

Jan. 23, 1945.

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2,367,973

SCREW-THREAD GENERATING METHODS

Filed March 23, 1944

2 Sheets-Sheet 1

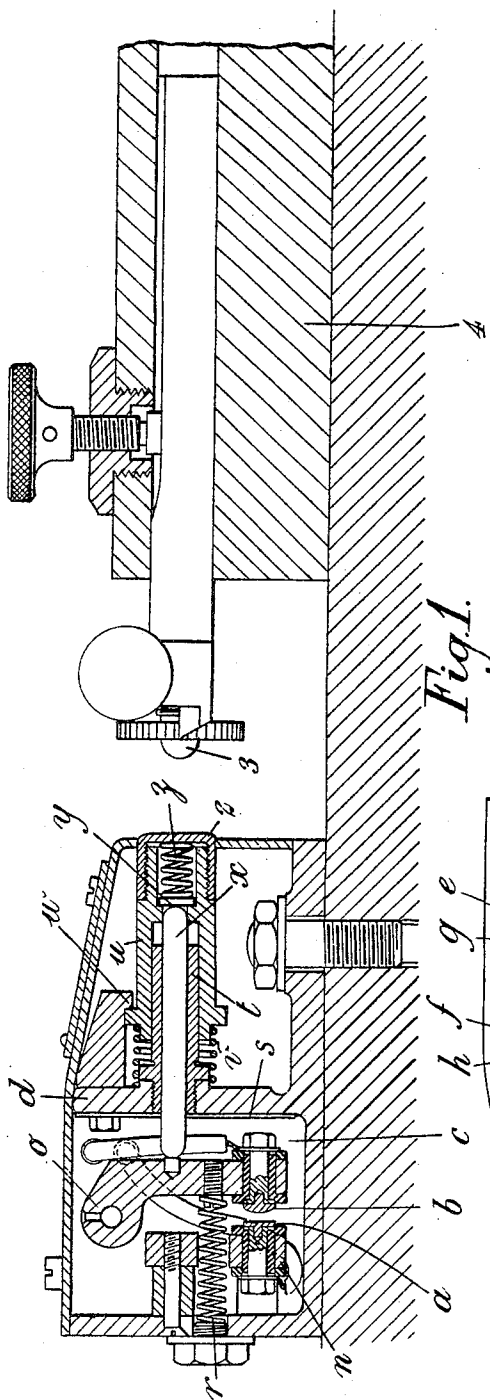


Fig. 1.

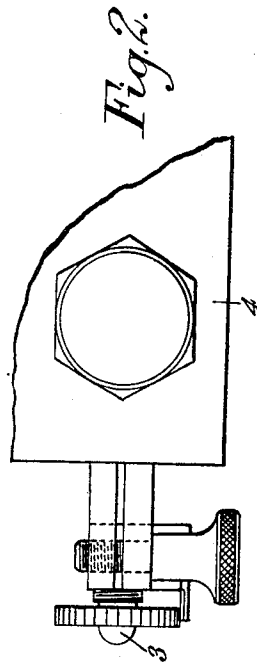
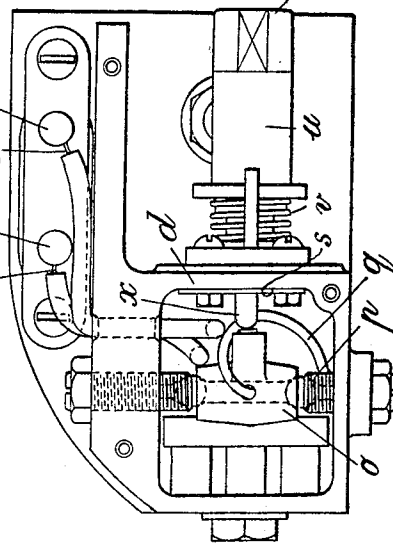


Fig. 2.



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2 Sheets-Sheet 2

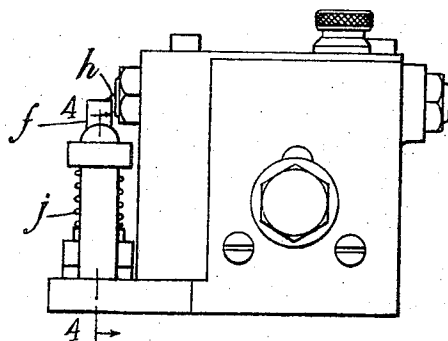


Fig. 3.

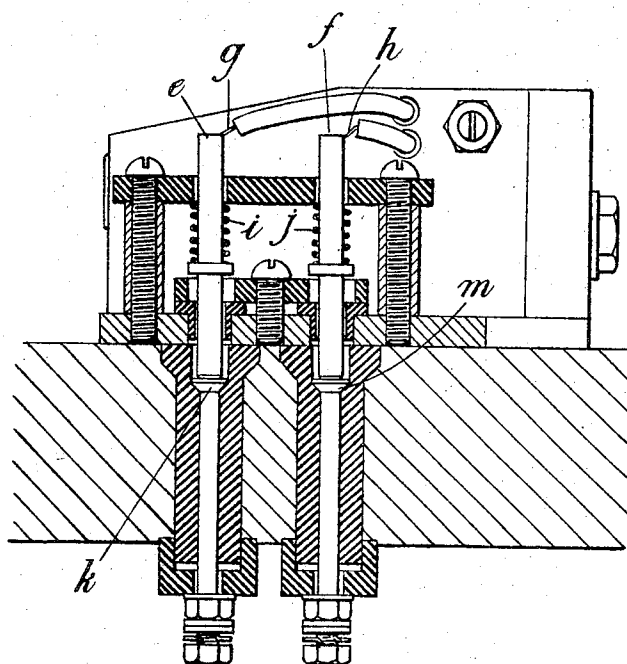


Fig. 4.

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UNITED STATES PATENT OFFICE

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SCREW-THREAD GENERATING METHOD

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Cedric Harold Hanwell, Cogenhoe, EnglandApplication March 23, 1944, Serial No. 527,834
In Great Britain March 23, 1943

2 Claims. (Cl. 80-61)

This invention relates to screw-thread-generating machines of the type wherein external screw threads are generated on a blank by means of a pair of roller dies furnished with screw threads and rotatable in the same direction, one of the roller dies being mounted in bearings on a slide and movable towards and from the other roller which latter is mounted in stationary bearings.

The invention is applicable also to other machines or operations wherein a movement requires to be arrested with a high degree of precision by the employment of a stop or abutment possessing a certain amount of yield.

In screw-thread-generating machines as indicated above it has been proposed to provide hydraulically operated pistons to thrust forward the slide, a screw bolt with a head co-operating with an abutment to limit the forward movement of the slide and electric switch contacts adapted when closed at a predetermined point in the forward movement of the slide to interrupt the supply of oil to the cylinders of the hydraulic pistons.

We have found in practice that the thread generated on the finished blank is not truly formed but is slightly oval. As a result of research we have discovered that the main cause for this inaccuracy is that the interruption of the supply of oil commences at a moment when the movable-axis roller die is advancing comparatively rapidly under maximum hydraulic pressure.

The main object of the present invention is to provide a method of and means for eliminating or reducing to a minimum the inaccuracy referred to above. This result we achieve in the case of screw-thread-generating machines as indicated above by ensuring that the interruption of the oil supply—or other means for applying pressure to the movable-axis roller die—shall not commence until after the forward thrust on the said roller die has been substantially reduced.

In order to obtain precision of action it is necessary if using an electromagnetically actuated cut-off arrangement to provide an electric switch device possessing high precision action operated by the forward movement of the slide.

The invention consists in a method of automatically terminating an operation involving limitation by a positive stop of translational movement produced by an applied thrust, e. g. the thread-generating action of a machine of

the type set forth above after a predetermined advance of the movable-axis roller die has taken place according to which a substantial part of the pressure acting to effect the translational movement is transferred from the latter to a positive stop and the ensuing slight further translational movement, permitted to take place due to yield of the stop, is caused to operate an electric switch device to interrupt the thrust effecting the translational movement.

The invention also consists in a method as set forth in the preceding paragraph, wherein the switch device is set to be operated at about midway between positions of a roller die when advanced to the point where transference of pressure from the movable-axis roller die commences and when fully advanced.

The invention also consists in apparatus for carrying into effect either of the methods set forth in the two preceding paragraphs, wherein the switch device comprises oil-immersed switch contacts, one of which is fixed, the other of which is actuated by the movable roller die slide or by a member rigid thereon.

The invention also consists in apparatus as set forth in the preceding paragraph, wherein the switch device is formed as a unit readily removable from a roller die screw-thread-generating machine substantially as hereinafter described.

The invention also consists in methods and means for controlling automatically the cut-off operation of a screw-thread-generating machine of the type described in British Specification No. 516,233 substantially as hereinafter described.

Referring to the accompanying diagrammatic drawings:

Figure 1 is a vertical longitudinal section illustrating part of a screw-thread-generating machine and

Figure 2 is a plan view thereof with switch cover removed.

Figure 3 is an end view thereof, and

Figure 4 is an enlarged cross-sectional view on the line 4-4 of Figure 3.

In carrying the invention into effect according to one form by way of example as applied to a machine of the general construction indicated in British Specification No. 516,233, we provide means for interrupting the supply of oil to the hydraulic cylinders comprising an electromagnet, plunger and oil control valve arm, the circuit of the electromagnet being controlled by a high precision oil-immersed electric switch illustrated in Figures 1 to 4.

The switch embodies a pair of electrical contacts *a*, *b*, immersed in an oil-filled chamber *c*. The chamber forms part of a casting *d* constituting a detachable switch unit, the casting embodying two spring-urged insulated connecting plungers *e*, *f* connected respectively by flexible leads to the two contacts *a*, *b* and being urged downwards by springs *i*, *j* to project below the lower face of the casting. When the unit is mounted in the correct position on the machine, the plungers automatically contact with insulated contact sockets *k*, *m* fitted in recesses in the upper face of the machine (Figure 4).

The contact *a* is mounted on a rigid plate *n* whilst the co-operating movable insulated contact *b* is mounted at the lower end of a lever *o* pivoted on pivot pins *p*, *p* about a horizontal axis. A wick *q* ensures lubrication of the bearings on the pivot pins.

A compression spring *r* is provided to urge the two contacts apart and an insulated stop plate *s* is provided to limit the opening of the contacts.

Slidably mounted on a rigid tubular member *t* projecting outwards from the oil chamber is a flanged actuating tube *u* thrust outwards by a compression spring *v* and limited in its outward movement by a fixed stop *w*.

Within the fixed tubular projection *t* a tappet rod *x* is slidably carried, one end of which engages the movable-contact lever *o* at a point intermediate between the pivot end and the contact-carrying end and the other end of the tappet rod is adapted to be engaged by a spring-urged member *y* slidably carried within the flanged actuating tube; the member *y* and its actuating spring *z* are retained by a screwed cap 2.

The unit is so positioned on the machine that the head 3 of an adjustable screw mounted on the slide 4 may be caused to engage the cup 2 at a predetermined point in the forward travel of the slide; further forward movement of the slide thrusts the actuating tubular member in a direction towards the oil chamber and in due course brings the movable contact *b* into engagement with the fixed contact *a*. Slight further movement of the actuating tubular member *u* can take place without overstressing the contacts on account of the spring *z* provided.

The machine is provided with a screw bolt passing through a hole in a rigid upright, the head of the bolt being adapted to come into contact with an abutment ring, preferably as described in Specification Serial 482,064 to limit mechanically the forward movement of the slide and movable-axis roller die; the screw bolt thus acts as a limit screw and, as will be explained below, this limit screw must undergo a certain amount of stretch in accordance with the pres-

ent invention before the advancing pressure exerted on the movable-axis roller die is interrupted.

In operation, a blank to be threaded is placed between the roller dies and the movable die is advanced by means of oil under pressure admitted to the hydraulic cylinders by opening the control valve. As soon as the head of the limit screw is arrested the hydraulic pressure in the cylinders rises to the top pre-set pressure, but owing to the forward travel of the roller slide commencing to be arrested by the limit screw this pressure is transferred to and absorbed by the limit screw. The limit screw in turn stretches by say one to two thousandths of an inch, thereby allowing the movable-axis roller on the slide to squeeze in to the work by this amount, the result of which being that the work is rounded and sized to very fine limits. During this elastic stretching of the limit screw the pressure for advancing the slide is thus transferred to the upright of the machine with which the head of the limit screw engages, and it is during this extension action of the limit screw that the electrical contacts are caused to close the circuit to cut off the oil supply to the hydraulic cylinders.

Conveniently the contacts may be caused to come together at about the middle point of the extension of the limit screw, at which point this hydraulic pressure applied to the movable-axis roller die will have been reduced by about 50 per cent.

In practice an accuracy of the order of 0.0002 inch to 0.0001 inch has been obtained on screw-threaded blanks generated by machines embodying the present invention.

We claim:

1. A method of automatically terminating an operation involving limitation by a positive stop of translational movement produced by an applied thrust, after a predetermined advance of the movable-axis roller die has taken place according to which a substantial part of the pressure acting to effect the translational movement is transferred from the latter to a positive stop and the ensuing slight further translational movement, permitted to take place due to yield of the stop, is caused to operate an electric switch device to interrupt the thrust effecting the translational movement.

2. A method as claimed in claim 1 wherein the switch device is set to be operated at about midway between positions of a roller die when advanced to the point where transference of pressure from the movable-axis roller die commences and when fully advanced.

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