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Filed Dec. 4, 1942

Serial No. 467,858

2 Sheets-Sheet 1

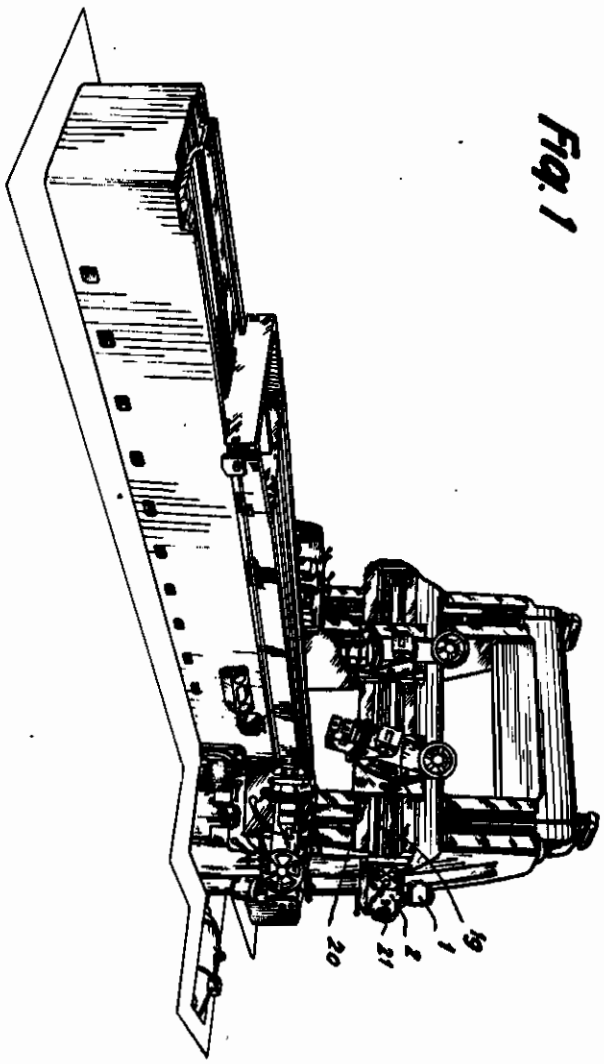

Fig. 1

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Fig. 2

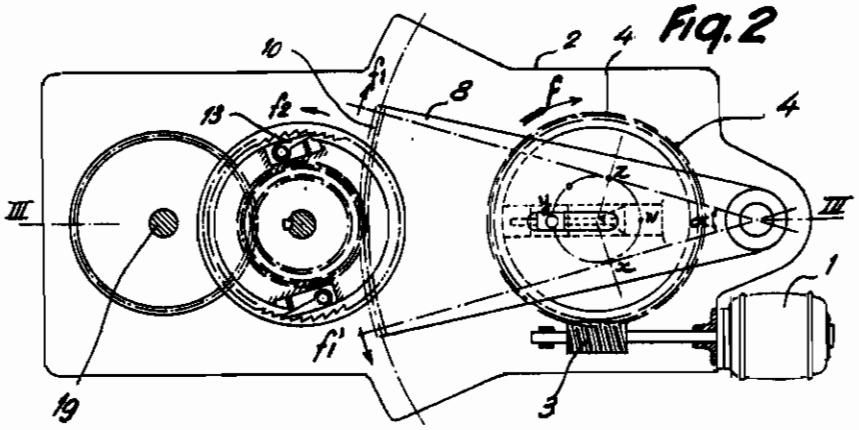
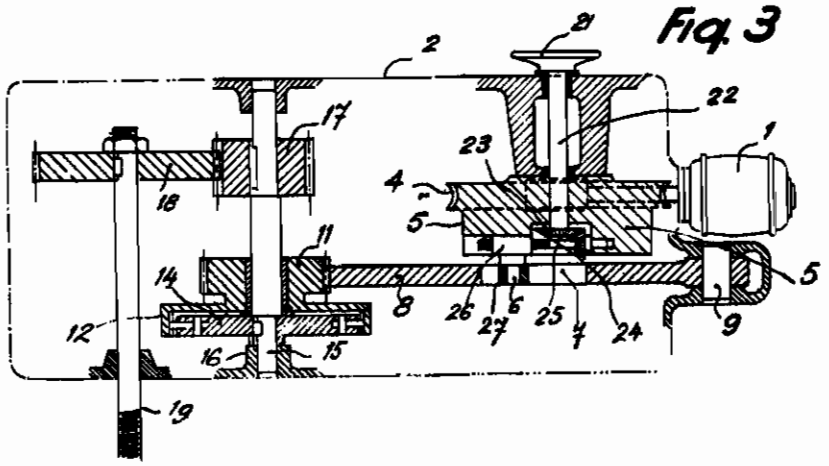


Fig. 3



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ALIEN PROPERTY CUSTODIAN

DEVICES FOR ADJUSTING THE FEED OR DISPLACEMENT OF CERTAIN PARTS OF MACHINE-TOOLS OR THE LIKE

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The present invention relates to devices for adjusting the feed or displacement of certain parts of machine-tools or the like.

Up to the present time, the devices used for the adjustment of the feed of the tool (in a planing machine) or of the table (in a shaping machine or in a slotting machine or a punching machine for instance) were constituted either by friction devices, rack and pawl systems, connected to the main control of the machine, or by autonomous electric motors which were electrically braked (by counter current or through magnetic means) and all these devices were of a great mechanical complication and of a high cost while being rather delicate to conduct.

As a rule, the stopping of these devices was not instantaneous and a certain supplementary path was travelled over after the exact time where said stopping was to take place. Furthermore, this supplementary path was variable (in particular in accordance with the speed and the inertia of the moving parts) and it was impossible to determine it in a very accurate manner. Under such conditions, such devices did not permit of obtaining an exact and invariable adjustment of the feed of the tool or of the table.

The object of the present invention is to provide a device of the type above mentioned, which obviates these drawbacks.

With this object in view, an essential feature of the invention consists in the use of an electric motor which is mounted directly upon the feed box without any intermediate transmission and which controls an oscillating part, the amplitude of movement of which determines the value of the feed and is itself driven by a crank pin system which turns through a full revolution after each stroke of the table (for instance in the case of a planing machine) or of the tool (for instance in the case of a planing machine or a slotting machine).

According to another feature of my invention, the means for transmitting movement from the above mentioned oscillating element to the part which controls the feed includes a pawl and ratchet device, the combination of said device and of the oscillating element making it possible to avoid the necessity of reversing the direction of movement of the control motor. Furthermore, as the feed is determined solely by the adjustable amplitude of the movement of the oscillating element, there is no necessity of having the control motor stopped in an accurate manner at a predetermined point, as in the systems used prior to this invention.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

A preferred embodiment of the present invention will be hereinafter described with reference to the accompanying drawings given merely by way of example and in which:

Fig. 1 is a perspective view of a planing machine having a single vertical frame and which is made according to the present invention.

Fig. 2 is a cross section of a feed box made according to the invention; and

Fig. 3 is a sectional view on the line III—III of Fig. 2.

As shown by the drawing, in order to produce the feed, for instance in a planing machine, I make use of an electric motor 1 which is fitted on the casing 2 of the feed control device. The shaft of this motor carries an endless screw 3 which meshes with a helical wheel 4 carried by a disc 5 (Figure 3). This disc 5 carries a crank pin 6, the position of which is adjustable, in a manner which will be hereinafter described, in an elongated slot 7 provided in an oscillating piece 8 which constitutes one of the essential parts of the device according to the present invention.

This oscillating piece 8 is pivoted about an axis 9 carried by the wall of casing 2. The periphery of said oscillating piece forms a toothed sector 10 which meshes with a toothed wheel 11 rigid with a toothed wheel 12 provided with inner teeth so as to form a ratchet wheel (Figure 2).

The teeth of said ratchet wheel are adapted to cooperate with pawls 13 pivotally mounted on a disc 14 keyed on a shaft 15 journalled in bearings 16, carried by the casing of the device. On this shaft 15 there is also keyed a pinion 17, which meshes with the toothed wheel 18, the latter driving feed screw 19 which causes tool-carriage 20 to move forward a given distance.

The position of crank pin 6 in the slot 7 of oscillating piece 8 is adjusted by means of an operating hand wheel 21 located on the outside of the casing and rigid with a spindle 22, the inner end of which carries, fixed thereon, a bevel pinion 23. This pinion 23 meshes with another bevel pinion 24 keyed on a shaft 25, having a threaded portion upon which can move a nut 26 rigid with a block 27, in which crank pin 6 can turn and which can slide in slot 7.

When motor 1 is in operation, it drives through the transmission above described, crank pin 6, which then moves along a circle shown in dot-and-dash line at $x—y—z—w$ of Figure 2. As a consequence of this, oscillating sector 8 is caused

to oscillate between two extreme positions (the extreme positions of the axis of symmetry of oscillating piece 8 are shown in dot-and-dash lines in Fig. 2). Under these conditions, the amplitude of the movement of the oscillating piece will remain the same as long as the eccentricity of crank pin 6 is not changed and consequently the rotation of wheel 12, disc 14 and feed screw 19 will also remain the same as long as the eccentricity of crank pin 6 is not varied.

If, for instance, motor 1 runs in such manner as to drive wheel 4 in the direction of arrow *f* (Figure 2), oscillating piece 8 will move in the direction of arrow f_1 and ratchet wheel 12 in the direction of arrow f_2, driving disc 14 which carries pawls 13, in the same direction, together with shaft 15. The rotation of said shaft 15 will be transmitted through pinion 17 and toothed wheel 18 to the feed screw 19 of the tool carriage.

This feed movement will take place during the portion of the movement of crank pin 6 corresponding to the circular arc *x*—*y*—*z*. When, under the action of the motor turning always in the same direction, crank pin 6 moves along circular arc *z*—*w*—*x*, oscillating piece 8 turns in the opposite direction, that is to say in the direction of arrow f'_1 (Figure 2). In the course of this last mentioned movement ratchet wheel 12 turns in a direction opposed to that of arrow f_2 and pawls 13 slide over the teeth of said ratchet wheel. In other words, when crank pin 6 moves through circular arc *z*—*w*—*x*, disc 14 and, consequently, shaft 15 and feed screw 19 are not driven. The feed movement is therefore stopped when crank pin 6 comes to point *z* and said movement can be resumed only when crank pin 6 passes at point *x*.

If the position of crank pin 6 in slot 7 (that is to say the eccentricity of said crank pin) is modified, the radius of circumference *y*—*z*—*w*—*x* is varied. the limit of variation being zero (crank pin 6 being then co-axial with disc 5) and a maximum value. I thus vary the angle of amplitude α of the movement of the oscillating piece and, consequently, the angle of rotation of toothed wheel 11 and finally the value of the angle of rotation of feed screw 19 which determines the feed. Thus, the value of the feed depends exactly upon the amplitude of the movement of oscillating piece 8, which can be adjusted to the desired value in a highly accurate and invariable manner.

It has been explained that the feed movement takes place while crank pin 6 is moving through circular arc *x*—*y*—*z* and that circular arc *z*—*w*—*x* corresponds to no movement of the transmission elements 14—15—17—18—19. This zone *z*—*w*—*x* is thus available for stopping the movement of the motor at one of the ends of the stroke of the planing machine table.

Supposing that Figure 2 shows the adjustment for the maximum feed, it will be seen that zone *z*—*w*—*x* has at this time a minimum value. If, for instance, this feed movement corresponds to about $^{200}/_{360}$ of a revolution of crank disc 5 (circular arc *x*—*y*—*z* of the travel of crank pin 6), the motor will stop at any point of the remaining $^{160}/_{360}$ of the circumference (circular arc *z*—*w*—*x* of the travel of crank pin 6. In other words, it is not necessary to obtain any delicate adjustment of the stopping of the engine.

If, as in the embodiment illustrated by the drawing, I consider the case of a planing machine, the table, when reaching the end of its stroke, closes the circuit in motor 1 which starts running, crank pin 6 starting from any point of circular arc *z*—*w*—*x*. This crank pin travels over circumference *x*—*y*—*z*—*w* in the direction of arrow *f*, the feed movement beginning when said crank pin reaches point *x* and ending when the crank pin has reached point *z*. When it has moved slightly past this last mentioned point, the very movement of said crank pin causes the circuit of motor 1 to be opened through an electric device not shown by the drawing, whereby crank pin 6 stops at any point of circular arc *z*—*w*—*x*, where it is ready to resume its movement for a new stroke of the table.

The preceding explanations show that the invention, in addition to the very high accuracy which can be obtained in a very simple manner for adjusting the feed of the tool or all other part, has the advantage of utilizing a matter which has not to be reversed in operation except for the quick and continuous displacement of the carriages which has not been shown on the drawing as being not a part of the present invention.

The device above described and illustrated by Figs. 2 and 3 can be placed, as shown by Fig. 1, at the end of the cross piece of the planing machine. In big machines, it might also be mounted on the carriage itself.

The same device is also applicable not only to control the feed of the tool in planing machines but also to the control of the tables in shaping machines or slotting machines for instance. In a general manner, the device according to the invention can be applied to all kinds of machines of which it is necessary to obtain, at predetermined times, an accurate feed or displacement of a part of the machine.

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