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Engineering Record - Snap Action Discs

The following is a general discussion on the processing of snap action bimetal discs. The manufacturing firms, who make this type of an element guard carefully certain trade secrets which are necessary to manufacture these parts. There is a certain amount of information known throughout the thermostat and related industries which can probably be passed on the other interested parties considering such devices.

The bimetal material supplied for this application should be uniform in the quality of the bond, the thickness of the material across the width and flatness of the strips. Cross curvature of the material should also be kept to a minimum. Some manufacturers prefer a high hardness bimetal whereas others obtain better results with standard hardness. Possibly in a new application the two types of materials should be tested and the one giving the best results in life tests should be used.

Usually, these discs are blanked from the material in two rows. For the sake of uniformity in calibration, the discs obtained from one strip of bimetal which represents the yield of one billet should be processed separately from those obtained from succeeding strips. In addition to this segregation, the two rows of blanked parts should be separated and processed separately. The reason for the above segregation is that there seems to be slight differences in material characteristics between billets. Also, slight thickness variations across the strip width cause one row of discs to calibrate slightly different from the adjacent row.

The blanked discs are heat treated for a period of two hours in a salt bath at 600° F for the purpose of relieving stresses in the material due to cold rolling and blanking. Possibly a heat treat in air would serve the same purpose. The first form is then made in the discs which will determine the top operating temperature. The shape of the tool for this form is a section of a sphere with the top flattened out. This is the larger of two forms, the second of which comes later. The second and smaller form is made with the same tool as the first one; however, it is in the opposite direction and serves to determine the bottom temperature. The amount of both first band second forms is determined by the bottom and top temperature values. The press used in making the form is adjustable so that very small variations can be obtained in the amount of the form.

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The second heat treat process is made for a period of 15 to 30 minutes in a salt bath at 550°F.

This is to relieve stresses due to forming. Here again a heat treat in air may possibly be satisfactory.

The next process is calibration which consists of separating the discs according to their characteristic top and bottom temperatures. Four temperature-controlled salt pots are used, each one having a temperature which corresponds to either the high or low limit of the top and bottom temperatures. Each disc is immersed in the various salt pots to determine whether or not its temperatures are within limits. Those rejected are segregated according to whether they are high or low in temperature and are eventually reprocessed by bumping to bring their temperatures back within limits. The ones passing this calibration test are now ready for assembly into the thermostat.

Satisfactory material and processing should result in a yield of between 60 – 70%. If the yield is below this value, indications are that the bimetal material was not sufficiently uniform or the bumping setup was not properly selected for the average characteristics of the bimetal stock. Where the temperature limits of the top and bottom temperatures are quite broad, yields of 85% and better can readily be obtained.

The following are a few very general suggestions for material disc sizes to operate within certain temperature ranges.

Temperature Range	Material Type	Disc Dimensions
75 to 270°F	#2400	006 x ½ “dia. 010 x ½ “dia. 012 x 1”dia. 014 x 1”dia. 016 x 1”dia.
270 to 450°F	#2800	012 x 1”dia. 014 x 1”dia. 016 x 1”dia.