Sept. 21, 1937. F. H. MARKWICK 2,093,639

GAUGE

Filed Oct. 16, 1934

FIG. 1

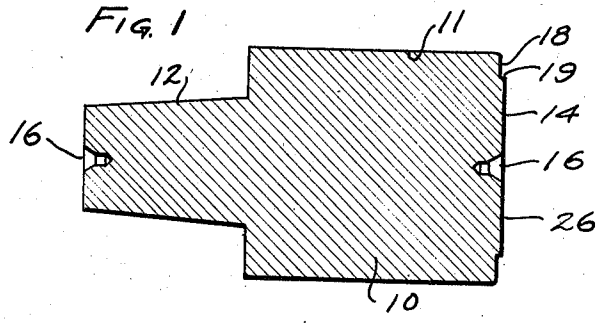


FIG. 2

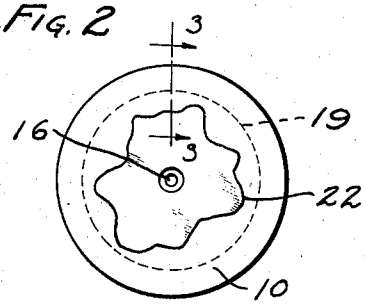


FIG. 3

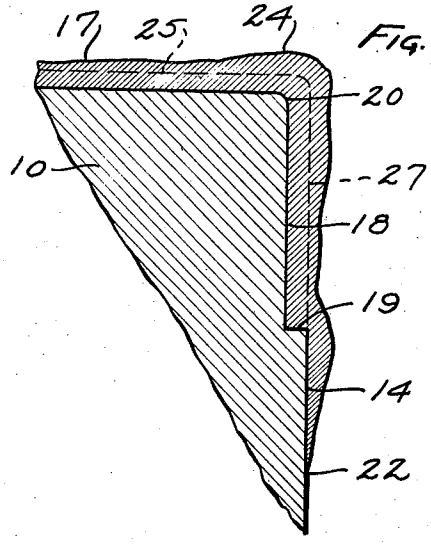
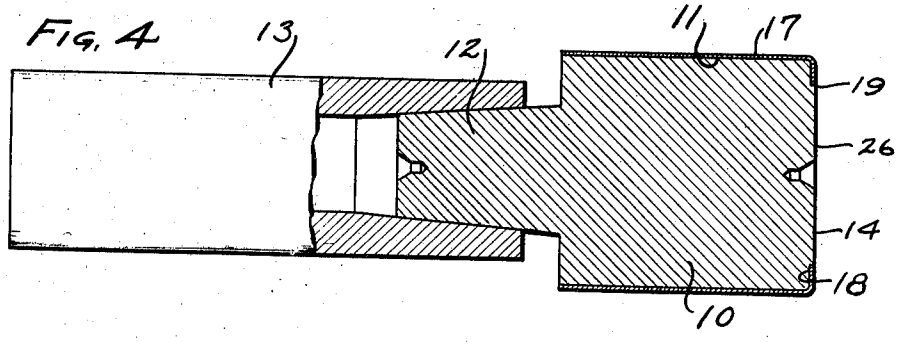


FIG. 4



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2,093,639

GAUGE

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Application October 16, 1934, Serial No. 748,513

4 Claims. (Cl. 33—178)

This invention relates to tools, and more particularly to tool members of the character that in service repeatedly interengage other members.

One of the principal objects of the invention is the provision of a tool member of simple construction incorporating an applied hard metal surface coating of such character as to effectively withstand the deteriorating effects of continued use.

Another object of the invention is the provision of a tool member of the character referred to having an electro-deposited hard metal coating which covers the engaging face of the tool member and which terminates on the entering end of the tool member in abutting relationship with a shoulder formed thereon.

Another object of the invention is the provision of such a tool member in which an offset is provided on the entering end for accommodation of a continuing lip of the hard metal coating; the offset being of such proportions as to permit finishing the end of the tool member flush without reducing the lip to objectionable thinness.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing, and the appended claims.

The application of a hard metal coating to the wearing surfaces of tool members such as die punches, gauges, and the like has been resorted to as a measure of economy. The desirable quality of hard metal, such as chromium, in resisting wear when applied to tool members of the character that are repeatedly interengaged with other members during service is but one factor in providing for economical usage of such tool members. In addition, a tool member incorporating an electro-deposited hard metal surface coating may be readily reoperated by a renewal of the surface coating at but a fraction of the cost of the replacement value of the tool member. This is particularly true in the case of die punches, gauges and the like which, because of the quality of material used and the close limits of accuracy to which such tools must be held, are costly to produce.

There is, however, another factor to be considered. Unless the hard metal coating is applied in such a manner as to resist removal as by chipping or flaking the reoperation may be required so frequently that more economical usage will be afforded by un-coated tool members having no reoperation value.

The problem, therefore, is to apply the coating in such a manner that it will effectively resist removal by chipping or flaking as a result of repeated engagement with other parts. In the case of a punch such chipping or flaking will render the punch useless for proper engagement with a die, while in the case of a gauge such a condition will not only render the gauge inaccurate but in addition may damage the work piece by scratching or scoring.

The present invention contemplates a construction incorporating an electro-deposited hard metal surface of such character that it will effectively resist removal by chipping or flaking. A suitable uniform depth of coating is assured on those portions of the tool member which contact the mating parts in service, and the coating is such that it is free from thin overlaps that may readily flake off and thus adversely affect the expected useful life of such a surface coating. In addition, the practice of this invention permits the application of an electro-deposited coating of such character that only the wearing surfaces of the tool member are coated, this making for further economy.

It has been mentioned that a hard metal coating may be applied according to this invention to punches, gauges and like tool members which in service repeatedly engage other parts. It is believed that the full field of usefulness will be clearly apparent from a consideration of but one form of application, and the invention is therefore disclosed as applied to a plug gauge.

Plug gauges have widespread usage for gauging the size of the annular openings in work pieces. In the entire field of gauging, including very elaborate equipment for accurately gauging to extremely fine limits, plug gauges may be regarded as being relatively inexpensive. However, these gauges do represent an investment of such value that any means of increasing their useful life within cost limits favorably commensurate with the initial cost is of advantage. Applicant, by applying a durable hard metal coating of such character as to effectively resist removal and wear in service, materially adds to the normal useful life of a plug gauge, and affords further economy by providing a gauge that may be readily restored to its original dimensions and usefulness.

In the initial processing of a plug gauge according to this invention the gauging face of the steel plug part is finished undersized with respect to a desired diameter, and is subsequently increased in size by plating thereon a coating of hard chromium. The chromium coating is not limited to the gauging surface alone but continues onto the entering face of the gauge to form

thereon a ring-like lip of chromium that is integral with the gauging surface. To insure an adequate thickness of chromium on the gauge as well as to avoid the termination of the coating as a thin overlapping layer which may readily flake off and thus present to the work piece sharp jagged edges that will adversely affect the gauging operation, the chromium lip occupies an offset in the gauge end which extends inwardly from the junction with the gauging surface. In the case of a ring gauge the chromium coating likewise covers the gauging surface and extends as an integral lip onto the entering end of the gauge. When applied to a punch the chromium coating covers the punch part which interengages the die and extends as a continuing lip onto the entering face of the punch. The cutting edge of the punch therefore is of hard chromium which also extends onto both faces from the working edge.

In the drawing, which discloses a preferred form of the invention,—

Fig. 1 is a sectional view taken on the axis of an unfinished gauge plug;

Fig. 2 is an end elevational view of a gauge plug upon which the chromium coating is applied but which has not been processed to the finished form;

Fig. 3 is an enlarged fragmentary sectional view as indicated at 3—3 of Fig. 2; and

Fig. 4 is a view of the finished gauge which is shown partly in section for clearness of illustration.

To refer now to the drawing, in which like characters designate like parts in the several views thereof, there is shown a plug part 10 having an undersized surface 11. One end of the gauge is provided with a tapering extension 12 for application of a handle 13, and the other end 14, referred to as the entering end, stands transversely to the gauging face 11.

Centering holes 16 are provided in the gauge ends as a means of support during the processing of the gauge. As a plug gauge, to be effective as a gauge, must be of uniform diameter throughout the extent of its gauging surface and must be capable of being finished to a desired degree of accuracy, it is essential that the centering holes 16 be maintained in true axial alignment so that when the plug is re-mounted on the centers during successive stages of the processing the gauging surface will always be concentric with the axis of support.

In preparing the gauge for plating the steel face 11, which is preferably hardened, is machined to a diameter sufficiently less than the desired dimension so that upon application of the chromium coating 17 the gauge may then be finished to the desired dimension without reducing the chromium coating to an objectionable thinness. The finished chromium layer is of the order of .003".

As mentioned above, an offset is provided on the entering end 14 which also receives a coating of chromium, this offset 18 extending inwardly toward the gauge center line from the junction of the end face with the gauging face. The offset has a depth in the direction of the gauge axis of the order of .005", and a width extending toward the gauge center of the order of ⅛". In the drawing the inner limit of the offset is defined by the shoulder 19. The shoulder is shown extending transversely to the gauge end face. The shape or contour of the shoulder may vary somewhat without departing from the spirit of the invention as its purpose is to define a recess or offset which, when filled with the chromium coating that is subsequently machined to a smooth surface flush with the remainder of the gauge end, will obviate any thin overlapping surface of chromium that may flake off during service and so destroy the usefulness of the gauge. Instead, by providing the offset, the chromium coating continues for the extent of the gauging surface and onto the entering end as a layer of substantially uniform thickness which terminates at the end of the lip in abutting relationship with the plug end face. As is subsequently described, during the plating process the chromium may form on parts of the gauge end in a thin overlapping layer but this, however, is removed in finishing the gauge so that there are then no portions of the plating in which overlapping edges are exposed, or in which the chromium is of such thinness that flaking of the chromium coating may occur.

In the application of the chromium plating to the gauge the hard surface metal is deposited only on desired parts of the gauge by the use of a cylindrical anode which, in the plating bath, stands concentrically with respect to the plug axis. By the use of a cylindrical anode the hard metal is applied to the gauging face as a coating which is substantially uniform in thickness except adjacent the junction of the gauging face and entering end, indicated at 20, where the applied metal tends to build out to a larger diameter than on the remainder of the gauging face. Further, the thickness of the hard metal coating on the entering end tends to taper off to a degree that the entire end face is not covered. The extent of end coating follows generally an irregular line as indicated at 22 which, as shown, does not extend to the plug center 16. This is an advantageous method of coating because it prevents the chromium surface layer from entering the centering hole, and thus prevents the possibility of shifting the center for subsequent processing operations on the center, which might easily result from an uneven coating of chromium on the surface of the centering hole. The chromium coat does, however, extend inwardly on the end an amount sufficient to fill the offset 18 and to extend over the offset shoulder 19 as indicated diagrammatically in Fig. 3.

Following the application of the chromium the plug is again mounted on the centering holes 16 and is further processed to reduce the gauging face to the desired diameter. Owing to the irregularity of the hard metal thickness, particularly adjacent the corner 24, the gauging surface is preferably ground to a dimension that will permit accurately lapping the gauging surface to the desired diameter which is indicated by the dotted line 25 in Fig. 3. The end face 14 is likewise finished and is preferably ground to the elevation of the part 26 of the end face which continues in from the offset. This end finishing removes all the chromium from within the limits of the ring or face 26 defined by the shoulder 19 but does not objectionably reduce the thickness of the lip which fills the offset and which, in finished form, will have a face as indicated at 27 in Fig. 3. During the processing of the gauge before applying the chromium coat the junction or edge 20 is preferably ground or stoned sufficiently to break the sharp corner. This same short radius may be formed at the edge on the chromium coating to facilitate entering the gauge during a gauging operation.

The provision of an offset on the entering end

adjacent the gauging face permits a pleasing finish on the gauge end in that the plated lip shows as a well defined annular ring that is concentric with the centering hole. The pleasing appearance however is quite secondary to the utility afforded by this construction. By continuing the chromium surface coating onto the entering end of the gauge, rather than restricting the chromium coating to the gauging surface alone there is no exposed plated edge which may flake off as a result of repeated engagement with the work piece. It is thought that it is now clearly apparent that the hard metal coating of this invention is such as to afford economical processing, and is such as to effectively resist deterioration other than as a result of natural wear. It is believed also that it is clearly apparent that the construction is equally well adapted to punches, gauges and like tool members of the character that are required to repeatedly interfit other members. In any usage the tool member edge, which is subjected to most severe wear, is supported by a well anchored coating extending in two directions from the edge. The coating is of suitable depth to resist flaking or chipping at all points throughout its extent. The terminating edge of the lip stands in abutting relationship with an abrupt shoulder so that a flush end face is afforded that is free of thin overlying portions of plating that result in flaking. And, as pointed out above, these advantages obtain in a construction that is economical in that but a relatively small part of the entering end of the tool member need be coated. In the case of large gauges or punches this saving is an item of considerable value.

While the method and articles herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to the precise method and articles, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A tool member of the character described adapted for engagement with another member, said tool member comprising a steel body part having a side and a transverse entering end, the entering end having an offset extending inwardly from the side and terminating in an abrupt shoulder, the offset having a depth of the order of .005" and having a substantial face width, and an electro-deposited chromium coating of the order of .005" in thickness on the body covering the side and providing a gauging surface and covering the offset as a chromium lip continuing from the gauging side and presenting an end portion flush with the end of the body part.

2. A gauging device of the character described adapted for engagement with a member to accurately determine a size relationship, said gauging device comprising a metal body part having a wall for provision of a gauging face and having a transverse end face of which a portion remote from the said wall stands outwardly of the junction of the wall and end face, and an electro-deposited hard metal coating covering the said wall and forming a gauging face thereon and continuing onto the end face and terminating at the remote portion that stands outwardly.

3. A gauging device of the character described adapted for engagement with a member to accurately determine a size relationship, said gauging device comprising a metal body part having a side wall for provision of a gauging face and having a transversely related flat entering end face formed with an offset extending from the side wall and terminating on the face in an abrupt shoulder, and an electro-deposited hard metal coating covering the side wall as a gauging face and covering the offset portion of the end face as a hard metal lip continuing from the side wall and terminating at the shoulder flush with the flat entering face.

4. A gauging device of the character described adapted for engagement with a member to accurately determine a size relationship, said gauging device comprising a metal body part having a wall for provision of a gauging face and having a transverse end face, the end face of said body part having a recessed portion, and an electro-deposited hard metal coating covering the said wall and forming a gauging face thereon, said coating continuing from the gauging face onto the end face and terminating in engagement with said recessed portion.

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