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METHOD FOR TESTING SHEET METAL

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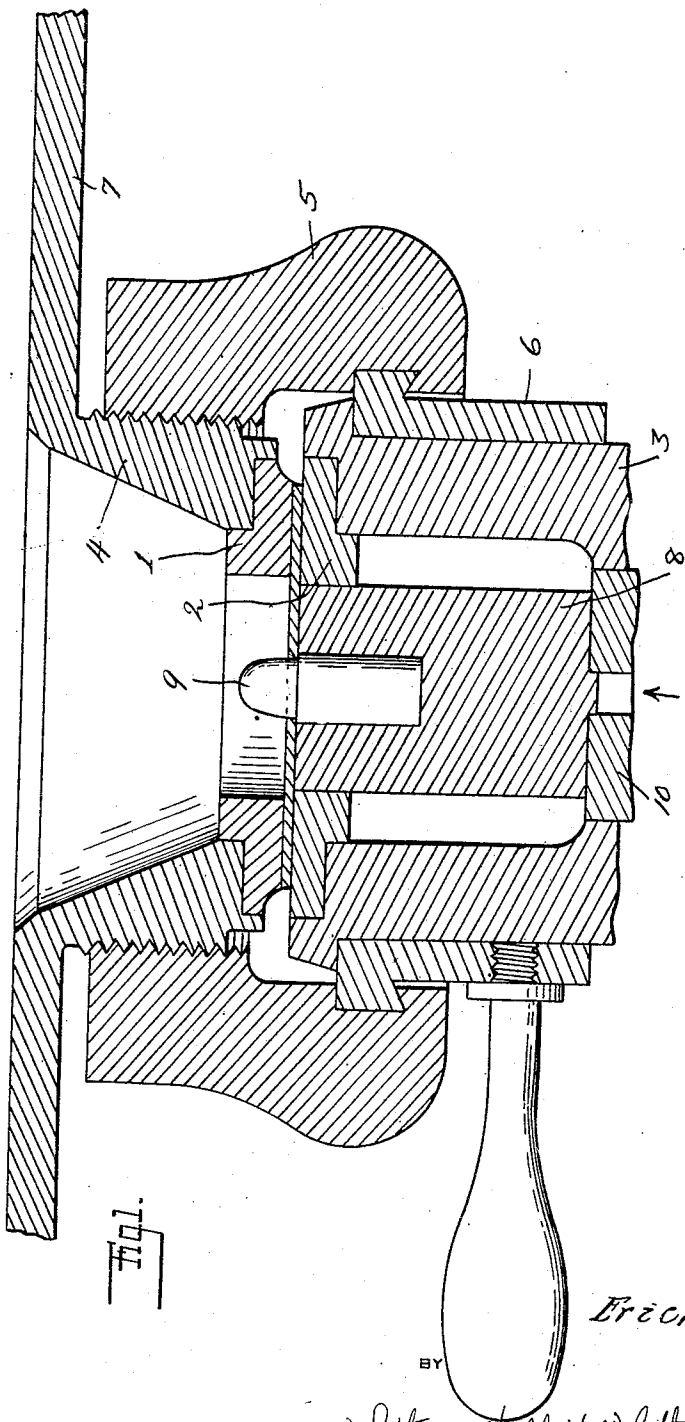


Fig 1.

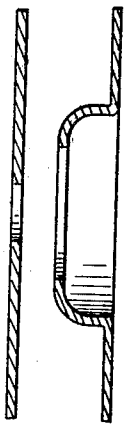


Fig 2.

Fig 3.

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METHOD FOR TESTING SHEET METAL

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The principal object in mind of this invention is to test the drawing quality of sheet materials. Deep draw is made in the sample different from the methods used up to this time. A hole is drilled in the specimen before the drawing operation is made. This hole must be centrally located and the metal specimen must be held on its outer edges in such a way as to prevent a drawing in of metals from the gripping zone during the drawing operation. During this operation, the metal required for building up the side walls of this deep draw comes out of the metal immediately over the drawing punch and inside of the opening in the upper gripping holder, that is, the circular metal laying on the top of the draw punch is drawn in a radial direction over the outer draw edge of the punch. This operation will open the hole in the sample to a point where the drawing strength of the metal specimen is exhausted and naturally will start to tear. The opening of the hole to the point of breaking gives us a point on which to base calculations with regard to the drawing strength of the metal. The determining of this point can be more easily found if the actual draw punch area is flush with the metal specimen at the time of starting the test.

An arrangement for performing this test is graphically illustrated in the accompanying drawing. Fig. 1 shows a cross section of the machine head holding grips and draw punch. Fig. 2 the sample before and Fig. 3 after the draw.

The machine head consists of the two grips 1 and 2, the latter is located in the upper end of the cylindrical housing 3, grip 1 is held by the movable butterfly nut 4. This butterfly nut is equipped with a male thread and serves as an object of pressure and is screwed into the housing 5, which in turn is held by the clamping device 6 to the solid housing 3. In order to secure a tight lock of part 4 and part 5, the former is equipped with levers 7.

The draw punch 8 shows on its face a locater 9. The inside diameter of grip 2 corresponds to the diameter of the draw punch. The anvil in which the draw punch 8 is inserted is 10.

The method of performing is in the following manner: When the sample has been drilled as in Fig. 2, said sample will be laid upon grip 2 and the central location of the hole is assured through the locater 9 built into the draw punch. The butterfly nut 4 with the housing 5 and grip 1 will be raised during the insertion of the sample. Then the housing and the butterfly nut will be replaced as described before and fastened with the clamp device 6. Through the turning of the butterfly nut 4, the sample will be held securely by the grips 1 and 2 and the draw test of the sample will be accomplished by the upward movement of the draw punch 1, this movement being accomplished preferably by a hydraulic ram. As the draw punch is moving upward, one can see the opening of the hole in the sample, as the material necessary to the building up of the cylindrical side wall flows from the circular face of the draw punch. This forming of the draw and the consequent opening of the hole is shown in Fig. 3. As soon as a tear appears on the edge of the hole in the specimen, the test of the draw is completed. The maximum opening of the hole as compared with its original size gives an exact indication of the drawing quality of the material under circumstances which are similar to the deep drawing operation in actual production, also the depth which is secured at the point of tearing can be used as a standard for deep draw strength.

This proposed new test method has also this advantage; that when used in conjunction with a flat, cylindrical punch and a circular hole, the tensile strength of the sheet metal ring located on the head of the punch may be calculated from the load. The physical exertion in this cylindrical section must during the draw operation correspond with the draw resistance. Consequently the draw loads, if the draw resistance is known, is given by formulas. Another way it is possible to calculate the draw resistance of the material and also the tensile strength from the known draw load. This method can also be used with thin sheet metal for the simple

reason that the tightening of the outer edges does not cause any difficulties and the circular ring around the bore is only exposed to the tensile loads. As known, the tension load with thin sheet metal is impractical with methods known up to this time and consequently this new method gives this valued addition of the tension test.

I claim:

1. In the method of testing sheet metal for deep drawing, the steps of forming an opening in the sample, locating the sample so that the center of said opening will be in the axis of a draw punch, gripping the sample peripherally to prevent any flow of the metal from the gripping zone, and drawing that metal located over the draw punch and within the gripped zone.

2. In the method of testing sheet metal for deep drawing, the steps of forming an opening in the sample, locating the sample so that the center of said opening will be in the axis of a draw punch and flush with the face thereof, gripping the sample circumferentially with respect to said opening to prevent a flow of the metal from the gripped zone during the drawing operation, and drawing the metal located over the draw punch.

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