July 6, 1937. R. A. SCHAFER 2,086,095

MACHINE TOOL

Filed Feb. 20, 1936

Fig. 1.

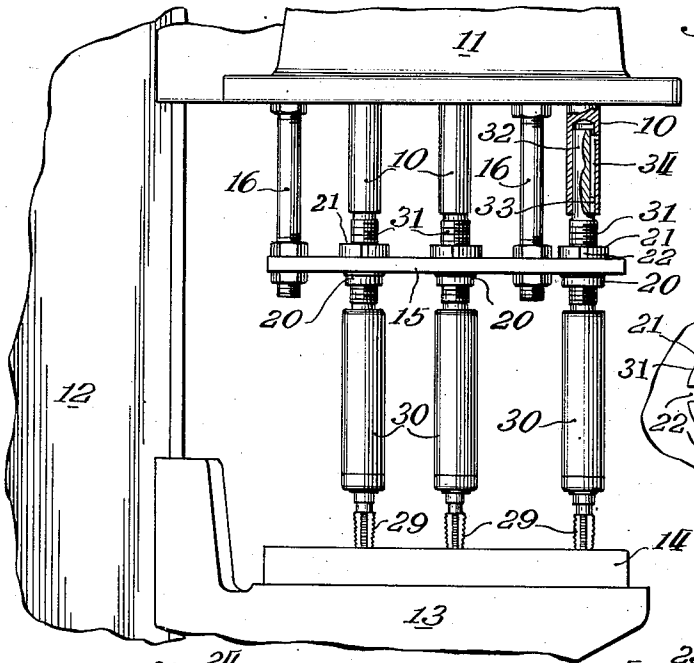


Fig. 3.

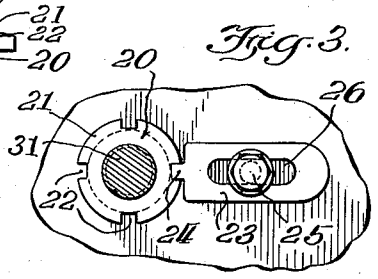


Fig. 2.

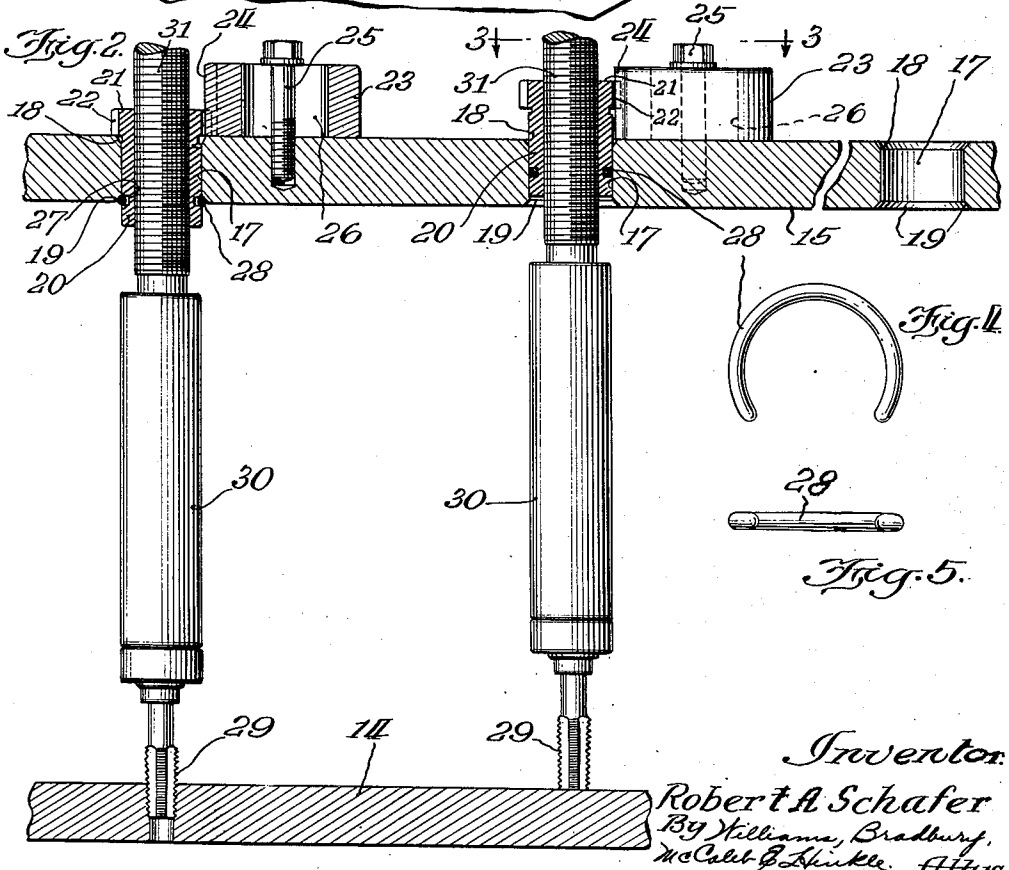


Fig. 4.

Fig. 5.

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MACHINE TOOL

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8 Claims. (Cl. 10—135)

This invention relates to machine tools and particularly to the mounting of tools whereby they may yield when subjected to excessive loads.

The invention will be specifically described with reference to tapping machines. If a tap encounters an undrilled part of the work, or if a tap breaks, the improved mounting yields and further injury to the machine tool or the work is prevented.

One of the objects of the invention is to provide an improved tool mounting.

A further object of the invention is to provide a lead screw nut having a yieldable locking element which remains mounted on the lead screw nut in normal position and also when it yields from that position.

A further object of the invention is to provide a lead screw nut which can be readily removed and replaced so as to enable the tap to be adjusted with relation to the work.

Other objects, advantages and capabilities of the invention will appear from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing, in which

Figure 1 is a fragmentary elevational view showing a tapping machine embodying my invention, in elevation;

Fig. 2 is a sectional view on a larger scale showing a lead screw plate and tap spindles mounted thereon;

Fig. 3 is a fragmentary sectional plan view, taken on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of the locking element, and

Fig. 5 is a side view of the locking element.

Referring to the drawing, the reference numeral 10 designates sleeves which are driven by suitable mechanism (not shown) within a tool head 11. The tool head 11 may be carried upon a suitable standard 12 which also carries a table 13 on which is located a work piece 14.

A lead screw plate 15 is rigidly supported from the head 11 by means of rods 16. This plate is provided with an opening 17 corresponding to each tap. The upper edge of the opening 17 is chamfered as shown at 18, (Fig. 2) and the lower edge is chamfered at 19. A lead screw nut 20 has a sliding fit in each of the openings 17. The lead screw nut 20 has a flange 21 at its upper end, which rests on the upper surface of the plate 15. The flange 21 is provided with a plurality of recesses 22.

A block 23 having a vertical rib 24 is secured to the plate 15 by means of a bolt 25. The bolt 25 extends through a slot 26 in the block 23. The block is normally located with its rib 24 within one of the recesses 22 so as to hold the nut 20 against rotation.

The nut 20 normally projects below the plate 15 and is provided near its lower end with an annular groove 27 in which is received the locking element 28.

The locking element 28 is preferably ring-like in form and is arranged so that it may be compressed to a smaller diameter. In the embodiment of the invention illustrated, the locking element 28 is in the form of a C-ring which is flat or lies in a plane as shown in Fig. 5. When mounted in position, the ring 28 is located in the groove 27. When the lead screw nut 20 is in its operative position, the groove 27 is opposite the chamfered surface 19 and the ring 28 is in firm contact with that surface due to its inherent resilience and its partly compressed condition. The groove 27 is preferably of rectangular section so that there is no component tending to force the ring out of the groove.

The tap 29 is rigidly mounted in a tap spindle 30 which is rigidly carried by the lead screw 31. The lead screw 31 is integral with a shank 32 which extends into a sleeve 10 and is provided with a way 33. Each sleeve 10 is provided with a spline 34 which is located in the way 33 so that the tap spindle is caused to rotate with its sleeve 10 and at the same time is free to slide towards and away from the work.

In assembling the machine, the ring 28 is located in the groove 27. A shank 32 and lead screw 31 are inserted upwardly through an opening 17 and the lead screw nut 20 is applied to lead screw 31 for approximately the right amount for the desired location of the tap, and the shank 32 is slid into its sleeve 10. The lead screw nut 20 is then forced downwardly into its opening 17. The spring 28 is forcibly contracted by the chamfer 18 and it expands against the chamfer 19 when the flange 21 comes into contact with the upper surface of the lead screw plate 15.

The lead screw nut 20 may be applied to the plate 15 whether or not the block 23 is in position. In the former circumstance, it is merely necessary that one of the recesses 22 be brought into registry with the rib 24. To adjust the position of the tap with respect to the work, the bolt 25 may be loosened and the block 23 may be slid away to remove the rib 24 from the recess 22. The nut 20 may now be rotated in either direction to the desired extent and the block 23 replaced. If desired, this adjustment may be performed by forcing the nut 20 upward-

ly out of its opening 17 to a position above the block 23, rotating the nut in the appropriate direction and returning it to its mounted position.

The taps are driven by the sleeves 10 in opposite directions so as to tap the openings in the work in alignment with the taps. When a tap is subjected to overload, as for example when it contacts the face of work which inadvertently has not been drilled, or in the event that the tap breaks and cannot feed into the work, then the yielding mounting of the lead screw nut 20 enables it to move upwardly out of the lead screw plate 15 and breakage of the machine or destruction of the work is avoided. After the defective work or broken tap is replaced and the nut 20 forced back into its opening 17, work may be resumed forthwith. It is to be noted that the spring 28 remains in the annular groove 27 at all times, with the results that assembly and adjustment are facilitated and the spring is protected from distortion and maintains its initial flat condition indefinitely.

Although the invention has been described in connection with the specific details of a preferred embodiment thereof, it must be understood that such details are not intended to be limitative of the invention except in so far as set forth in the accompanying claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine tool, in combination, a tool, a sleeve adapted to take the thrust of said tool, said sleeve having an exterior annular groove, said groove being adapted completely to receive said expansible member when compressed, an expansible member in said groove, and a supporting member having an opening receiving said sleeve, said opening having a chamfered edge normally engaged by said expansible member, said chamfered edge being arranged to compress the expansible member into said groove to allow the sleeve to move in said opening when the sleeve is subjected to overload.

2. In a machine tool, in combination, a tool, a sleeve adapted to take the thrust of said tool, said sleeve having an exterior anngular groove, a resilient ring-like member capable of compression to a smaller diameter, said groove being adapted completely to receive said ring-like member when thus compressed, and a supporting plate having an opening receiving said sleeve, said opening having a chamfered edge normally engaged by said ring-like member in a state of compression, said chamfered edge being arranged to compress the ring-like member into said groove to allow the sleeve to move in said opening when the sleeve is subjected to overload.

3. In a machine tool, in combination, a tool, a sleeve adapted to take the thrust of said tool, said sleeve having an exterior annular groove, a C-ring in said groove and partly extending therefrom and compressible into said groove, said groove being adapted completely to receive said ring in compressed condition, and a supporting plate having an opening receiving said sleeve, said opening having a chamfered edge normally engaged by said ring in a state of compression, said chamfered edge being arranged to compress the ring into said groove to allow the sleeve to move in said opening when the sleeve is subjected to overload.

4. In a machine tool, in combination, a tool, a sleeve adapted to take the thrust of said tool, said sleeve having an exterior annular groove, a resilient ring-like member capable of compression to a smaller diameter, said groove being adapted completely to receive said ring-like member when thus compressed, and a supporting plate having an opening receiving said sleeve, said opening having chamfered edges, one of which is normally engaged by said ring-like member in a state of compression, said chamfered edges being arranged to compress the ring-like member into said groove when the sleeve is forced into or out of said opening.

5. In a tapping machine, in combination, a lead screw nut, a lead screw plate having an opening normally occupied by said nut, said opening having a chamfered edge and said nut having an exterior annular groove normally adjacent said edge, and a compressible ring element in said groove normally engaging said chamfered edge, said chamfered edge being arranged to compress said ring into the groove when the nut is moved axially, said groove being adapted completely to receive the ring element when thus compressed.

6. In a tapping machine, in combination, a lead screw nut, a lead screw plate having an opening normally occupied by said nut, said opening having a chamfered edge and said nut having an annular groove, and a resilient ring-like spring in said groove arranged to be compressed into said groove by said chamfered edge, said groove being adapted completely to receive said spring when compressed.

7. In a tapping machine, in combination, a lead screw nut having a flange at one end, a lead screw plate having an opening normally occupied by said nut, said opening having chamfered edges, said nut having an exterior annular groove, and a resilient C-spring in said groove arranged to contact the chamfered edge at one face of the plate, said flange contacting the other face of the plate, to hold the nut in its opening, said groove being adapted completely to receive the spring in compressed condition.

8. In a tapping machine, in combination, a lead screw nut having a flange at one end, a lead screw plate having an opening normally occupied by said nut, said opening having chamfered edges, said nut having an exterior annular groove, a resilient C-spring in said groove arranged to contact the chamfered edge at one face of the plate, said flange contacting the other face of the plate, to hold the nut in its opening, said groove being adapted completely to receive the spring in compressed condition, said flange having recesses, and means carrying a rib projecting into one of said recesses to prevent rotation of said nut.

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