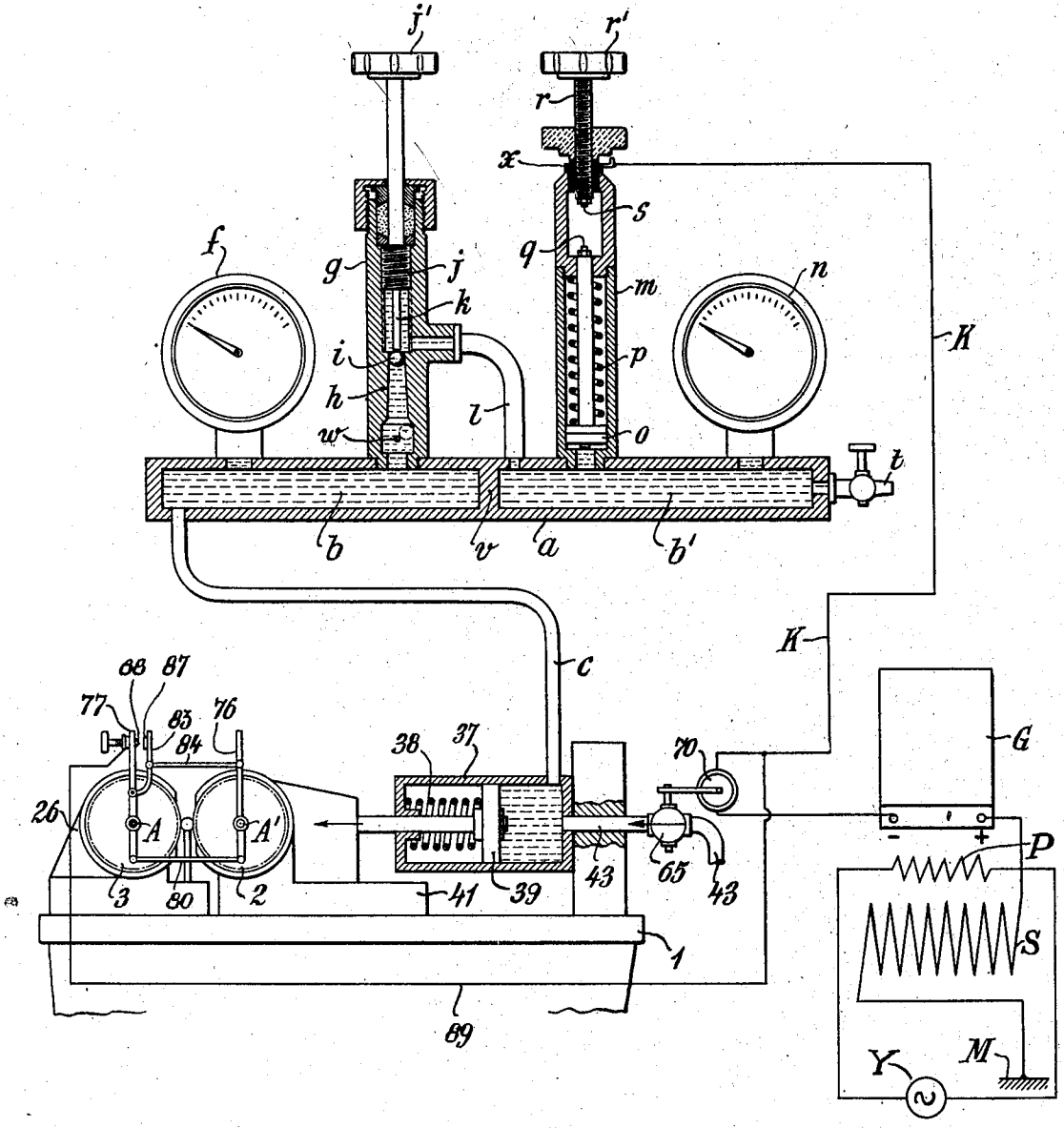
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MACHINE TOOLS AND THE LIKE

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MACHINE TOOL AND THE LIKE

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My invention relates to improvements in machine tools and the like, and more particularly in operating mechanisms provided in such machine tools. The object of the improvements is to provide time controlled means in connection with the said operating mechanisms for preventing excessive pressure to be built up which might destroy either the operating mechanism or the blank.

My invention may be used for example in screw-threading machines of the type described in the copending application for patent of Plagemann and Wemhöner, Patent No. 2,257,253 issued September 30, 1941, the time controlled means being used in connection with the supply of oil under pressure to the cylinders for advancing the roller dies towards each other. In the following I shall describe the invention with reference to the said screw-threading machine. But I wish it to be understood that my invention is not limited to such use, and that it may be embodied in other machine tools.

As has been described in the said application for patent, externally screw-threaded roller dies are provided for sinking screw-threads in a blank placed between the same, the said roller dies being rotated in the same direction and being advanced towards each other while rolling takes place for sinking the thread into the blank. In the said machine means are provided for interrupting the feed of the roller dies towards each other when the threads have been sunk to the desired depth.

The blanks to be screw-threaded in the said machine are first reduced on a suitable machine to a definite diameter, so that after sinking the screw-threads into the same a screw of the desired diameter is obtained. If the diameter of the blank to be threaded on the machine is too large, the screw-thread is finished before the roller dies have been advanced to the end of their strokes, and if rolling and feeding of the dies is continued excessive pressure is built up, whereby the blank or parts of the machine, and particularly the expensive roller dies may be injured.

In my improved machine the feeding movement of the roller die or dies is continued only until the screw-thread has been finished, whereupon the feeding movement is automatically interrupted, and for this purpose the said time controlled interrupting means are provided. In the operation of the machine a blank of normal size is first placed on the machine, and the time needed for sinking the screw-thread into the same is ascertained, and thereafter the following blanks, which may have the exact size or which may be too thick or too small in diameter, are placed on the machine, and the machine is operated exactly the time previously ascertained by working a blank of normal size. If now the blank to be worked has the exact diameter of the normal blank, the work is automatically interrupted either by my improved time controlled means or by means which are made operative when the roller dies have arrived in their end positions. If, however, the blank is too thick, the feed of the roller die or dies is interrupted by the time controlled means and before the roller dies have arrived in their predetermined end position or positions. If, however, the blank is too small in diameter, the feed is interrupted in the end position of the die or dies and before the thread has been finished. Thus, my improved means also enable me to distinguish screws of abnormal size from screws of normal size which are suitable for sale.

In the preferred embodiment of the invention the time controlled means depend on the flow of a part of the pressure fluid advancing the roller die or dies through an orifice of a definite area. In the embodiment of the invention described herein the fluid supply is connected with a conduit including a throttle valve through which the said part of the liquid is forced into a portion of the conduit connected with a piston adapted to be shifted by the fluid flowing through the said orifice and to interrupt the supply of pressure fluid to the roller die feeding mechanism.

For the purpose of explaining the invention an example embodying the same has been illustrated in the accompanying drawing, the said drawing showing the device in a diagrammatical way and partly in section.

In the said drawing certain parts of the machine illustrated in the said application for patent have been illustrated and corresponding parts have received the same reference characters as in the said application. The said parts are a bed 1 on which the operative parts are mounted, two roller dies 2 and 3, a bearing 26 fixed to the bed 1 and having the roller die 3 rotatably mounted thereon, a slide 41 on which the roller die 2 is mounted, a cylinder 37 fixed to the bed and having a piston 39 mounted therein, the said piston engaging the slide 41 for urging the same with its roller die 2 towards the roller die 3 and being acted upon a spring 38 tending to retract the same from the roller die 3, a pressure liquid supply 43 connected with the said cylinder and

including a three-way valve 65, and an electromagnet 70 controlling the said valve.

On the axes A and A' of the roller dies levers 76 and 77 are mounted which are connected at their lower ends by a link 80, and to the lever 77 an arm 83 is jointed which is connected with the lever 76 by a link 84, the lever 77 and arm 83 carrying contacts 88 and 87. The contact 87 is grounded, and the contact 88 is insulated from the lever 77 and connected by a lead 89 with the electromagnet 70.

The cylinder 37 is connected by a pipe *c* with a conduit *a* divided by a partition *v* into two chambers *b* and *b'*. The said chambers are provided with pressure gauges *f* and *n*, and they are connected with each other through a branch conduit providing an orifice. As shown, the branch conduit comprises a cylindrical body *g* fixed to the left hand part of the conduit *a* and formed with a tapering bore *h* forming the said orifice. Within the said bore *h* there is a spherical plug or ball *i* normally resting on a pin *w* and adapted to be forced upwardly by the flow of the liquid rising within the bore *h*. The upper part of the body *g* is internally screw-threaded, and it contains a screw-threaded stem *j* which is adapted to be screwed inwardly or outwardly by means of a knob *j'*. The bottom end of the stem *j* is in the form of a needle *k* adapted to limit the upward movement of the spherical valve body *i* in accordance with the position of the stem *j*.

The right hand chamber *b'* communicates with the upper part of the bore of the body *g* through a pipe *l*. To the right hand part of the conduit *a* providing the chamber *b'* a cylinder *m* is fixed in which a piston *o* is mounted, a spring *p* urging the piston *o* downwardly. At its upper end the rod of the piston *o* is in the form of a switch contact *q* which is electrically connected with the cylinder *m* and with the ground. In an insulating stuffing box *x* of the cylinder *m* a screw *r* is guided which is provided with a switch contact *s* and which is adapted to be screwed inwardly and outwardly by means of a knob *r'*.

The chamber *b'* is provided with a vent *t* normally closed by a valve for removing air from the chamber *b'*.

The insulated screw *r* and contact *s* are connected by a lead K with a source of electric energy which as shown comprises a transformer the primary P of which is connected with a source of alternating current Y, and the secondary S of which is connected to a rectifier G, the said rectifier transforming the alternating current into direct current. The lead K includes the electromagnet 70. The rectifier G is also connected with the circuit comprising the lead 89 extending between the electromagnet 70 and the contact 88.

The operation of the device in connection with the aforesaid screw-threading machine is as follows:

At first a blank of exact size is placed between the roller dies 2 and 3, the needle *k* is set so as to hold the ball *i* in a position to provide a suitable annular orifice between the same and the tapering wall *h*. For the present the ball *i* rests on the pin *w*. Pressure fluid is supplied to the cylinder 37 through the pipe 43, the said pressure fluid forcing the piston 39 and the slide 41 to the left and with the roller die 2 into contact with the blank. A portion of the pressure liquid flows through the pipe *c* into the chambers *b* and *b'* of the cylindrical body *a*, and it completely fills the said parts as has been indicated in the figure. The ball *i* is lifted by the liquid until it is arrested by the needle *k*. During this operation the pressure within the chambers *b* and *b'* is small, because the resistance opposed to the piston 39 is small. Now the roller dies 2 and 3 are rotated, and the supply of pressure fluid to the cylinder 37 is continued. By the increased resistance opposed to the roller dies during rolling the pressure within chambers *b* and *b'* rises, the said pressure being indicated on the gauges *f* and *n*. The flow of liquid within the chambers *b* and *b'* is controlled by the orifice between the ball *i* and the bore *h*. By the supply of liquid to the chamber *b'* and the increasing pressure thereof the piston *o* is gradually shifted upwardly in opposition to the pressure of the spring *p*. When the thread has been sunk in the blank, the screw *r* is screwed inwardly so far that the contacts *q* and *s* engage each other. Thus the electromagnet 70 is energized and the three-way valve 65 is closed as against the pipe 43 and opened to the outer air so that the piston 39 is forced to the right by the spring acting thereon, and the roller die 2 is retracted. The piston *o* is forced downwardly and on its seat, and it expels the liquid from the cylinder *m*.

The extent of the upward movement of the piston *o* indicates the time needed for sinking a screw-thread in the blank, and it depends on the area of the orifice provided by the bore *h* and the ball *i*. Should the extent of the upward movement of the piston *o* and the contact *q* not be suitable for a proper operation of the device, the orifice between the ball *i* and the bore *h* is varied by screwing the stem *j* inwardly or outwardly.

After the parts have thus been set into the proper positions, the regular work begins by placing a blank between the roller dies 2 and 3. The pressure liquid is supplied to the cylinder 37 for moving the roller die 2 into contact with the blank. During this movement no pressure liquid flows into the chamber *b'*, because the pressure within the cylinder 37 is not sufficient to lift the piston *o*. When rolling begins the pressure rises within the cylinder 37 and the chambers *b* and *b'*, and therefore the piston *o* is slowly moved upwardly, while the screw-thread is being sunk in the blank. Finally the contact *q* gets into engagement with the contact *s*, indicating that the screw-thread is finished. The electromagnet 70 is energized and the valve 65 is closed.

If the blank was too thick in diameter, the switch *q*, *s* is closed before the contacts 87 and 88 of the lever 77 and the arm 83 engage each other, and if the blank was too small in diameter, the contacts 77 and 88 engage, before the switch *q*, *s* is closed, thus indicating that the screw has not the regular size.

I claim:

1. In operating mechanism for cutting machines, the combination of means for advancing a tool toward a blank and into deforming engagement therewith, said means continuing to advance the tool into the blank to perform its operation, means responsive to the resistance encountered between said tool and blank, said latter means including a cutout operable to interrupt further deformation beyond a predetermined time interval, and means concurrently operable with said resistance responsive means for interrupting further tool advancement and resulting deformation beyond a predetermined point.

2. In operating mechanism for cutting machines, the combination of pressure fluid operated means for advancing a tool toward a blank and into deforming engagement therewith, said means

continuing to advance the tool into the blank to perform its operation, a conduit from said fluid operated means through which fluid may flow therefrom at an increased pressure during the tool advance into the blank, means operative by the increased pressure including a cut-out operable to interrupt further deformation beyond a predetermined time interval, and means concurrently operable with said pressure operative means for interrupting further tool advancement and resulting deformation beyond a predetermined point.

3. In a machine for rolling threads in a blank, the combination of a pair of roller dies between which said blank is positioned, a fluid pressure operated device for advancing one of said dies toward the other and into deforming engagement with said blank, means for relieving said fluid pressure when said first-named die has advanced a predetermined amount, and means controlled by said fluid pressure and concurrently operable with said first-named means for relieving said pressure after said first die has been advanced for a predetermined time interval.

4. In a machine for rolling threads in a blank, the combination of a pair of roller dies between which said blank is positioned, a fluid pressure operated device for advancing one of said dies toward the other and into deforming engagement with said blank, means for supplying fluid pressure to said device, a three-way valve operable to alternately admit pressure through said supplying means to the device and to exhaust pressure from the device to the atmosphere, means for moving said valve to exhausting position when said first die has advanced a predetermined amount, and means controlled by said fluid pressure and concurrently operable with said last-named means for moving said valve to exhausting position after said first die has been advanced for a predetermined time interval.

5. In a machine for rolling threads in a blank, the combination of a pair of roller dies between which said blank is positioned, a fluid pressure operated device for advancing one of said dies toward the other and into deforming engagement with said blank, means for supplying fluid pressure to said device, a three-way valve operable to alternately admit pressure through said supplying means to the device and to exhaust pressure from the device to the atmosphere, an electrical circuit, a switch in said circuit closable by said fluid pressure when said first die has advanced a predetermined amount, a second electrical circuit, a second switch in said second circuit closable when said first die has advanced for a predetermined time interval, and a solenoid common to both of said circuits for operating said valve.

6. In a machine for rolling threads in a blank, the combination of a pair of roller dies between which said blank is positioned, a fluid pressure operated device for advancing one of said dies toward the other and into deforming engagement with said blank, means for supplying fluid pressure to said device, a three-way valve operable to alternately admit pressure through said supplying means to the device and to exhaust pressure from the device to the atmosphere, an electrical circuit, a switch in said circuit closable by said fluid pressure when said first die has advanced for a predetermined time interval, and a solenoid in said circuit operatively connected to said valve, whereby said valve will be moved to pressure exhausting position when said switch is closed.

7. In combination with a screw thread rolling apparatus, means for classifying blanks relative to a predetermined size while being threaded comprising a tool, means for advancing said tool toward the blank and into deforming engagement therewith, said means continuing to advance the tool into the blank to perform its operation, means responsive to the resistance encountered between said tool and blank for interrupting further deformation when said blank is larger than the predetermined size, and means concurrently operable with said resistance responsive means and controlled by the advancement of said tool for interrupting further deformation when said blank is smaller than said predetermined size.

8. In operating mechanism for cutting machines, the combination of means for advancing a tool toward a blank and into deforming engagement therewith, said means continuing to advance the tool into the blank to perform its operation, time control means responsive to the resistance between said tool and blank, space control means responsive upon a predetermined tool advancement and concurrently operable with said time control means, and means common to both said time and space control means for interrupting further deformation of said blank.

9. In operating mechanism for cutting machines, the combination of pressure fluid operated means for advancing a tool toward a blank and into deforming engagement therewith, said means continuing to advance the tool into the blank to perform its operation, a conduit from said fluid operated means through which fluid may flow therefrom at an increased pressure during the tool advance into the blank, time control means responsive to the pressure in said conduit, space control means responsive upon a predetermined tool advancement and concurrently operable with said time control means, and means common to both said time and space control means for interrupting further deformation of said blank.

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