July 9, 1929. G. SCHNEIDER ET AL 1,720,353

TAPPET

Filed Dec. 12, 1927

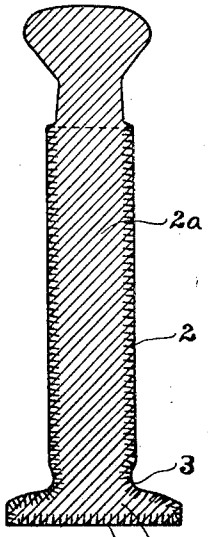


Fig. 1.

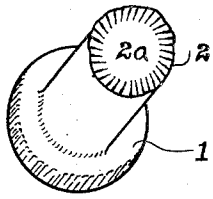


Fig. 2.

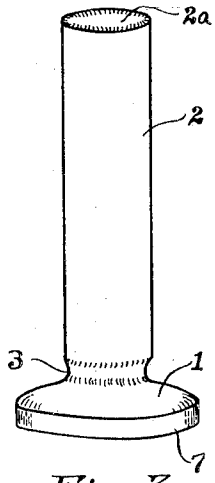


Fig. 3.

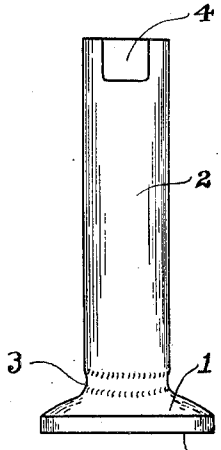


Fig. 4.

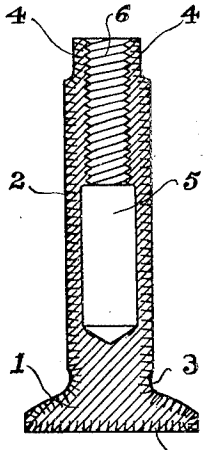


Fig. 6.

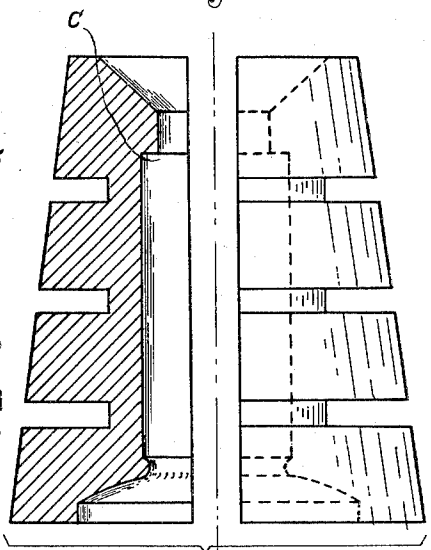


Fig. 7.

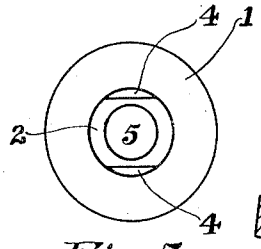


Fig. 5.

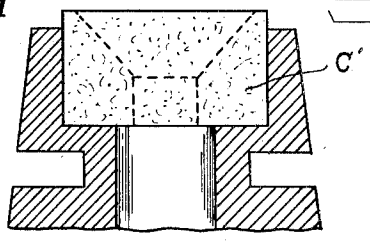


Fig. 8.

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UNITED STATES PATENT OFFICE.

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TAPPET.

Application filed December 12, 1927. Serial No. 239,290.

This is an improvement in the manufacture of tappets for internal combustion engines.

The invention resides in certain novel means by which the process of manufacture is simplified, the cost of production is reduced, and in certain specific details the construction and efficiency of operation of the tappet is improved.

The kind of tappet to which the invention is applicable is known as a one-piece cast iron tappet. A typical example of such a tappet is described in United States patent to Merrill M. Wilcox, No. 1,497,421, issued June 10, 1924, in which the head is cast in a chill and the tubular body or stem is cast in sand and is, therefore, entirely of soft grey iron.

In practice such one-piece cast iron tappets have been found to possess disadvantages, partly commercial and partly physical. Our improvement avoids those disadvantages while retaining all the inherent good qualities of a one-piece cast iron tappet.

An object of the invention is to provide a tappet having a body made of cast iron but having an outer polished surface of great hardness, so hard in fact that it is proof against being nicked, roughened or surface-raised during such handling as tappets are commonly subjected to when manufactured in mass. The usual high percentage of rejects on account of nicking cast iron tappet bodies is avoided.

The importance of making a cast iron tappet stem or body capable of resisting nicking will be apparent when it is remembered that these bodies are to slide lengthwise in bearings with a clearance of only about one tenth of one thousandth of an inch. It is a common experience to discover many nicked stems in a lot of tappets that have merely been poured out on a bench for inspection, the nicks having been produced by the tappets striking against each other. A nick produced in that way in a tappet of steel, or even in a stem of soft cast iron, will make a slight raise or projection on the polished surface and cause rejection of the tappet. Frequently experts have to be sent from the tappet factory to an engine assembling plant to hone away the microscopic raises that are produced in the tappet stem surfaces by such nicking. Our invention avoids such waste of time and material.

Another object is to provide a tappet body having a highly polished glass-hard cylindrical nick-resisting surface shell of white iron that surrounds a core of soft grey iron relatively tough and easily machined and capable of being bored out rapidly and cheaply. We thus produce a tubular stem with a thin tough outer shell whose hardness increases from approximately that of soft grey iron at its inner face to substantially glass-hardness at its outer face.

A still further object is to provide a stem of cast iron in which the individual internal threads of the tapped ends are much stronger, tougher, and possess sharper, smoother edges and cleaner roots than in tappets of ordinary grey iron. The rather common defect in cast iron tappets, namely, stripping the threads or crumbling them while the tappet is in use is avoided by cutting the threads in this harder tougher metal.

The foregoing new and useful results are attained in this invention by means which, although apparently minute is effective. Converting the outer shell of the stem into white chilled iron while the inner core remains of soft grey iron results in a tappet which, considered as a new and useful article of manufacture, is a product of invention notwithstanding the well-known fact that chilling is a process commonly used in iron foundries and has been applied to the impact faces of the heads of cast iron tappets, as witness the Wilcox patent above referred to.

Our invention applies an old means, chilling, to attain new results in solving those difficulties that are peculiar to the conditions of use of tappet stems in modern combustion engines, and by applying the old means in the manner herein set forth, we make a number of steps forward in the art of tappet manufacture by mass production.

Although in its physical embodiment the invention is an article of manufacture, yet it belongs in that class of inventions that can not be properly defined except by reference to the process producing it, hence it will be described at least partly in terms of process or method.

With the foregoing and certain other objects in view, which will appear later in the specifications, our invention comprises the devices herein described and claimed and the equivalents thereof.

In the drawings Fig. 1 is a horizontal sec-

tion of a tappet as cast, with the sprue in place.

Fig. 2 is a perspective view, broken, showing the end structure of the hardened cast iron stem or body.

Fig. 3 is a side view of a tappet casting with the sprue removed.

Fig. 4 is a side view of the finished tappet.

Fig. 5 is a top view of the same.

Fig. 6 is a longitudinal section through a completed tappet.

Fig. 7 is a side view, partly sectional, showing a mold in which the tappet is cast.

Fig. 8 is a sectional detail of the sprue end of a modified form of mold.

As is clearly shown in the drawings, the tappet is of the usual one-piece type, preferably made of cast iron, and consisting in the head 1, of mushroom type, or the tappet may be made without a head as in the ordinary slug type. The body 2 of the tappet joins the head by an undercut or relieved peripheral recess 3. The other end of the stem is provided with the usual two wrench flats 4, 4. The interior or core 2^a of the stem 2 is soft and may be formed with a bore 5, the upper end of which is threaded, as at 6, to receive the usual push rod adjusting screw, not shown. The entire tappet is made of a single piece of cast iron. The working face 7 of its head 1 is chilled in the usual manner, and according to our invention, the body 2 is also chilled from the outside inward, say, about one sixteenth inch, leaving the soft cast iron core 2^a. The depth of chill of the stem is easily regulated by increasing or decreasing the size of the iron mold, Fig. 7, in which the tappet is cast, or by raising or lowering the temperature of the molten iron within proper limits, or both.

The externally chilled body 2 has a much greater degree of hardness at its outer surface than is commercially feasible to give to a tappet body or stem made, for instance, of a piece of steel tubing. Consequently the external surface can easily be made so hard that it can not be nicked in ordinary handling. Even if the surface is marred it is of such a crystalline character that the metal will not flow or raise and consequently the accuracy of the fit of the tappet stem in the engine bracket will not be impaired. This feature results in a great reduction in the cost of manufacture, by reason of having a smaller percentage of rejects on account of nicking. Furthermore, the wrench flats are no longer a common source of rejects on account of cracking caused by the setting down of the adjusting screw. The walls at the wrench flat, although very thin, are, by reason of being chilled, sufficiently strong and tough to avoid that difficulty.

The end face of the stem, that is, the annular ring at the tappet end against which the bearing face of the adjusting nut seats, is also made extremely hard by chilling, and the tendency for the face of the nut to bur the end of the tappet stem is entirely eliminated.

Heretofore it has been necessary to turn down an outer face of the tappet at the two ends where the bearing face of the stem overtravels the bracket in order to prevent long use from causing a shoulder on the stem. But that extra operation of grinding down the ends is found to be unnecessary in our improved tappet, for the reason that the chilled surface does not wear to any appreciable extent, hence the necessity for reducing the diameter of the tappet at its upper end no longer exists, and at its lower or head end the recess 3 is formed in the mold.

In Fig. 7 is shown a type of mold in which the shoulder chill C is used to produce an annular hardened area across a part of the diameter of the top end of the tappet. This is preferably used on large diameter tappets where there is ample room left for the screw recess 6 in the soft metal.

For smaller tappets the end chill is not used, a sand core C′, Fig. 8, preventing it, and giving a tappet body having the side chill only.

Our invention, although extremely simple in its nature, has made a distinct advance in the art of tappet manufacture by improving the ordinary cast iron tappet to a point where it is in all commercial respects equal to the best built-up tubular stem tappets and is in many respects superior to them, as well as being a distinct advance over the usual one-piece cast iron tappets which up to this time have been somewhat lacking in reliability and wear resisting qualities.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

A cast iron tappet, the outer surface of whose stem is rendered nick-resistant by being made of chilled hardened white iron and whose interior axial body is made of a core of soft grey iron.

In testimony whereof, we affix our signatures.

GEORGE SCHNEIDER.
FREDERICK A. WELSMILLER.