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AIR PLUG GAGE CONSTRUCTION

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Fig. 1.

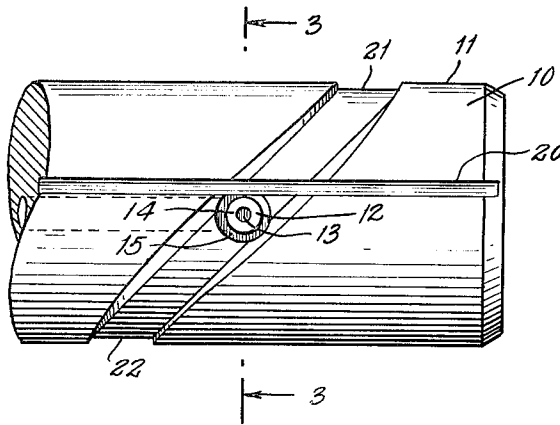


Fig. 2.

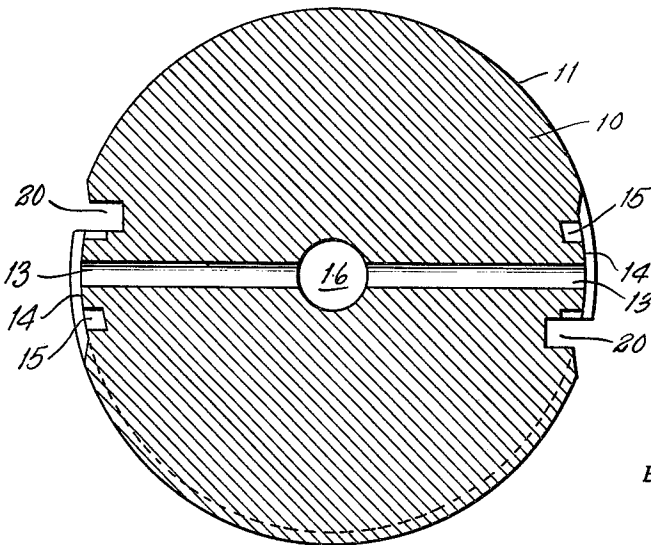
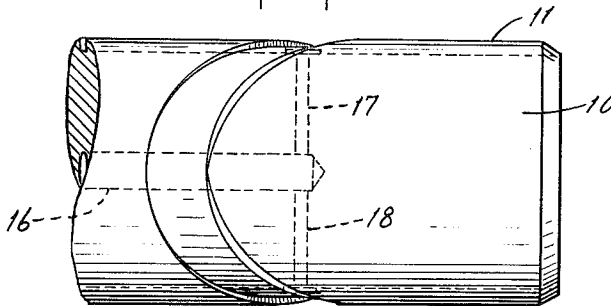


Fig. 3.

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AIR PLUG GAGE CONSTRUCTION

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2 Claims. (Cl. 73—37.9)

The present invention relates to plug gages and especially to plug gages in which the gaging operation is performed by flow of air from a diametrically arranged pair of orifices. As is well known in plug gages of the air type orifices are provided by diametrically opposed nozzles, the faces of which are cylindrical and at the ends of a diameter slightly less than the diameter of the cylindrical plug body. Air escape grooves are located adjacent the nozzles, the size of the orifices and the width of the land surrounding the orifices having a proportion which has been well established in commercial practice.

It has, however, been costly to produce plug gages having the small diametrical difference in cylindrical radius necessary as between the nozzle faces on the one hand and the cylindrical body of the gaging plug on the other. One method which has been utilized to produce high quality long wearing air plug gages was to first machine the gage to give the proper nozzle air orifices and escape grooves and to then cylindrically grind the plug, on centers, to establish the proper diameter across the nozzles. Thereafter the nozzle faces were masked and the plug body plated with hard chrome to a thickness somewhat greater than the required radial difference between the nozzle and the body. This radial difference is normally approximately 0.0015 inch. The body was then ground to a desired final diameter leaving a smooth layer of chromium for wear resistance.

As will be obvious in the case when the radial difference between the nozzle and body is 0.0015 inch, the body in its finished grinding will be ground to a diameter 0.003 inch greater than the diameter resulting from the first grinding prior to chromium plating. The time required for the masking, heavy plating and subsequent grinding add materially to the cost of producing such a plug gage.

Another method of producing plug gages of the general type discussed above has been that known as "rock" grinding. In this method a very small grinding wheel making end contact grinds the nozzle faces one at a time to the desired dimension, this being achieved by oscillating or rocking the workpiece slightly on its centers to thus produce the cylindrical faces of the nozzles only. By this means the plating is avoided but the necessity for exactly determining the degree of oscillation and for making the two nozzles on a true cylindrical diameter and exactly the same depth below the body surface while obtaining a good finish on the nozzle faces renders this method also quite costly.

In a third method of producing plug air gages the plug is ground to two diameters, the nozzle faces being part of a shallow circumferential relief band just wide enough to include the nozzles. This method is considerably cheaper than the two methods outlined hereinabove and produces a gage which is satisfactory for many types of gaging operations. Except for the fact that the gage is not chromium plated it is in general comparable to those formed by the other methods. Because of the lack of plating it is of course more subject to wear and is generally used only for short run operation. Gages produced by this third method have an additional shortcoming, however, namely that the nozzles are more subject to damage and wear under certain conditions.

The present invention is a gage made by a modification

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of the third method in a form in which the limitations as to conditions of use are overcome. The limitations mentioned broadly arise from the fact that with a circumferential relief band it is difficult if not impossible to avoid damage to the nozzles when a workpiece of relatively small axial extent is to be gaged, since when this is the case tipping of the workpiece will cause an edge of that workpiece to come into contact with and damage the nozzle faces.

My invention modifies the construction of this third type of gage by utilizing a relief groove which, instead of extending circumferentially, extends in a oval about the cylindrical plug, that is, the groove extends about the cylindrical plug at an angle to a circumference which angle is preferably, but not necessarily, 45°.

It is an object of my invention to provide a relatively inexpensive air plug gage which at the same time eliminates the possibility of nozzle damage even when gaging a workpiece which is of relatively small extent in the axial direction.

It is another object of the invention to provide an air plug gage having a relief band which leaves a maximum surface of the body diameter in a plane perpendicular to the plug axis and extending through the nozzles.

Other objects and features of the invention will be apparent when the following description is considered in connection with the annexed drawings, in which,

FIGURE 1 is a top plan view of a plug gage in accordance with my invention;

FIGURE 2 is a side elevational view of the gage of FIGURE 1; and

FIGURE 3 is a transverse cross-sectional view of the gage of the preceding figures, the view being taken on the plane of the line 1—1 of FIGURE 1.

Referring now to the drawings, the air plug 10 is, in a customary manner, formed of a cylindrical surface 11 having nozzles 12 formed generally centrally thereof in an axial direction and at opposite ends of a diameter. The nozzles 12 comprise a central orifice 13 surrounded by land 14 which is in turn surrounded by a shallow circumferential groove 15.

As is customary, a central air passage extends axially through the plug as indicated at 16, this passageway communicating with the two passageways 17 and 18 which in turn communicate with the orifices 13. As is well known, the passageway 16 is connected to a source of air pressure through a pressure gage so that the gage reading determines the pressure drop resulting from flow of air through the orifices and through the restricted passageways formed by the cylindrical nozzle faces and the adjacent walls of the bore being gaged.

Extending longitudinally of the plug 10 are the air escape grooves 20 each of which communicates with the corresponding circumferential groove 15, thus permitting air flow to be regulated only by the restriction above mentioned and not otherwise.

In order to grind the nozzle faces so that they form part of a cylindrical surface of slightly lesser diameter than that of the body of the gage, a relief groove 21 is produced, this groove forming a band preferably at 45° to the plane of a cylindrical diameter and including the nozzle faces, that is, the land 14 between the circular groove 15 and the orifice opening 13. This relief groove 21 may be produced in a number of ways, but it is preferable that a grinding wheel be mounted on an axis parallel to the centers of the plug body 11 and that as the body is rotated on center the grinding wheel rotates on its center and at the same time reciprocates from the point 21 to the point indicated at 22. When the reciprocatory movement and the rotation of the plug body are properly synchronized the skewed groove 21 will be produced and

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as indicated the nozzle faces will lie on the cylindrical surface of that groove and be the desired amount beneath the surface of the plug body.

As will be readily apparent, a piece to be gaged which is axially relatively narrow is nevertheless well supported by the plug body and cannot be tipped so that an edge thereof engages and damages either of the nozzle faces. On the other hand, when similar relief grooves were provided which extended circumferentially of the gage body, an axially narrow workpiece might, in the absence of extreme care, be so tipped as to strike one of the nozzle faces and cause damage thereto. When it is realized that in order for the gage to be usable and accurate, the nozzle faces must be accurately spaced from the gage body surface by amounts in the range of 0.0015 inch or less, it becomes clear that any damage to these nozzle faces destroys the utility of the gage. Thus by the relatively simple provision of a groove which is inclined to the diametrical plane of the nozzles rather than being centered about that plane, the possibility of damaging the nozzles and destroying the utility of the gage is substantially eliminated.

Moreover, as has been indicated, the cost of producing a gage having this inclined groove, is materially less than the cost of gages produced by methods requiring masking and plating and it is, in fact, substantially the same as the cost of producing the circumferential groove which presents the possibility of damage as hereinabove described.

While I have described a preferred embodiment of my invention, it will be understood that I wish to be limited not by the foregoing description, but solely by the claims granted to me.

What is claimed is:

1. In an air plug gage, in combination, a cylindrical

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plug body, a band of lesser diameter than said body extending completely around said body at an angle to the plane of a cylindrical diameter of said body, a pair of nozzles in said plug body, said nozzles comprising apertures opening into said band at diametrically opposite points thereof and a circular groove concentric with each said aperture, and a pair of longitudinal grooves, each said longitudinal groove communicating with one of said concentric grooves whereby air may escape from said apertures.

2. In an air plug gage, in combination, a cylindrical plug body, a band of lesser diameter than said body extending completely around said body at an angle of 45° to the plane of a cylindrical diameter of said body, a pair of nozzles in said plug body, said nozzles comprising apertures opening into said band at diametrically opposite points thereof and a circular groove concentric with each aperture, and a pair of longitudinal grooves, each said longitudinal groove communicating with one of said concentric grooves whereby air may escape from said apertures.

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