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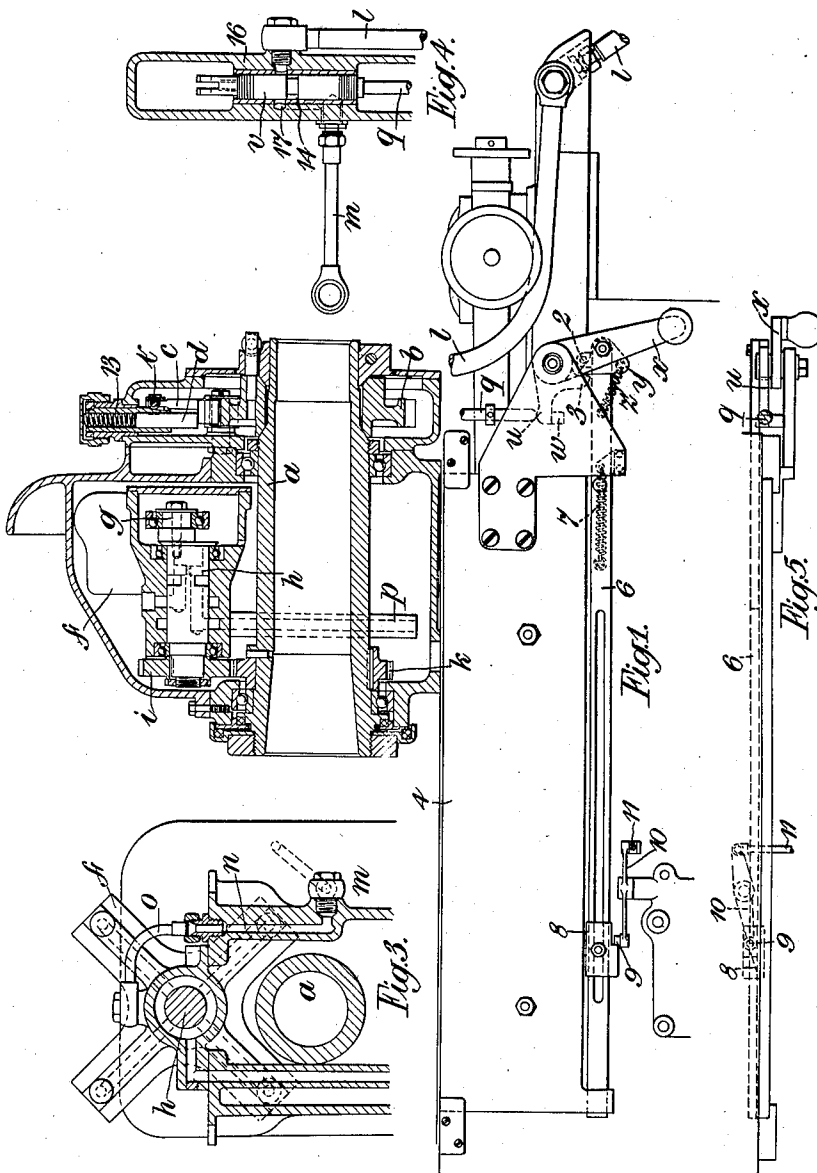
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INDEXING OR DIVIDING MECHANISM FOR MACHINE TOOLS

Filed April 23, 1932

2 Sheets-Sheet 1



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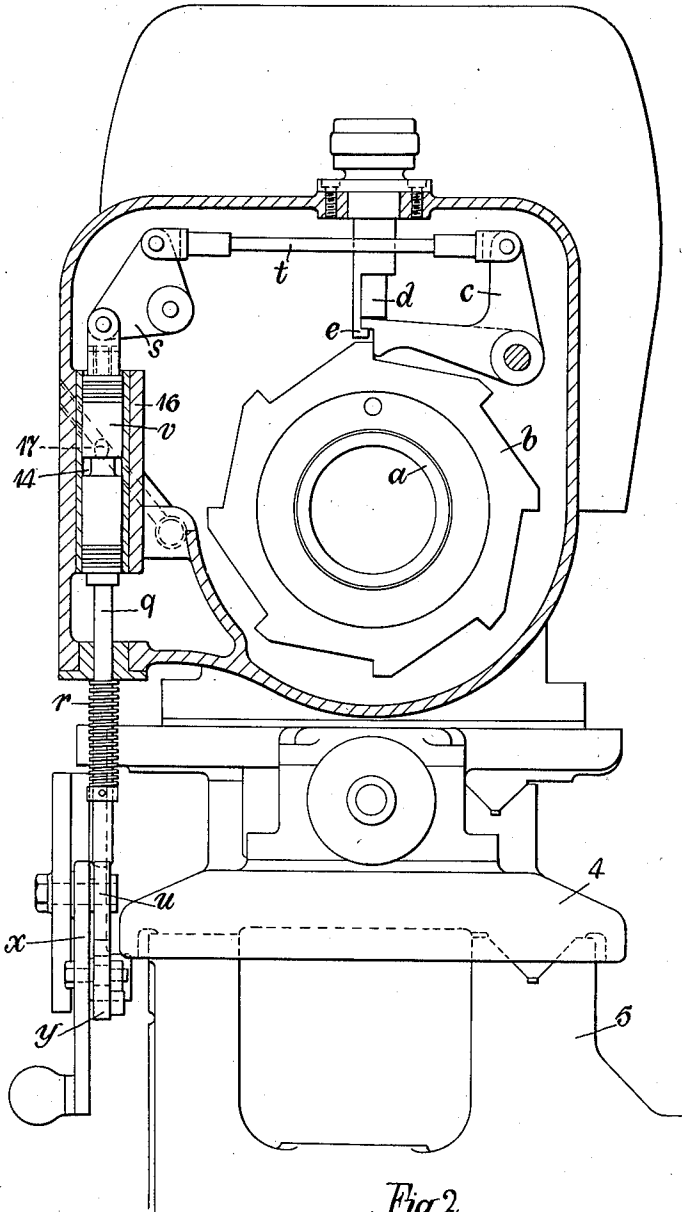


Fig. 2.

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INDEXING OR DIVIDING MECHANISM FOR
MACHINE TOOLS

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2 Claims. (Cl. 51—216)

This invention has for its object to provide improved indexing mechanisms, such as are employed in machines for cutting or grinding gear wheel teeth, splined shafts and for other analogous purposes.

The invention comprises the combination with a rotatable, notched, toothed or other like member connected with the work piece, of means for imposing a constantly acting torque on the said member, a pawl or its equivalent acting on the said member, and means for moving the pawl or its equivalent into and out of action.

In particular the invention comprises the combination with the rotatable member, of a fluid operated device for exerting the required torque.

Further the invention comprises the combination with the means for actuating the pawl or the like, of a valve for regulating the supply of fluid to the torque device.

In the two accompanying sheets of explanatory drawings:—

Figure 1 is a sectional front elevation of a portion of a machine provided with the invention and adapted for grinding spline shafts, gear wheels or like bodies by means of grinding wheels shaped to the contours of the surfaces to be ground, and Figure 2 is a sectional end view of the machine.

Figure 3 is a sectional end view illustrating a fluid operated motor for exerting torque on the work, and Figure 4 is a sectional front elevation of a valve for controlling the fluid supplied to the motor.

Figure 5 is a plan of the mechanism for actuating the pawl which engages a notched dividing plate on the headstock of the machine.

The machine illustrated is adapted more particularly for use in the grinding of splined shafts, gear wheels and like bodies, by means of a grinding wheel having its periphery shaped exactly to correspond with the contour of the faces to be ground, the grinding being effected by moving the work relatively to the rotating wheel in a direction parallel with the axis of the work, and the axis of the wheel being situated at right angles to the axis of the work. Alternatively the wheel may be moved parallel with the axis of a stationary work piece.

The work piece, or a spindle carrying the same, is carried at one end by the hollow spindle *a* of a headstock containing the dividing mechanism. This mechanism in accordance with the present invention, consists of a ratchet wheel *b* secured to the spindle, the pitch of the teeth of the ratchet wheel corresponding exactly to the angular move-

ments required to be given to the spindle after each grinding operation. The spindle is held against movement during the grinding operation by the engagement therewith of a pivoted pawl *c*. The pawl is held in engagement with the ratchet wheel by a plunger *d* which may be loaded by a spring 13 or weight, and the extent to which the pawl can be pressed into engagement with the ratchet wheel is limited by a fixed abutment *e*.

In the headstock is arranged a multicylinder fluid motor *f* in each cylinder of which is a piston, all the pistons being arranged to act on a common crank *g* provided on one end of a spindle *h* which is connected with the spindle *a* by gear wheels *i*, *k*. The spindle *h* may be adapted in any convenient manner to control the supply of motor fluid, (usually oil) to and from the various cylinders of the motor. The fluid is conveyed by a pipe *l* from a pump or other convenient source to a valve *v* to be hereinafter described, and after passing through this valve it flows along a pipe *m* (Figures 3 and 4) to a passage *n* which communicates by means of a pipe *o* with the housing or bearing of the spindle *h*. Exhaust fluid from the motor passes back to the pump or other source through a pipe or passage *p*.

By means of the fluid motor, a constant torque is exerted on the spindle *a* which torque is resisted by the pawl *c* when the latter engages a tooth of the ratchet *b*. Under the combined and opposing actions of the motor and pawl, the spindle *a* is effectively held against accidental movement during the grinding operation.

After each operation, the required angular movement is given to the spindle *a* for bringing another part of the work piece under the action of the grinding wheel by momentarily releasing the pawl *c* from the ratchet wheel. This is effected in the example illustrated by means of a rod *q* acted on by a spring *r* and connected through the valve *v*, a bell crank lever *s* and link *t* to the pawl. Upward movement is given to the rod *q* for releasing the pawl by means of a lever *u* which at one end is supported on a fixed stop *w*. Co-axially with the lever *u* is pivoted a hand lever *x* carrying a detent *y* controlled in one direction by a spring *z*, and in the other direction by, for example, a peg 2 rigid with a lug on a slidable slotted bar 6 which is connected at one end to the lever *x* and is hereinafter referred to. Referring to Figure 1, movement of the lower end of the hand lever *x* to the left causes the detent *y* to engage a shoulder 3 on the lever *u* and move the lever *u* in the direction for lifting the rod *q*

and releasing the pawl *c*. As soon as the detent *y* passes the shoulder 3 the rod is free to return under the action of the spring *r* and thereby re-engage the pawl *c* with the ratchet. During the
 5 opposite movement of the hand lever *x* towards the right, the detent *y* rocks idly on the lever *x* against the spring *z* and so enters into re-engagement with the shoulder 3 without moving the lever *u*.

10 Actuation of the lever *x* may be effected by hand or automatically. Automatic operation is effected as follows in the example illustrated. The headstock containing the spindle *a* is carried on a slide 4 which is reciprocated by any
 15 convenient means on the fixed bed 5 of the machine. At one side of the slide is carried the slotted bar 6 which as previously indicated is connected at one end to the lever *x* and is controlled by a spring 7. And on the bar is secured an ad-
 20 justable abutment 8 which can be engaged by a stop 9 on a lever 10 pivoted on an adjacent fixed part of the machine. This lever can be moved out of action when required by a link 11. As-
 25 suming the stop 9 to be in its active position as shown, movement of the slide to the right brings the abutment 8 into contact with the stop. As the bar 6 is now held by the stop, continued movement of the slide (which carries the lever
 30 *x*) to the right causes that lever to move towards the left and give an upward movement to the rod *q* for releasing the pawl *c* as above described. During the return movement of the slide the part
 35 8 is carried away from the stop 9 and the bar 6 and lever *x* are returned by the spring 7.

35 As soon as the pawl is released or disengaged from the ratchet *b*, the spindle *a* is rotated by the torque exerted on it by the motor *f*. The actuation of the rod *q* is only momentary, and therefore immediately after the pawl has been
 40 released, it is allowed to return in readiness for arresting the ratchet when the next tooth of the ratchet reaches the pawl.

40 It has already been mentioned that the motor *f* exerts a constant torque on the spindle *a*. This implies that pressure fluid is constantly acting on the motor, although fluid does not pass through the motor when the latter is at rest. While the motor is in motion it is desirable and
 45 necessary to provide it with an ample supply of pressure fluid, in order that it may operate quickly. But it is not desirable to allow the pawl to re-engage the ratchet when the latter is rotating at high speed; otherwise a detrimental
 50 blow will be given to the pawl each time it re-

engages the ratchet. I therefore employ the valve *v* to regulate the supply of fluid to the motor. When the pawl is in action as shown in
 80 Figure 2, the valve restricts the fluid passage between the pipes *l m* but does not completely intercept the passage. On raising the rod *q*, the valve is caused to open the passage and allow
 85 a free flow of fluid to the motor. As the rod *q* returns immediately after the pawl has been released, the free flow of fluid is only of brief duration and the valve is caused to restrict the flow and so prevent an excessive blow being given to the
 90 pawl when the latter encounters the next tooth on the ratchet.

90 Preferably the valve *v* is formed with a groove 14 for controlling the passage between the parts *l, m* and the part 16 containing the valve is formed with holes 17 which are narrower at one
 95 end than at the other (see Figure 2), the narrow end only being exposed to the groove when the pawl is in full engagement with the ratchet.

The invention is not limited to the example above described as subordinate details can be varied to suit different requirements. Also the
 100 invention is not limited to use on machines for shaping gear wheel teeth or splined shafts, as it may be applied to any other analogous uses in which indexing mechanisms are employed.

Having thus described my invention what I claim as new and desire to secure by Letters
 105 Patent is:—

1. In indexing or dividing mechanisms for machine tools, the combination with a rotatable toothed member connected with the work piece,
 110 of a fluid operated device for imposing a unidirectional constantly acting torque on the said member, a stop acting on the said member, means for moving the stop into and out of action, and
 115 a valve operatively associated with said means for regulating the supply of fluid to the said device substantially as described.

2. In indexing or dividing mechanisms as claimed in claim 1, the combination of a rotatable spindle, a ratchet secured to the spindle, a
 120 pivoted pawl engaging the ratchet, a fluid motor, gear wheels interconnecting the motor and spindle, a spring controlled slidable rod for actuating the pawl, a valve also actuated by the rod, the
 125 said valve serving to control the fluid supply to the motor, a pair of levers for operating the rod, and a detent on one of the levers for effecting unidirectional engagement of the levers, substan-
 130 tially as described.

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