Sept. 25, 1956 A. J. MARTIN 2,764,416

RELEASABLE TOOL HOLDERS

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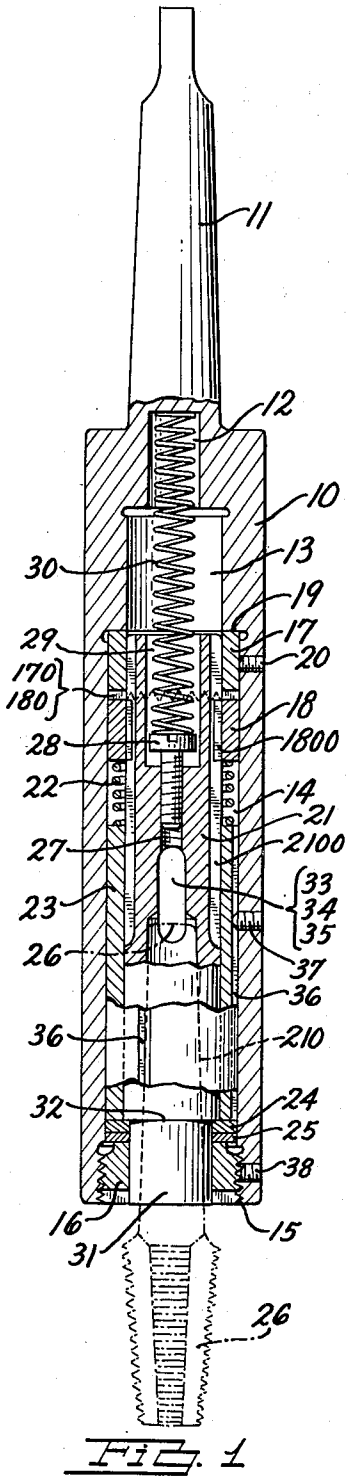

Fig. 1

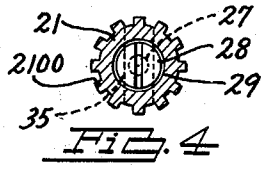

Fig. 4

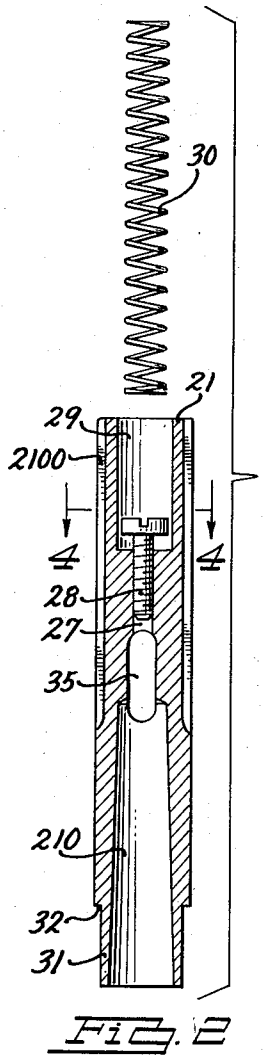

Fig. 2

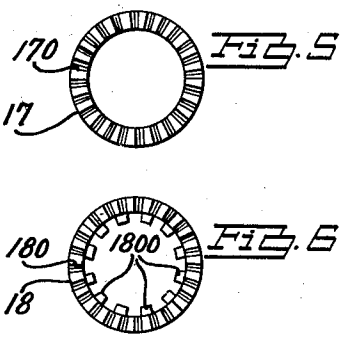

Fig. 5

Fig. 6

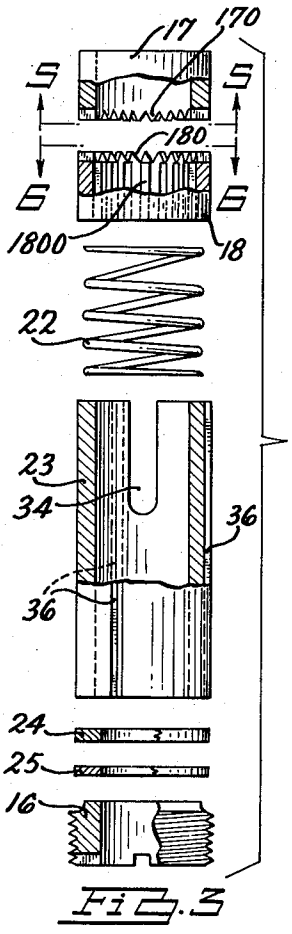

Fig. 3

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RELEASABLE TOOL HOLDERS

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3 Claims. (Cl. 279—9)

This invention relates to improvements in tool holders for holding taps, dies, drills and other cutting tools in automatic screw machines, drill presses and the like.

Numerous tool holders have been developed for use in holding taps, dies, drills and other cutting tools in the spindles of production machines such as automatic screw machines, gang drill presses and the like to protect the tools and the work in the event the tap, drill or other cutting tool sticks or in the event the work to be tapped, drilled or cut has not been suitably prepared for the operation. However, none of the prior art constructions has proven to be both economical and completely satisfactory.

Therefore, it is the object of this invention to provide an improved and economical to manufacture positive acting clutch type retractable tool holder for production machines that is universally adaptable for use in automatic screw machines, drill presses and other production equipment which will positively and accurately hold taps, drills and other cutting tools, which will release such a tool from being turned by its spindle if and when a predetermined torque is exceeded, and which will retract in the event the tap drill or other cutting tool fails to function allowing the spindle to advance and complete its cycle of operation without damage to the production machine, spindle, tool holder or the tool carried thereby.

Other objects of the invention will become apparent by reference to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a vertical sectional view of a clutch type retractable tool holder embodying the invention.

Fig. 2 is an exploded view of the spring loaded retractable tool holding mechanism.

Fig. 3 is an exploded view of the clutch mechanism.

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 2.

Figs. 5 and 6 are horizontal elevational views taken on the lines 5—5 and 6—6 of Fig. 3 looking in the direction indicated by the arrows showing respectively the cooperating clutch faces of the fixed and sliding clutch members preferably employed.

Referring now to the drawing wherein like numerals refer to like and corresponding parts throughout the several views, the clutch type retractable tool holder disclosed therein illustrative of the invention comprises a body **10** which is provided with a standard taper **11** at its upper end and which is bored and counter-bored from its lower end to provide a spring chamber **12**, a tool holder retracting chamber **13**, a clutch chamber **14** and an internally threaded end portion **15** which accommodates a lock nut **16** employed to hold the clutch mechanism and the retractable tool holder mechanism in assembled relationship within the said body **10**.

Sleeve type clutch elements **17** and **18** having complementary clutch teeth **170** and **180** formed in adjacent annular ends thereof are first telescoped within the clutch chamber **14** of the body **10**. The upper clutch element **17** is seated on the annular shoulder **19** and is

secured against rotation within the body **10** by such means as a set screw **20**. The inner periphery of the lower clutch element **18** is suitably splined at **1800** to receive the externally splined end **2100** of the tool holding element **21**. A compression spring **22**, a thrust sleeve **23**, washers **24** and **25** and the lock nut **16** complete the clutch mechanism and provide means for applying pressure onto the lower clutch element **18** whereby to releaseably maintain the reciprocable and rotatable lower clutch element **18** in engagement with the upper fixed clutch element **17**.

The upper fixed clutch element **17** serves as a drive element to drive the lower spring loaded clutch element **18** which in turn serves as a drive element through which the tool holding element **21** splined therein for longitudinal movement in respect thereto is driven until the torque applied to the tool holding element **21** exceeds the permissible torque allowed to be transmitted from the body **10** to the tool holding element through the clutch elements **17** and **18**, whereupon the clutch slips or clicks and ceases to drive the tool holding element **21**.

The amount of torque permitted to be transmitted from the body **10** to the tool holding element **21** through the clutch mechanism depends upon the shape of the clutch teeth **170** and **180**, the strength of the compression spring **22**, and the number and thickness of the washers **24** and **25** employed to adjust the compressive force of the said compression spring **22**. It is therefore obvious that the clutch-drive portion of tool holders embodying the invention are not only susceptible to wide ranges of torque resistance in their construction but the torque transmitted to the tool holding element may be readily adjusted to suit particular requirements.

The external splines **2100** at the upper end of the tool holding element **21** are of sufficient length to permit the said tool holding element to reciprocate from its extended position shown in Fig. 1 into the tool holder retracting chamber **13**. The lower end of the tool holding element **21** is provided with an internal or female taper **210** to receive cutting tools such as a tap **26** as indicated in Fig. 1. The upper end of the tool holding element **21** is bored and threaded at **27** to accommodate a spring load adjusting screw **28** and is counterbored at **29** to telescopingly receive the lower end of a retracting resisting compression spring **30**. The lower end of the tool holding element **21** is reduced in diameter at **31** to provide an annular shoulder **32** which bears on the upper washer **24**. By reference to Fig. 1, it will be noted that the same lock nut **16** and washers **24** and **25** that maintain the clutch mechanism in assembled relationship within the body **10** also retains the tool holding element **21** within the clutch mechanism.

In assembling the tool holding mechanism within the clutch mechanism, the washers **24** and **25** and the lock nut **16** are removed, the retraction resisting compression spring **30** is positioned in the spring chamber **12**, the tool holding element **21** is telescoped onto the compression spring **30** and the external splines **2100** thereof are telescoped through the female splines **1800** of the clutch element **18**. The washers **24** and **25** and the lock nut **16** are then telescoped onto the reduced end **31** of the tool holder **21**, and the lock nut **16** is threaded into the internally threaded end **15** of the body **10**.

The retraction resisting compression spring **30** is of such strength as will resiliently hold the tool holding element **21** in its fully extended position within the body **10** as indicated in Fig. 1 during normal operation of a tool held therein. The resistance preventing the retraction of the tool holding element may be varied both by using a spring **30** of a greater or lesser compressive resistance or the spring resistance may be increased or de-

creased by threading the spring load adjusting screw **28** to different positions within the counterbore **29**.

If desired, transverse slots **33**, **34** and **35** may be provided through the body **10**, thrust sleeve **23** and tool holding element **21** respectively which are suitably located to receive a tapered bar wedge or other means (not shown) and engage the end of the tool **26** to remove the said tool **26** from the internal taper **210** of the tool holding element **21**. A suitable longitudinal groove **36** is provided along the outer periphery of the thrust sleeve **23** into which the inner end of a set screw **37** threaded through the body **10** extends for the purpose of maintaining the slots **34** of the thrust sleeve **23** in circumferential alignment with the slots **33** and **35** of the body and tool holding element respectively. A set screw **38** is employed to fix the lock nut **16** in the position to which it is threaded in the lower end of the body **10**.

When a clutch type retractable tool holder embodying the invention is employed for drilling or tapping or other operations, and the tool carried by the tool holding element **21** is applied to the work, if the torque required to accomplish the operation becomes excessive, the clutch elements **17** and **18** slip to prevent further rotation of the tool whereby to eliminate possible damage to or breakage of the tool spindle, the tool holder, the tool or the work is avoided. If the advance of the tool into the work is prevented by conditions not normal to the operation, the tool will retract within the clutch, and like and similar damage or breakage is avoided.

This improved tool holder has been found to be extremely rugged, positive in its functioning, economical to manufacture and readily maintained. Furthermore, it is readily adjustable for use with various types of work to safeguard the machine tool, the spindle, the tool holder and the work from breakage or spoilage due to unexpected conditions encountered in drilling or tapping or in other operations where the tool is advanced to the work or vice versa.

Although but one specific embodiment of the invention has been disclosed and described herein, it is obvious that many changes may be made in the size, shape, arrangement and detail of the various elements of the invention, all without departing from the spirit and scope thereof or defined by the appended claims.

I claim:

1. A clutch type retractable tool holder comprising a bored and counterbored body portion, an annular clutch element fixed within said body portion, a second annular clutch element reciprocally and rotatably mounted within said body portion, spring means resiliently urging said second annular clutch element into engagement with said fixed clutch element, adjacent annular faces of said clutch elements having interengaging beveled teeth therein, a tool holder reciprocatingly mounted within said clutch elements splined in axially slidable and rotatably driven relationship within said second annular clutch element, means retaining said second annular clutch element and said tool holder within said body portion, compression spring means reacting against said body portion resiliently holding said tool holder against said retaining means, and means for varying the pressure of said compression spring means whereby to vary the torsion at which said clutch will slip.

2. A clutch type retractable tool holder comprising a body portion, an annular clutch element fixed within said body portion, an annular rotatable and slidable internally splined clutch element within said body portion disposed in alignment with said fixed clutch element, said clutch elements having interengaging clutch faces formed in adjacent annular ends thereof, an annular thrust sleeve slidably mounted within said body portion in axial alignment with said clutch elements, spring means disposed between said slidable clutch element and said thrust sleeve resiliently maintaining said clutch elements in engagement, an externally splined tool holding element reciprocatingly mounted in said sleeve element having one end thereof telescopingly engaged by the internal splines of said slidable clutch element, means for retaining said movable clutch and tool holder elements in said body portion, and spring means disposed axially between said body portion and said tool holding element constantly urging said tool holder element toward said retaining means.

3. A clutch type retractable tool holder comprising a body portion, an annular clutch element fixed within said body portion, an annular rotatable and slidable internally splined clutch element within said body portion disposed in alignment with said fixed clutch element, said clutch elements having interengaging clutch faces formed in adjacent annular ends thereof, an annular thrust sleeve slidably mounted within said body portion in axial alignment with said clutch elements, spring means disposed between said slidable clutch element and said thrust sleeve resiliently maintaining said clutch elements in engagement, an externally splined tool holding element reciprocatingly mounted in said sleeve element having one end thereof telescopingly engaged by the internal splines of said slidable clutch element, a single means for retaining said movable clutch and tool holder elements in said body portion, spring means disposed axially between said body portion and said tool holding element constantly urging said tool holder element toward said retaining means, the said body portion, thrust sleeve and tool holding element having aligned transverse slots therethrough to receive a bar to permit ready removal of a tool carried thereby, and means for maintaining the said thrust sleeve slot in alignment with the others.

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