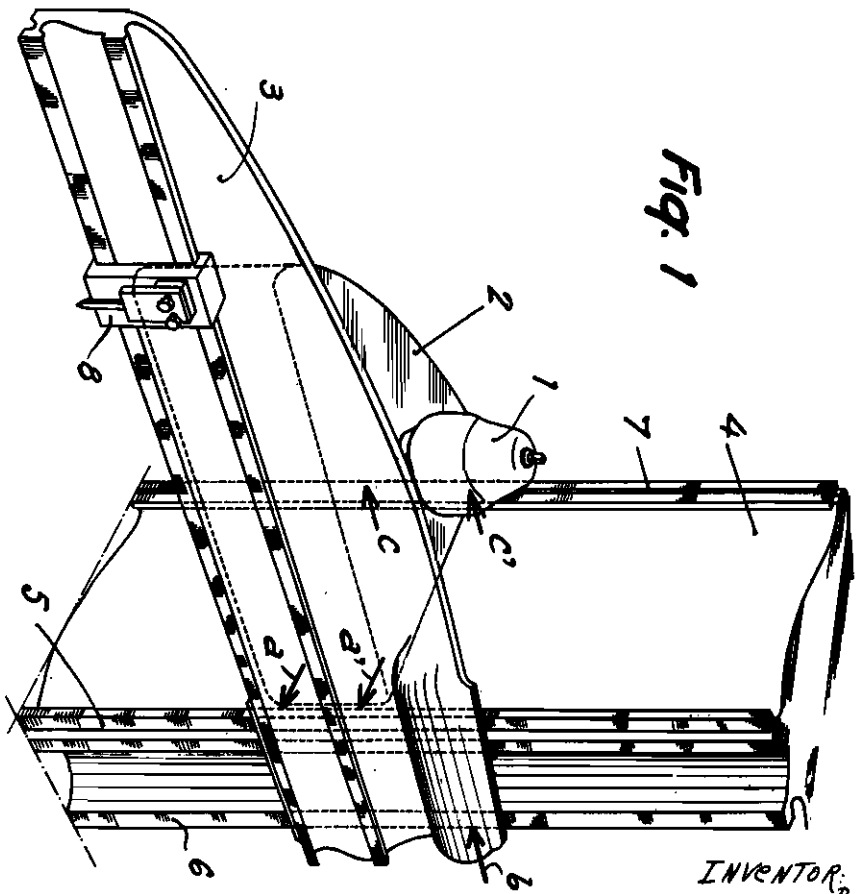


Fig. 1



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4 Sheets-Sheet 2

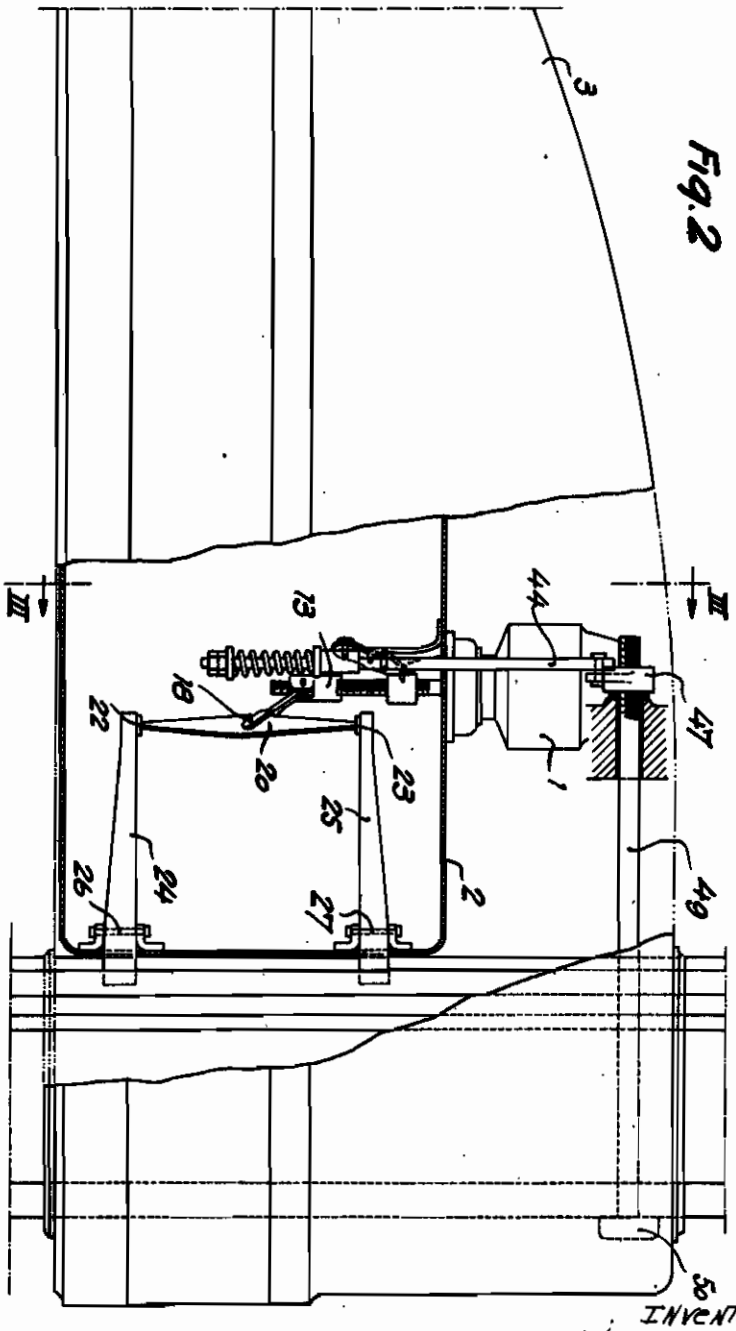

Fig. 2

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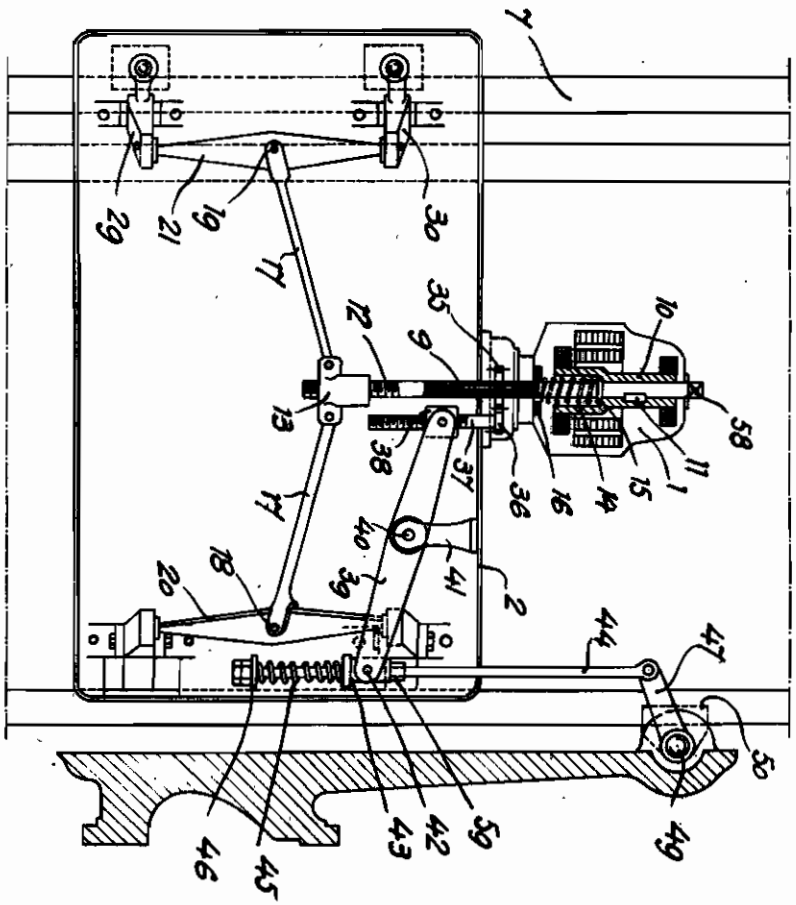
Fig. 3



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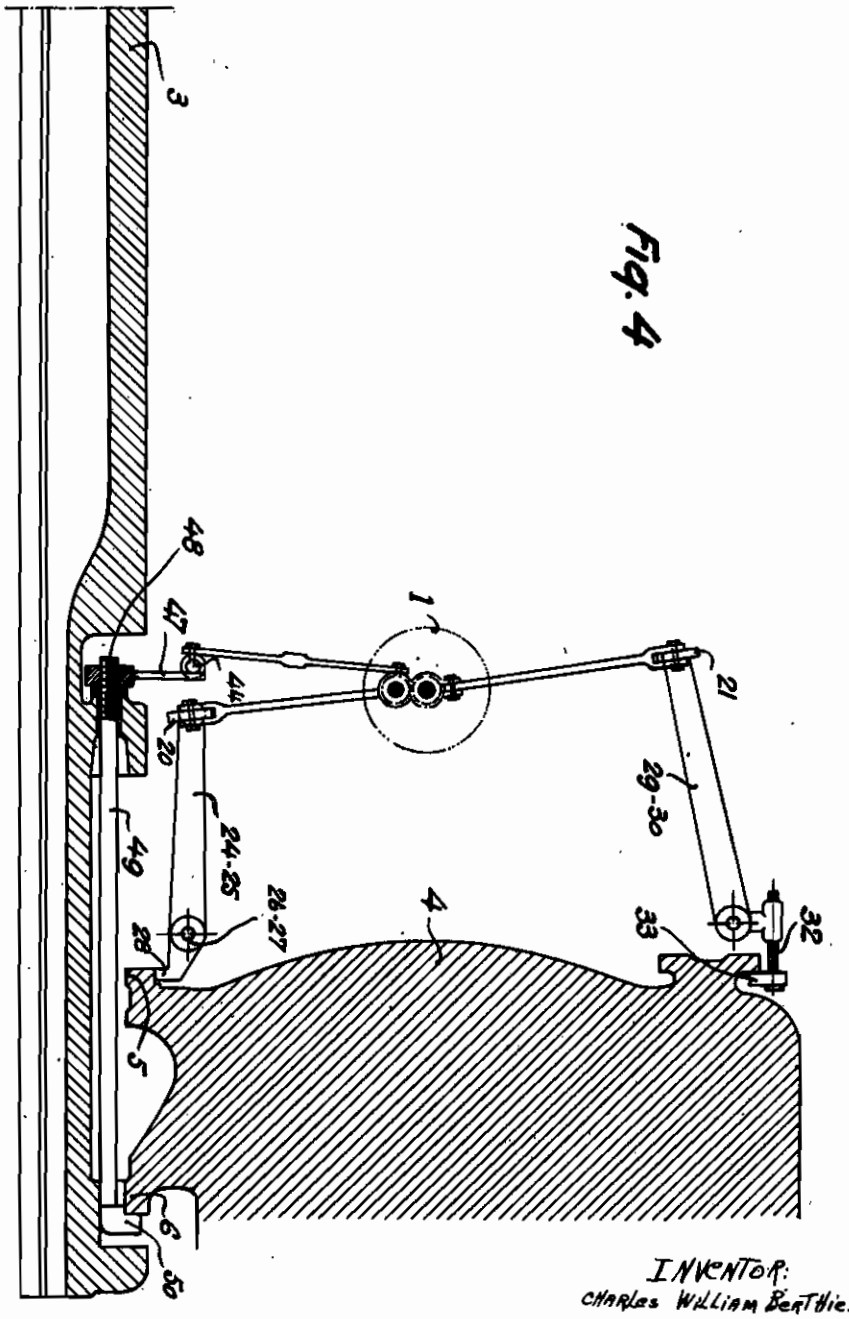

Fig. 4

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ALIEN PROPERTY CUSTODIAN

DEVICE MAKING IT POSSIBLE TO ENSURE THE HORIZONTALITY AND LOCKING OF AN OVERHANGING ARM MOVING VERTICALLY ALONG A COLUMN

Charles William Berthiez, Paris, France; vested in the Alien Property Custodian

Application filed October 16, 1941

This invention relates to a device making it possible to ensure the horizontality and locking of an overhanging arm moving vertically along a column.

In machines, such for instance as a radial drill, a single pillar vertical lathe, a single pillar planer, etc., which comprise a column along which a horizontal overhanging arm can slide, there is a more or less marked drop of the end of the arm, said drop being due to the clearance it is necessary to allow for the sliding of the arm along the column or pillar.

In said machines, the clamping of the arm onto the pillar is generally ensured by systems provided with nuts which are screwed home by the operator one after another and, inevitably, in a different and varying manner. The result is that the arm does not remain strictly parallel to itself from one operation to another.

The object of the present invention is to cope with this difficulty, that is to say to reëstablish the horizontality of the arm prior to ensuring, in the latter position, the clamping of the arm on the pillar; it fulfills the further object of ensuring an invariably identical clamping of the arm from one operation to another. In this manner, the machine to which the present invention is applied will be enabled to execute the operations it is intended to perform with a strict accuracy which it was previously impossible to attain.

The invention relates, first of all, to a method making it possible to obtain the results indicated hereinbefore, said method consisting fundamentally, when the arm has reached its position along the pillar, in suppressing all clearance between said two members of the machine, this being obtained by creating bearing points of the horizontal arm and its square bracket against the rear or side faces of the guiding devices or slides. Preferably, five bearing points have been created, three for the arm proper and two for its square bracket, said bearing points being selected so as to provide perfect stability of the toolholder horizontal arm.

Moreover, according to the invention, the tightening on the bearing point by which the realignment of the arm is ensured is carried out before the tightening up on the other bearing points by means of which locking is ensured.

The invention further relates to a device for carrying the pre-cited method into effect, which device is fundamentally characterized by the fact that when the arm has reached the position it is intended to occupy on the vertical pillar a motor is started for the purpose of powerfully applying, against certain points of the slides, studs or heelpieces which temporarily suppress the clearance necessary to allow the sliding of the horizontal arm along the vertical pillar and lock said arm onto said pillar.

Said device is likewise characterized by the fact that, between the motor controlling horizontality and locking and the studs pressing against the slides, a series of operating links and rocking levers is interposed, as well as springs, the mounting load of which determines the magnitude of the pressures applied to the bearing points of the aforesaid studs on the slides.

In the attached drawing a form of embodiment of the invention in its application to a single pillar planer has been shown in diagram form and merely as an example.

In this drawing:

Figure 1 is a view in perspective of a fragment of the vertical pillar of a planing-machine, a horizontal arm provided with a horizontality and locking device according to the invention being capable of sliding along said pillar.

Figure 2 is a front elevation in which the device shown in Fig. 1 has been partially cut away;

Figure 3 is a section according to line III—III of Fig. 2.

Figure 4 is a horizontal section.

Finally, Figure 5 is a detailed view showing the contact-making device by means of which the horizontality and locking device can be stopped after having operated in one direction or the other.

As is shown in the drawing, the horizontality and locking device which forms the subject matter of the invention comprises a motor 1 which is mounted on square bracket 2 of horizontal arm 3; said horizontal arm is capable of sliding vertically along pillar 4 of the planer. In the example shown, said pillar is provided with slides 5 and 6 for arm 3 and slide 7 for square bracket 2. Toolholder 8 is slidingly mounted on horizontal arm 3.

The purpose of the present invention is to obtain, between horizontal arm 3 and its square bracket 2 on the one hand, and vertical pillar 4 on the other hand, a powerful grip on a certain number of judiciously selected points in order to ensure, when the horizontal arm has been brought to its suitable position along pillar 4, firstly the horizontality of said arm (the overhanging end of which tends to drop on account of the clearance necessary to allow the arm to

slide along pillar 4) and then the locking of said arm in the required position.

The clamping bearing-points selected in the example illustrated have been indicated by arrows in Fig. 1. As will be observed, for horizontal arm 3 proper, there are two bearing points *a* and *a'* on the rear portion of slide 5, and one bearing point *b* on the side portion of slide 6; in addition, for square bracket 2, two bearing points c and *c'* have been provided on the rear portion of slide 7. The alignment of the arm is ensured by means of a bearing point *b* and the locking of the arm in its horizontal position is ensured in a uniform manner by means of bearing points *a*, *a'*, c, *c'*.

Actuating motor 1 which is intended to ensure the horizontality and clamping of arm 3 and of its square bracket, comprises a rotor which is drilled to allow a spindle 9 to pass through it; said spindle is driven by hollow shaft 10 of the rotor, by means of a key 11 for instance. The end of said spindle 9 is threaded at point 12 (refer to Fig. 3) and screws into a yoke 13. Said spindle 9 is capable of vertical movement by compressing a spring 14 positioned between a shoulder 15 of spindle 9 and a ring 16 integral with the carcase of the motor.

For the purpose of ensuring the alignment of arm 3 and the clamping of its upper portion against the edge of the way, as indicated by arrow *b* in Fig. 1, the following arrangement is employed:

Spindle 9 which passes through the rotor of motor 1 is splined along a certain portion of its length (refer to Fig. 3) in order that said spindle may be capable of longitudinal movement while rotationally actuating a gearwheel 35 which meshes with a gear-wheel 36 gibbed to a screw 37. Said screw 37 screws into a nut 38 articulated by means of a fork to a counter-motion lever 39; said counter-motion lever is capable of rotation about an axis 40 mounted, for instance, by means of a stirrup 41, on square bracket 2. The other end of lever 39 is connected, by means of an articulation 42, to a sleeve 43 slidingly mounted on rod 44. A spring 45 is interposed between sleeve 43 and a washer 46 secured to the lower end of rod 44 (refer to Figs. 3 and 4) the tapped boss of which screws onto the threaded end 48 of a rod 49 the other end of which is provided with a heel-piece 50 capable of bearing against the side face of slide 6 (refer to Fig. 4 and arrow *b* of Fig 1).

In order to ensure uniform clamping of all four bearing points *a*, *a'*, and *c*, c', the following arrangement is employed:

To yoke 13 are coupled two links 17 the free ends 18 and 19 of which are articulated to rocking levers 20 and 21.

Each end of rocking lever 20 is in turn articulated at 22 and 23 to the long arm of straight levers 24 and 25 (refer to Fig. 2), said levers themselves being capable of rotating about fixed axes 26 and 27 supported by square bracket 2. The end of the short arm of levers 24 and 25 is provided with a heel-piece 29 which bears against the rear side of slide 5 (refer to Fig. 4); said heel-pieces 28 constitute bearing points *a*, *a'* against slide 5 as indicated by arrows in Fig. 1.

Each end of rocking lever 21, is articulated to the long arm of bell-crank levers 29, 30 which are themselves capable of rotating about a fixed axis 31 supported by square bracket 2; the end of the small arm of bell-crank levers 29 and 30 fits into a slot cut in the shank of bolts 32. The heads of said bolts are provided with clamps 33 which bear against rear facing 34 of square bracket slide 7. In this way are obtained the two bearing points, indicated by arrows at *c* and *c'* in Fig. 1, between square bracket 2 and slide 7.

On square bracket 2 (Fig. 5) there is likewise mounted a double contact making device 51 comprising a contact 52 and a contact 53 which can be operated by means of cams 54 and 55 provided on a rod 56 mounted on a rod 57 which is itself solid with yoke 13 in its upward and downward movements. Contact makers 52 and 53 make it possible to break the current of motor 1 at the suitable moments as will be explained below.

Operation of the device which has just been described is as follows:

Locking is effected by the manipulation of a contact maker (which is not shown in the drawing) which locks the motor which causes the rise and fall of the horizontal arm and which, at the same time, starts locking motor 1. By means of its threaded end 12, the rotation of spindle 9 causes the rise of the nut of yoke 13 and at the same time, through gearing 35—36 causes the rotation of screw 39 and continues to do so until the required stresses are applied first on the bearing point of rod 49 and next on the bearing points of levers 24, 25, 29 and 30. The magnitude of said stresses obviously corresponds to the mounting loads of springs 14 and 15.

At this moment, yoke 13 can no longer continue its upward motion and if motor 1 were not stopped, spindle 9 would screw into said yoke; but cam 54 is located on rod 56 in such a manner that, at the moment under consideration, it may actuate contact maker 52, the effect of which is to stop motor 1. At this moment, springs 14 and 45 are compressed by a fraction additional to their mounting load in order to cancel the inertia torque of the rotor of motor 1.

Horizontal arm 3 is then brought into alignment and tightened onto vertical pillar 4 by bearing points *b*, *a*, *a'*, *c*, *c'*, which prevents any dropping of the end of the end of arm 3, owing to the fact that there is no longer any clearanee between the horizontal arm and the vertical pillar; moreover, tightening onto bearing points *a*, *a'*, *c*, c', takes place in a uniform manner contrary to what occurred in earlier machines where it was to operator who carried out said tightening in a variable manner on systems provided with nuts independent of one another; under these conditions it is possible to carry out the most accurate operations by means of the tool mounted in tool-holder 8.

When it is again necessary to maneuver horizontal arm 3 along vertical pillar 4, said arm 3 must be unclamped in order to reestablish, in a way, the clearance necessary for the sliding of said arm along the pillar. For this purpose a second contact maker (which is not shown in the drawing) is operated and starts motor 1 in the opposite direction. The above described movements are reproduced in reverse order until the unclamping of the five bearing points *a*, *a'*, *b*, *c*, c', has been obtained. The effect of said movements in reverse order is to cause yoke 13 to rise and return to its original location and, with it, rod 56. Contact maker 53 is then actuated by cam 55 thus switching off the current which feeds the motor when release of the clamping has been obtained.

It should be noted that rocking levers 21 ensure the equality of the stresses on the bearing

points of levers **24, 25** (which apply the horizontal arm against its guide **5**) and on the bearing points of levers **29** and **30** (which apply to horizontal arm against its guide **5**) and on the bearing points of levers **29** and **30** (which apply square bracket **2** against its guide **5**) which contributes to the uniformity of the tightening on bearing points *a*, *a'*, *c*, *c'*.

It should likewise be noted (refer in particular to Fig. 3) that, at the top of the motor, spindle **9** is provided with a bold head **58** capable of being operated by means of a wrench which makes it possible to carry out clamping and unclamping by hand.

As has been seen, the magnitude of the gripping effect on bearing points *a*, *a'*, *b*, *c*, *c'* depends fundamentally on the mounting loads of springs **14** and **45**. Nevertheless, it is possible to adjust said gripping effect easily according to the requirements of the moment without being compelled to dismantle the above described device either wholly or partly.

In order to effect the adjustment of the gripping effect on bearing points *a*, *a'*, *b*, *c*, *c'*, the method of proceeding is as follows:

For bearing points *a*, *a'*, *c*, *c'*, it is sufficient to adjust the lengths of links **17** (which are threaded to the right at one end and to the left at the other end for this purpose). The length of links **17** can be adjusted, for instance, so that there shall be a clearance of .05 millimeters at bearing points *a*, *a'*, *c*, *c'*.

As regards bearing point *b* it is sufficient to adjust the length of rod **44** so that there shall, for instance, be a clearance of .05 millimeters between the outer edge of pillar **4** and heel-piece **50** of rod **49**. The clearance between the inside edge of the pillar and the cross-piece in line with part **49** should not exceed .01 millimeter. Adjustment of the length of rod **44** is effected by means of a nut with double inverse tapping. The adjustment should be such that, when tightening up, bearing point *b* is clamped before points *a*, *a'*, *c*, *c'*.

In addition, the location of cam **54** is adjusted so that the switching off of the current may occur at the moment when spring **14** begins to give; said yielding can be detected by observing the end of spindle **9** which protrudes from the top of the motor and which moves downwards when the spring flexes.

Finally, the location of cam **55** is adjusted so that the switching off of the current may occur in such a way that the center of articulation of yoke **13** offset by about 10 millimeters relatively to the straight line joining the centers of articulation of links **17** on rocking levers **19** and **20**.

Prior to making any adjustment, care will be taken to make the rocking levers **19** and **20** butt against the screws provided for that purpose on the upper wall of the square bracket and which are not shown in the drawing.

From the foregoing it will be seen that the gripping adjustment on bearing points *a*, *a'*, *b*, *c*, *c'*, can be carried out with the greatest facility and can be very readily modified whenever it becomes necessary.

The arrangement herein-before described and represented in the attached drawing has been given solely as an example; alterations may be made in details of embodiment without departing from the spirit and scope of the invention. Thus, in particular, the number and location of the bearing points provided according to the invention might differ from those indicated according to the type of machine to which the invention might be applied.

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