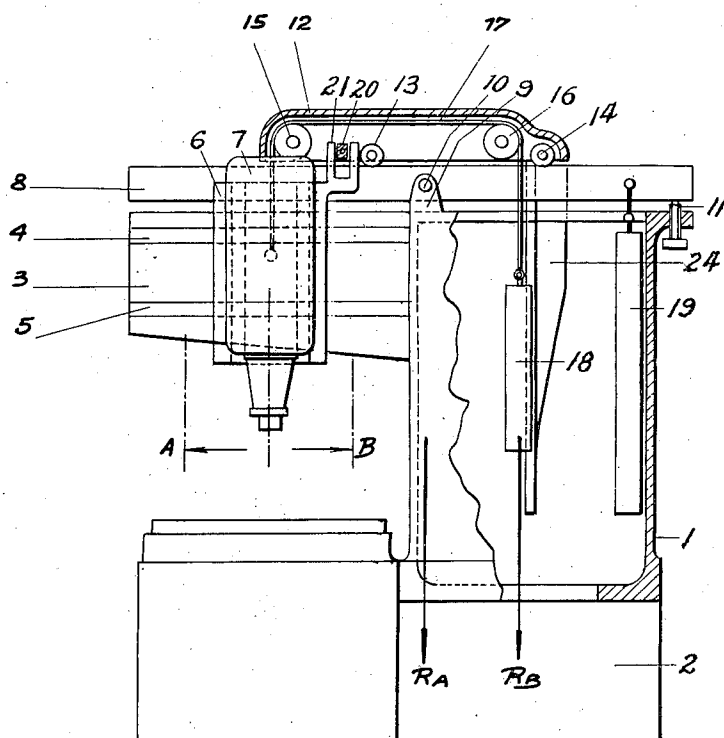


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M. PHILIPPE
MACHINE TOOL AND MORE PARTICULARLY TO
MARKING MACHINE WITH A CENTER
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Inventor
MAURICE PHILIPPE
By *Haseltine, Lake & Co.*
Attorneys

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MACHINE TOOL AND MORE PARTICULARLY
TO MARKING MACHINE WITH A CENTER

Maurice Philippe, Courbevoie, France, assignor to
Societe Anonyme A. B. G., and Societe Civile
d'Etude des Inventions et Procèdes Philippe,
Paris, France

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The present invention has for its main object to provide an improvement in machine-tools and in particular in marking machines with a center, which comprises a movable tool-holder on an extension arm supported in over-hanging position on the frame. The invention aims at overcoming the drawbacks which arise from the elastic deformation to which the extension arm is subject, however great the moment of inertia thereof may be, under the effect of the weight of the tool-holders; such deformations are, besides, variable according to the position of the tool-holders on the extension arm.

To this effect, this invention is chiefly characterized by the novel application to such machines of means for, at least in part, compensating the bending moment exerted on the extension arm by the weight of the tool-holder so as to relieve said extension arm of the supporting function and make said arm serve solely the function of guiding the horizontal movements of the tool.

The means considered to be preferable according to this invention consists in balancing the weight of the tool-holder, at least in part, by an opposing force exerting no reaction upon the extension arm.

This invention comprises within its scope all forms of embodiment of that principle, and in particular those which are characterized by the following features applied severally or in all their combinations:

(a) The reaction of the opposing force is exerted upon a support independent of the extension arm.

(b) The opposing force is provided by a counter-weight.

(c) The tool-holder and the counter-weight are interconnected by a flexible connecting means guided by pulleys or equivalent means such as sprockets and chain, or the like.

(d) The pulleys are supported by a carriage movable on the independent support.

(e) The displacements of the movable carriage are controlled by those of the tool-holder along the extension arm.

(f) The counter-weight balancing the tool-holder is vertically guided by an element rigid with the movable carriage.

(g) The independent support comprises a guide-way for guiding the movable carriage parallel to the extension arm.

(h) The independent support is connected to the frame in such a way as to make it possible to adjust the parallelism thereof with the extension arm.

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(i) The independent support is pivoted on the frame substantially at its center and its rear end rests upon an adjustable abutment.

(j) An opposing force such as that exerted by a counter-weight or a spring retains the independent support upon the adjustable rear abutment thereof.

(k) Abutments on the independent support restrict the movements of the movable carriage.

(l) The resulting force of the various fixed and movable loads exerted upon the frame remains at all times within the polygon of support of the latter, whatever the position of the movable elements may be.

This invention is applicable to all machine-tools comprising a tool-holder movable upon an over-hanging extension arm. However, it is more particularly adapted to precision machines such as large capacity marking machines with a center. This invention then enables the providing of a new article of manufacture constituted by a marking machine with a center of large capacity, which is entirely clear of any upstanding standard on three of its sides, whereas known machines comprise a pair of standards between which is mounted the support for the tool; it will be understood that this invention, the use of which eliminates any elastic deformation in the extension arm during the horizontal displacements of the tool-holder, and maintains for all positions of the latter a constant distance between the tool and the work-table of the machine, permits the manufacturer to do away with such standards. The limitation incurred by the latter with respect to the dimensions of work-pieces which the machine is capable to machine, is therefore suppressed, while the ease of access for the operator is enhanced. Such outstanding advantages are characteristic of the new article of manufacture constituted by the marking machine with a center according to this invention.

The appending drawing represents by way of example only, and in diagrammatic showing, a form of embodiment of such a marking machine with a center.

The frame 1 is rested upon a base 2 and comprises at its upper portion an extension arm 3 having a pair of slide-ways 4 and 5 on which is reciprocable a slide-block 6 receiving the tool-holder 7. A horizontal girder 8 surmounts the frame 1 and the arm 3; said girder is pivoted at its center on a support 9 secured to the frame by means of a horizontal pin 10; the end thereof opposite to the extension arm rests upon

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an adjustable abutment formed by a supporting screw 11, making it possible to adjust the horizontality of said girder, which has no point of contact with the extension arm on which the tool-holder slide-block 6 is horizontally movable. A carriage 12 is displaceable through the medium of rollers 13 and 14 on the upper side of the girder 8 which thus constitutes a support and a runway for said carriage 12; the latter carries a pair of pulleys 15 and 16 over which is trained a cable 17 fixed on one hand to the tool-holding head 7 and on the other hand to a balancing counter-weight 18 displaceable within the frame 1. For maintaining at all times the end of the supporting girder 8 in engagement with the supporting screw 11, a fixed counter-weight 19 produces on the pivotal axis 10 an opposing moment which at all times is greater than that set up by the tool-holder, even when the latter occupies its farthest position at the very end of the arm 3. The slide-block 6 is made to drive the carriage 12 by any suitable means, such as a projection 20 engaging a yoke 21 rigid with the carriage 7. Projection 20 is preferably formed as a bushing freely rotatable on a pin rigid with the carriage 12. Said yoke is so designed as to permit of a slight amount of relative vertical displacement in translation between said bushing and the arms of said yoke.

Thanks to the above arrangement, the girder 8 supports the tool-holding head 7 and the balancing counter-weight 18 thereof, without the arm 3 taking any part in said supporting action; the possible deformations which the girder 8 may be subject to under such load will be merely expressed as a vertical displacement of the counter-weight 18, without any additional stress being applied to the arm, the function of which is solely to guide the tool-holding slide-block 6 in the horizontal movement thereof. The vertical displacement of the tool-holding head 7 is accomplished without any effort thanks to the balancing counter-weight 18. A guiding device 24 integral with the carriage 12 prevents any oscillations which could arise from the effect of inertia during the reciprocation of said carriage.

The whole structure is so dimensioned and disposed that the resultant (R_A for the foremost position A of the toolholder, R_B for the rearmost position B of the tool-holder) of the various movable loads (slide-block 6, tool-holder 7, carriage 12, counter-weight 18) and the fixed loads (supporting girder 8 and counter-weight 19) applied to the frame 1 at all times remains within the supporting polygon of the frame, even for the maximum displacements. In this way, the frame is made to work in compression only; all bending stresses are eliminated, and thereby the relatively considerable deformations which could result therefrom.

By the use of the arrangements according to this invention, there is provided a marking machine with a center making possible the machining of parts of large dimensions, while at the same time permitting of easy access for the operator. In fact, the work-table is entirely clear of any upstanding support on three of its sides, whereas according to the conventional arrangement, large capacity marking machines with a center comprise a pair of standards between which the tool-holder is mounted. The spacing between such standards defines a maximum dimension for the work-pieces which it is possible to machine on such machines. According to this invention, on

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the contrary, although the supporting arm is over-hanging with respect to the frame and thereby enables the above mentioned results to be attained, any elastic deformation of the supporting arm, when the tool-holding slide-block is subject to longitudinal reciprocation, is suppressed and the spacing between the tool and the work-table is maintained accurately constant for all positions which the tool may occupy along said arm.

Of course, the form of embodiment and application which has been described and illustrated has been given by way of example only, and it is possible, without exceeding the scope of this invention, to alter in any suitable way the number, shape, type, disposition and mounting of the various elements.

In particular, the reaction element for compensating the weight of the tool-holder could be other than a counter-weight; it could for instance be a support independent of the frame of the machine acting in the manner of a crane and arranged for example within said frame. There could likewise be conceived an adjustable tension spring device fulfilling a function similar to that of the above-described counter-weight, or any other device capable of assuming the same compensating function. Pulleys 15 and 16 with their cable 17 could be replaced by any equivalent device, such as chain and sprockets or the like.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a marking machine, a frame, an extension arm integral with said frame in overhanging position, a tool-holder, guiding means for guiding said tool-holder horizontally and vertically on said extension arm, compensating means for at least partially compensating the load of said tool-holder and said guiding means on said extension arm, a support independent of said extension arm and carried by said frame, and means connected with said tool-holder and with said compensating means for transferring to said support the stresses due to said load and to said compensating means.

2. In a marking machine, a frame, an extension arm integral with said frame in overhanging position, a tool-holder, guiding means for guiding said tool-holder horizontally and vertically on said extension arm, compensating means for at least partially compensating the load of said tool-holder and said guiding means on said extension arm, a support independent of said extension arm, a horizontal pivotable axis carried by said frame and by said independent support, adjusting means for adjusting the position of said independent support and thereby the parallelism of said support with said horizontal guiding means and means connected with said tool-holder for transferring to said support the stresses due to said load and to said compensating means.

3. In a marking machine, a frame, a horizontal extension arm integral with said frame in over-hanging position, a tool-holder, guiding means for guiding said tool-holder horizontally and vertically on said extension arm, a support independent of said extension arm, a horizontal pivotable axis carried by said frame and said independent support, adjusting means for adjusting the parallelism of said independent support with said horizontal guiding means, means for compensating the load of said tool-holder and of the horizontally and vertically guiding means thereof, and a carriage connected with said tool-holder and movable in translation on said independent

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support for supporting the stresses due to said load and to said compensating means.

4. In a marking machine, a frame, a horizontal extension arm integral with said frame in over-hanging position, a tool-holder, guiding means for horizontally and vertically guiding said tool-holder on said extension arm, a support independent of said extension arm, a horizontal pivotable axis carried by said frame and said independent support, adjusting means for adjusting the parallelism of said independent support with said horizontal guiding means, a carriage movable in translation on said independent support, friction rollers interposed between said carriage and said independent support, pulleys carried by said carriage, and a flexible cable trained over said pulleys and bearing at one of its ends said tool-holder and at its other end a compensating counter-weight.

5. In a marking machine, a frame, a horizontal extension arm integral with said frame in over-hanging position, a tool-holder, a slide-block, horizontal slide-ways provided in said extension arm for the displacement of said slide-block, vertical slide-ways provided in said slide-block for the displacement of said tool-holder, a support independent of said extension arm, a horizontal pivotable axis carried by said frame and said independent support, adjusting means for adjusting the parallelism of said independent support with said horizontal slideways, a carriage movable in translation on said independent support, friction rollers interposed between said carriage and said independent support, pulleys carried by said carriage, a flexible cable trained over said pulleys and bearing at one of its ends said tool-holder and at its other end a compensating counter-weight, a vertical slideway integral with said carriage for

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guiding said counter-weight, a projection integral with said carriage and a yoke integral with said slide-block adapted to engage said extension.

6. In a machine-tool for precise machining in which the weight of the tool-holder should not exert on the support means thereof any bending stress detrimental to the precision of adjustment, a frame, a horizontal extension arm integral with said frame in over-hanging position, a tool-holder, a slide-block, horizontal slide-ways provided in said extension arm for the displacement of said slide-block, vertical slide-ways provided in said slide-block for the displacement of said tool-holder, a support independent of said extension arm, a horizontal pivotable axis carried by said frame and said independent support, adjusting means for adjusting the parallelism of said independent support with said horizontal slide-ways, a carriage movable in translation on said independent support, friction rollers interposed between said carriage and said independent support, pulleys carried by said carriage, a flexible cable trained over said pulleys and bearing at one of its ends said tool-holder and at its other end a compensating counter-weight, a vertical slide-way integral with said carriage for guiding said counter-weight, a projection integral with said carriage and a yoke integral with said slide-block adapted to engage said extension.

MAURICE PHILIPPE.

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The following references are of record in the file of this patent:

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