Sept. 16, 1947. C. E. JOHNSON 2,427,560

TAPPET SCREW

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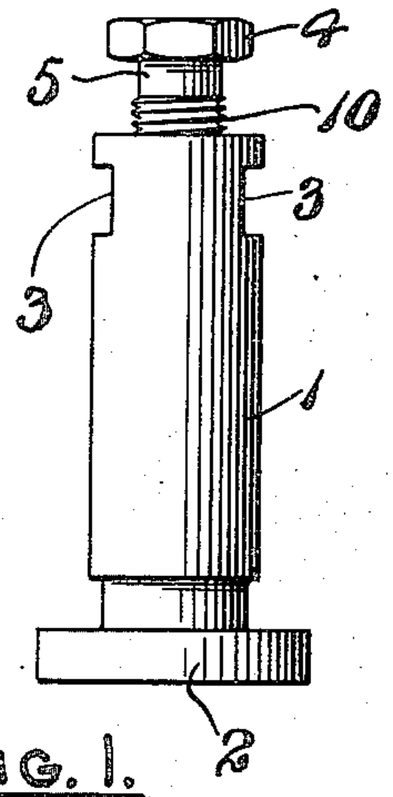

FIG. 1.

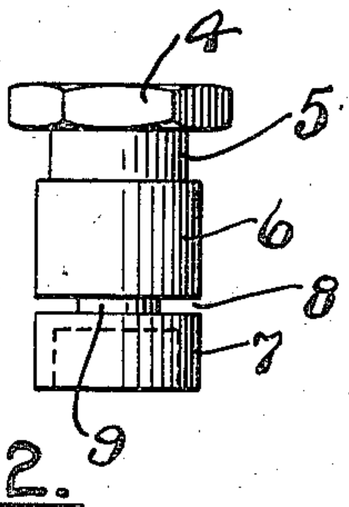

FIG. 2.

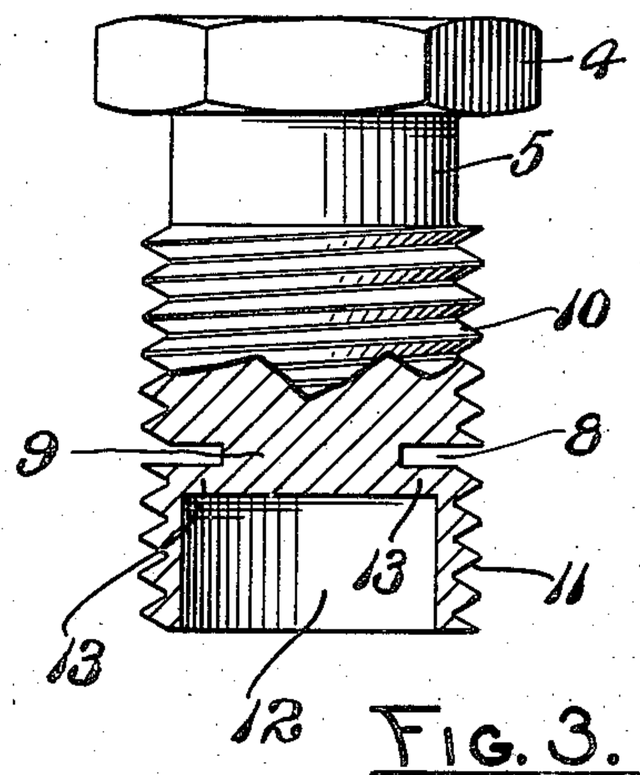

FIG. 3.

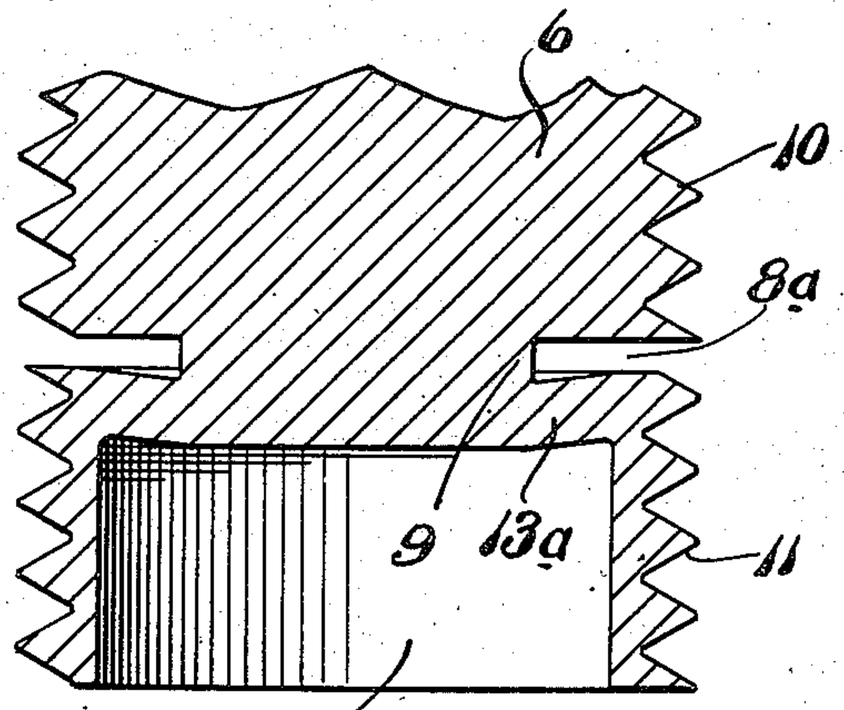

FIG. 4.

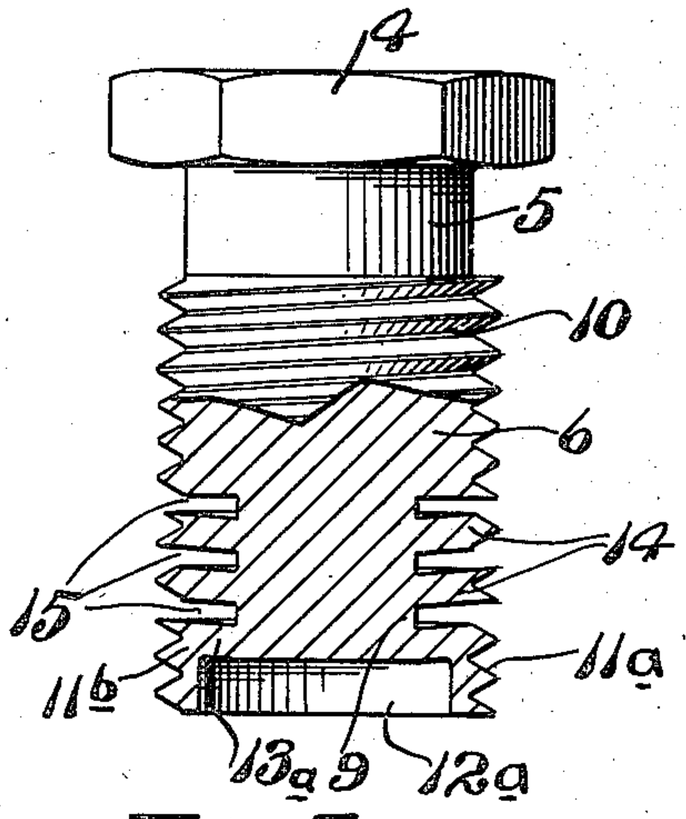

FIG. 5.

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TAPPET SCREW

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4 Claims. (Cl. 151—14)

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This invention relates to a novel construction of tappet screw which is adapted to be inserted in the upper end of an interiorly threaded tappet body and which, from its construction, is self-locking when screwed into place. By the term, "self-locking," is meant that, while the screw may be turned and adjusted, or removed with respect to the tappet body, it is firmly held and remains in place in any adjusted position without varying or changing its position, and thus disturbing the over-all length of the tappet in the service in internal combustion engines to which it is normally and regularly subjected.

Tappet screws generally called "self-locking" type or character which make it possible to dispense with and eliminate the use of locking nuts in conjunction with them and the body into which they are threaded, have been a development of recent years, and the present invention is directed to an improvement in structure which will secure all the desirable results of such self-locking at minimum cost of manufacture. Inasmuch as each internal combustion engine requires a number of tappets, in general, in the motor vehicle field, at least eight and many times more in an engine, two for each cylinder, it is evident that tappets must be manufactured in quantities of many millions. And the endeavor is and has been in the manufacture of tappets, as in all manufacturing to decrease the cost of manufacture, in the number of operations which have to be performed and, particularly, in handling of the materials and of the tappets in their course of production. The present invention has a novel structure which is producible at what is believed to be the greatest economy, not only without detriment to the self-locking qualities required, but with a certainty of substantial uniformity in quality and of performance of the tappets produced, and with a substantial perfection of attainment of the necessary self-locking property which the tappets must have.

An understanding of the invention may be had from the following description taken in connection with the accompanying drawing, in which,

Fig. 1 is an elevation of a completed tappet with which the tappet screw of my invention is used.

Fig. 2 is an elevation of the blank from which the tappet screw is made before the threading and subsequent operations are performed.

Fig. 3 is a somewhat enlarged elevation and partial central vertical section through the tappet, after the threading operation has been done.

Fig. 4 is a more greatly enlarged, fragmentary, central vertical section through the lower end of the completed tappet screw, and

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Fig. 5 is a view similar to Fig. 3, showing a slightly different or modified form of a tappet screw made in accordance with my invention.

Like reference characters refer to like parts in the different figures of the drawing.

The tappet body, with which the tappet screw of my invention is to be used, is of conventional structure including a cylindrical portion 1 which, in an engine, is mounted for reciprocation in a suitable vertical guide, and at its lower end has a bearing head 2, which rides against a cam of an engine's cam shaft. The cylindrical part 1, near its upper end is flattened at opposite sides as at 3, for engagement of a wrench therewith to hold it against turning during adjustment. While the tappet body with the enlarged diameter lower head, generally known as of mushroom type is shown in Fig. 1, it is to be understood that the tappet screw of my invention is usable not only with mushroom tappets, but with those of the barrel type which are uniform in diameter, usually having a diameter corresponding to the head 2, of the mushroom tappets.

The tappet screw has a head 4 of hexagonal or other equivalent shape, so that a wrench may be applied to turn the screw, from which at its lower side an integral stem extends downwardly for a short distance. Below the stem 5 there is an integral cylindrical section 6, somewhat larger in diameter than the shank 5, and below it a lower end cylindrical section 7, having the same diameter, which is spaced at its upper end from the lower end of the section 6 by an annular slot 8. The sections 6 and 7 are connected by an intervening short cylindrical portion 9 around which the angular slot 8 is cut, the length of the section 9 being equal to the width of the slot.

Tappet blanks for production of the tappet screws of the present invention, as described and shown in Fig. 2, are exteriorly threaded in one operation for the full lengths of the two cylindrical sections 6 and 7. The upper section has the exterior threads 10 and the lower section exterior threads 11 (Fig. 3).

The lower end section 7 is interiorly bored from its lower end upwardly thereby making a cylindrical recess 12 (Fig. 3), the upper side of which terminates short of the slot 8. The diameter of the recess 12 is greater than the diameter of the integral connecting portion 9, whereby there is provided a continuous angular horizontal shelf or ledge 13, as shown in Fig. 3, between the inner

portions of the slot 8 and the outer portions of the recess 12.

It is apparent that, using suitable hexagonal or equivalent stock, all the operations for turning the stock to produce the blanks, as in Fig. 2, and the exterior threading and the interior machining of the cylindrical recess 12 may be performed, and the tappets processed to the extent described on an automatic screw machine, to which the stock in bars of suitable length are merely fed to the machine.

Each of the tappet screws completed to the extent described as shown in Fig. 3, is subjected to a further operation of bending and permanently distorting the angular ledge or shelf 13 in a direction toward the head of the screw, thereby partially narrowing the slot 8 at its outer portions, as shown in Fig. 4, with the ledge 13 permanently distorted or strained to a position at a slight acute angle to the upper side of said slot. This moves the threads 11 a short distance equal approximately to one-eighth to one-fourteenth, modified in accordance with the tension required of a width of a thread, toward the threads 10 of the upper section 6. Such operation or distortion is rapidly and economically produced, using an automatic punch press or other equivalent processing machine, underneath the punch of which the tappet screw may be carried, one after another, in any suitable conveying means in properly timed step by step movements, the tappet screw as shown in Fig. 3, being placed on a suitable movable conveyor for them to be carried underneath the punch press ram at regularly timed intervals. Therefore, the tappet screw construction disclosed has production costs reduced to a minimum in connection with the machine operations required to produce the finished tappets.

The tappet screws made of a suitable material require thereafter only tempering or hardening for wear resistance and to give the distorted or strained portions 13*a* (Fig. 4) thereof, the necessary resilience and resistance against return to or toward horizontal position, and to maintain such resistance at all times when screwed in the upper end of the tappet body.

In Fig. 5 the lower section 11*b* is of a shorter length and the exteriorly threaded edge indicated at 11*a* and the cylindrical recess 12*a* therein is shortened. Between it and the section 6 having the exterior threads 10, a number of horizontal disks 14, separated by slots 15 are interposed the exterior diameter of the disks being the same as that of the upper and lower sections between which they are disposed, and said discs at their annular surfaces are threaded with threads of the same pitch. In such construction both the ledge or shelf 13 and the disks 14 are distorted upwardly toward the head of the screw.

When a tappet screw of either form, that shown in Fig. 5 or such as in Figs. 3 and 4, is screwed into the upper end of the tappet body the first screw threads 11, or 11*a* with those on the disks 14, enter very readily and easily. But upon the threads 10 reaching the interior threads of the tappet body and being screwed thereinto, the angularly distorted shelf 13*a* and in the construction shown in Figs. 4 and 5 in addition the angularly distorted disks 14, are forced or sprung back partially toward their original horizontal positions before such permanent distortion was made.

This pulls the lower sides of the screw threads 10 very strongly against the upper sides of the threads within the tappet body with which they engage, thereby inducing a heavy frictional resistance to turning the screw. Such resistance is sufficient to insure against the screw, accidentally or under the service to which it is subjected in internal combustion engines, altering or changing position, being to all normal purpose and effects locked against turning movement. Therefore, the screw is self-locking because of its construction, in the sense that it is securely held against turning movement or change of position in its normal intended use.

The construction described is very practical and useful and economically produced in quantity as has been proved in full test and trial thereof. Its economy is apparent.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. A tappet screw including, a head adapted for wrench engagement, and a shank extending below the head, said shank from its lower end upwardly being screw threaded and having an annular groove around it between its ends dividing the threads into upper and lower sections, said lower section being interiorly bored from its lower end upwardly to within a short distance of said groove, the depth of the groove and the diameter of the recess bored in said lower threaded section being such that an annular outwardly extending ledge is provided of relatively thin cross-section in the upper end of said lower threaded section extending outwardly from the inner end of said annular groove, said shelf being permanently distorted and strained to lie at a slight angle to the plane of said groove and off-setting the threads of one of the threaded sections with respect to the threads of the other threaded section.

2. A construction as defined in claim 1, said permanently distorted annular shelf being hardened and tempered to increase the elastic limit thereof, and provide resiliency therein and a continuous resistance in said shelf when it is forced away from the position to which it has been distorted toward a position paralleling the plane of said annular groove.

3. A construction as defined in claim 1, said upper threaded section, above said annular groove having the lower portion thereof divided by other annular grooves into spaced threaded disks, said disks being permanently distorted to lie substantially parallel to said permanently distorted shelf.

4. A tappet screw having a head and shank, said shank extending from one side of the head, and said shank a distance from the free end being provided with a continuous annular groove thereby making upper and lower shank sections, both of said sections being exteriorly threaded with like threads, said lower section having a cylindrical recess therein extending from its free end in the direction of the length of the shaft and terminating short of said annular slot to provide an annular shelf at the inner end portion of said section lying in substantial parallelism to the plane of said groove, and adapted to be dished in the direction of the head, to thereby narrow the width of said annular groove at its outer portions.

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