April 12, 1949. W. D. CORLETT 2,467,079

METHOD OF MAKING TAPPETS

Filed March 6, 1944

Fig. 1.

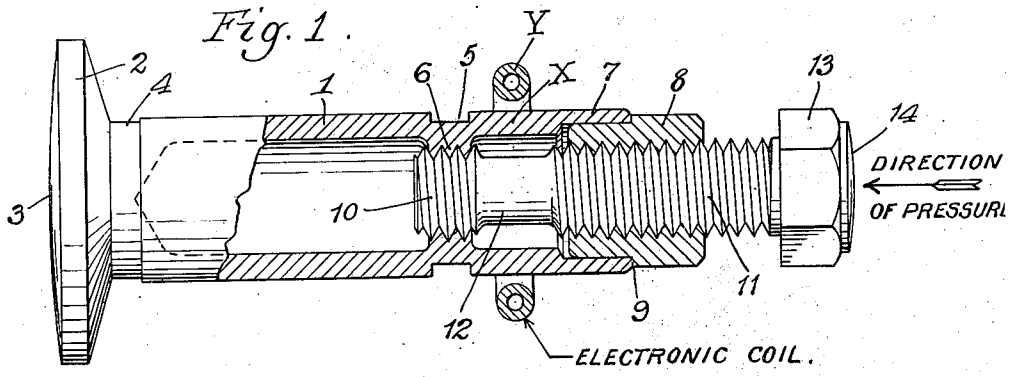


Fig. 2.

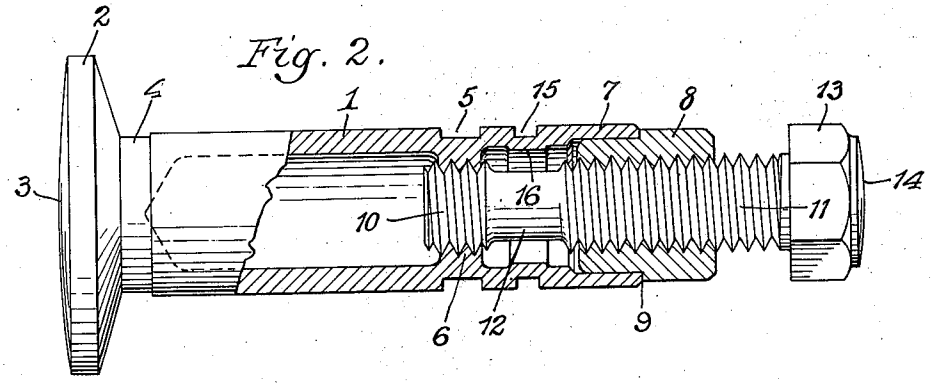
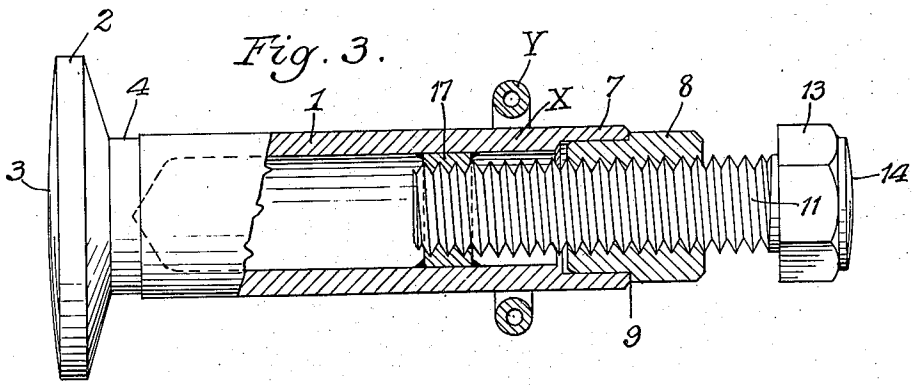


Fig. 3.



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METHOD OF MAKING TAPPETS

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5 Claims. (Cl. 29—156.7)

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This invention relates to the method of making a tappet. One common use for tappets is in connection with the operation of valves in which the tappet is positioned between a cam and a valve operating means, and one use of the structure made by the method of the present invention is, therefore, that of a valve tappet.

An object is to provide a method for making such a tappet.

Another object of the invention is to provide a method for securing tension or setting up tension in a portion of the screw which is positioned in a tappet.

Other objects will appear from time to time throughout the specification and claims.

The tappet is claimed in Patent 2,426,083, August 19, 1947, resulting from application Serial No. 553,329, filed September 9, 1944.

This invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a longitudinal section with parts broken away and parts in elevation, showing one form of the device, with a diagrammatic showing of a heating means for use in its manufacture;

Figure 2 is a similar view illustrating a modified form of the device; and

Figure 3 is a similar view illustrating a still further modification.

Like parts are indicated by like characters throughout the specification and the drawings.

In the form shown in Figure 1 the tappet includes a hollow body 1 having a "mushroom head" 2 formed integrally therewith. The outer surface of the head may be rounded, as at 3, and the body of the tappet may be reduced somewhat, as at 4, adjacent the head.

A portion of the barrel or body of the tappet is pressed or formed inwardly by shaping the groove 5, which may serve as an oil groove. This may be rolled in the barrel and when it is formed the wall is forced inwardly and this portion is threaded, as at 6. Adjacent its open end the tappet barrel may be somewhat reduced, as at 7. A perforated and interiorly threaded plug 8, which may have an exterior shoulder 9, is seated in the open end of the barrel and preferably in the reduced portion 7. The threaded plug is permanently located in place and may be hydrogen welded or otherwise permanently secured. The threads in the portions 6 and 8 are preferably formed after the plug 8 has been secured in place, and the threads are thus cut continuously through both portions.

With the tappet thus far completed—that is to say, with the formation of the two threaded portions—a screw not shown may be inserted in the threaded portion of the plug 8 and that portion of the tappet barrel which lies between the groove 5 and the reduced portion 7 is heated and a pull is exerted on the screw which is engaged in the threaded portion 8, and this results in a permanent stretch in that portion which has been heated. Since the threads in the portions 6 and 8 were formed originally in a continuous operation, and therefore are formed along a continuous pitch, the stretching just mentioned results in making the two threaded portions slightly off pitch with respect to each other.

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When now the permanent threaded screw is inserted and engages the threads in the portions 6 and 8, the shank of this screw becomes somewhat stretched between the two threaded portions and a locking effect results. In the form shown in Figure 1 the screw comprises a relatively short threaded portion 10, the threads of which are in mesh with the threads of the portion 5, and a relatively longer threaded portion 11, the threads of which are in mesh with the threaded portion 8. The two threaded portions 10 and 11 may be separated by a reduced portion 12. Where this is the case the stretching of the screw will occur primarily in the reduced portion 12. The screw is provided with a head 13 which is preferably of angular cross section and may have an outer rounded face 14.

While many different methods of heating that portion of the tappet barrel which is to be stretched may be used, one convenient and inexpensive method is to surround the portion to be stretched, which is marked x, with a high frequency heating element y. This element is shown only diagrammatically because such high frequency heating elements are well known in the art and are available at present on the market. The particular details of the high frequency heating element form no essential part of the invention and they are only illustrated diagrammatically.

In the modified form of Figure 2 the tappet parts are the same as those shown and described in connection with Figure 1, with one exception. To provide the necessary stretching of the tappet body which will result in bringing the two threaded portions slightly off pitch with respect to each other, heating need not be used, but a second groove 15 may be rolled or otherwise formed in the barrel 1, and this groove, which will result in an inward enlargement 16, has the effect of slightly increasing the length of the

tappet. When present, the second groove 15 may also serve as an oil groove, and in this manner the desired result is produced.

The modified form of Figure 3 is the same as that shown in Figure 1 except that instead of the screw formed of the two threaded sections 10 and 11 and separated by a reduced portion 12, the screw and its threads are continuous throughout. A continuous screw might also be used in the modified form of Figure 2. While a continuous screw is within the contemplation of the invention and may be used instead of the interrupted screw with the tappet bodies of Figures 1 or 2, it is ordinarily preferable to use an interrupted screw because the reduced diameter facilitates the stretch in the screw. Whatever the shape of the screw, some stretch will occur in it, and this gives a spring tension to the screw which is always, of course, below the elastic limit of the screw, but which at the same time has the necessary locking effect.

Whatever the particular form of the tappet body and whatever the particular form of the screw, there will be two threaded sections or portions fixed within the tappet, and these portions, whether formed originally continuously or not, will have been moved slightly out of pitch with respect to each other, either by heating, by forming a second groove or by otherwise lengthening the space between the two threaded portions. The result of this is that when the tappet screw is screwed into position the screw is somewhat stretched as it engages both threaded portions of the tappet and a locking effect is exerted on the screw. The device and the method producing it have many advantages.

In the first place, the construction is relatively cheap, because among other reasons, the threaded insert 8 may be put in place and a large number of the tappets may be welded at the same time, thus avoiding individual welding of individual tappets. The threaded insert is thus permanently fixed in the tappet, and in case an emergency repair requires the removal of the screw and the insertion of another screw, any screw may be substituted, and it may be held in place by any lock nut of known design. The preferred reduction in the section of the screw—for example, at 12—which lies between the two threads provides elasticity which will keep the torque against turning constant, even though a small amount of wear may be present in the threads in the tappet.

Another advantage which results from forming the threads generally as a part of a continuous operation is that the axes of the screw, and consequently the bearing surface 14 of the screw head, which is normally spherical, may be kept concentric with the body of the tappet, and this is of course important in accuracy and proper operation and long life.

Although I have shown an operative form of my invention, it will be recognized that many changes in the form, shape, and arrangement of parts can be made without departing from the spirit of the invention, and my showing is therefore to be taken as, in a sense, diagrammatic.

In particular, the invention is not limited to a form in which the external groove 5 is present. For some purposes and in some uses, the presence of such a groove or depression is neither desired nor necessary, and in a case of that sort, instead of forming the inner projection 6 by depressing the outer wall of the tappet, as shown at 5 in Figures 1 and 2, an insert 17 is put in place within the barrel of the tappet and is welded therein or otherwise permanently secured. A convenient

way of securing the insert 17 is by hydrogen welding, and this may be done at the same time that the insert 8 is welded in place. This form of the invention is shown in Figure 3. Whether or not this threaded portion is formed by an insert 17 or by inwardly depressing the walls of the tube is a matter primarily of convenience in manufacture. Whichever method is used, the parts 6 and 8 or 17 and 8 are normally tapped continuously, and then by the heating member Y or otherwise, the barrel of the tappet is arranged so that it can be somewhat elongated. Such a construction could be used with the continuous screw of Figure 3 or the interrupted screw of Figure 1.

The method of forming the device comprises generally the following steps: first the tappet is formed and a groove is then rolled in the body. A threaded insert is welded in the open end. The inwardly displaced portion of the tappet body which has resulted from the formation of the groove and the insertion are then threaded, preferably as a continuous operation. Thereafter the body is stretched by any means or process, so that the two threaded portions are moved slightly off pitch with respect to each other. Finally the threaded screw is inserted for the desired distance and it meshes with the two threaded portions. When this occurs the screw is somewhat stretched and is thus locked in proper adjusted position.

The method for elongating the tappet body between the two threaded portions may be mechanical alone; it may include the use of heat or may include heating and mechanical action in combination.

The general purpose of the tappet and of the method of forming it is to produce a self-locking tappet and adjusting screw assembly. In the various forms of the invention means are provided which establish tension in the screw 11 and which create pressure between the threads in the two threaded sections 17 and 8 or in the two threaded sections 6 and 8, and this pressure locks the screw against turning during operation of the motor in which the tappet may be positioned.

The locking effect may be expressed in terms of definite foot pounds of torque applied to the head 13 of the screw 11 and the amount of this torque can be varied by varying the amount of offset or distance by which the thread sections 6 and 8 or 17 and 8 are offset with respect to each other, and therefore in making any given tappet, the distance by which one thread section is moved from the other is determined by the value of the locking effect which it is desired to establish in the tappet.

I claim:

1. The method of forming a complete tappet assembly which includes the steps of forming a hollow, generally tubular tappet body, shaping a portion of the wall of said tappet, and thereby forming an inwardly projecting member within the tappet, inserting a member in an end of the tappet body separate from said inwardly projecting member and permanently securing the same in position, thereafter forming separate areas of screw threads in said inserted member and in said inwardly projecting member, and changing the relative position of said two threaded portions so as to move the threads of the two threaded areas off pitch with respect to each other, and finally threading an adjusting screw into engagement with both threaded portions.

2. The method of forming a complete tappet assembly which includes the steps of forming a hollow, generally tubular tappet body, shaping a

portion of the wall of said tappet, and thereby forming an inwardly projecting member within the tappet, inserting a member in an end of the tappet body and permanently securing the same in position away from said inwardly projecting member, thereafter forming screw threads in said inserted member and in said inwardly projecting member, and changing the relative position of said two threaded portions by elongating that part of the tappet wall which lies between them, so as to move the threads of the two threaded portions off pitch with respect to each other, and finally threading an adjusting screw into engagement with both threaded portions.

3. The method of forming a complete tappet assembly which includes the steps of forming a hollow, generally tubular tappet body, shaping a portion of the wall of said tappet inwardly, and thereby forming an inwardly projecting member within the tappet, inserting a member in an end of the tappet body and welding the same in position, thereafter forming separate areas of screw threads in said inserted member and in said inwardly projecting member, and changing the relative position of said two threaded areas by moving them away from each other, so as to move the threads of the two threaded areas off pitch with respect to each other, and finally threading an adjusting screw into engagement with both threaded areas.

4. The method of forming a complete tappet assembly which includes the steps of forming a hollow, generally tubular tappet body, shaping a portion of the wall of said tappet inwardly, and thereby forming an inwardly projecting member within the tappet, inserting a member in an end of the tappet body, and permanently securing the same in position, the said inwardly projecting member and inserted member being spaced away

from each other, thereafter, as a continuous operation, forming screw threads in said inserted member and in said inwardly projecting member, and changing the relative position of said two threaded portions by elongating that part of the tappet wall which lies between them, so as to move the threads of the two threaded portions slightly off pitch with respect to each other, and finally threading an adjusting screw into engagement with both threaded portions.

5. The method of forming a tappet which includes forming a hollow tappet body, displacing a portion of the wall of said body inwardly, positioning a perforated member in an end of said body, welding the same in place, forming separated areas of screw threads in the inwardly displaced part of the body and in said perforated member, said threads being initially in pitch, and thereafter elongating the tappet body between the threaded portions, and moving the threads on said inwardly displaced part of the body out of pitch with those in said perforated member.

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