Feb. 6, 1951 J. T. CLARK 2,540,932

METHOD OF MAKING OVAL DIAPHRAGMS

Filed July 10, 1948

Fig. 1

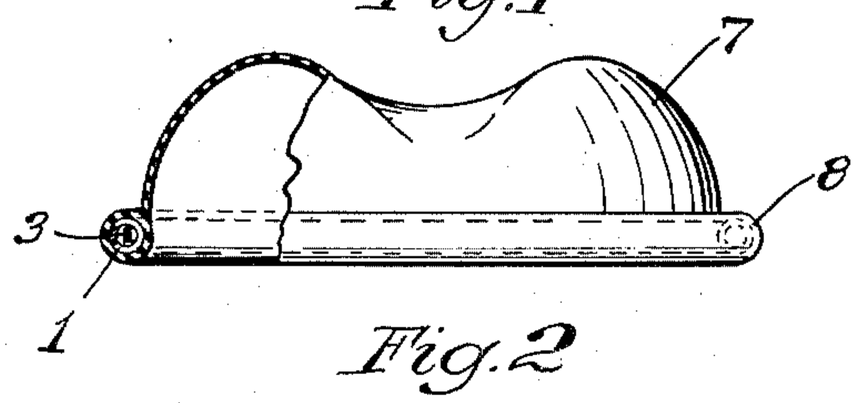

Fig. 2

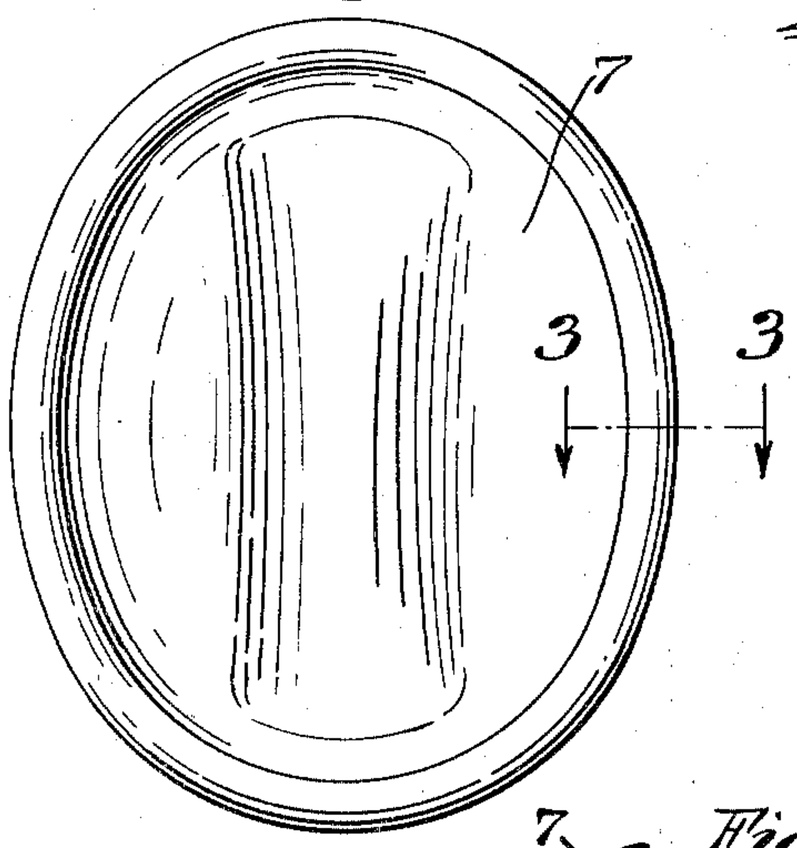

Fig. 3

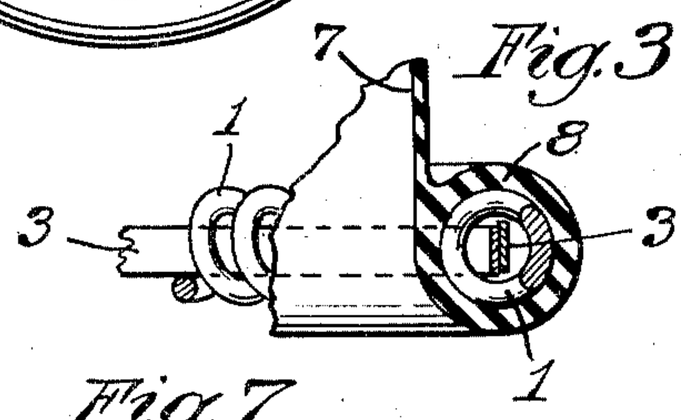

Fig. 4

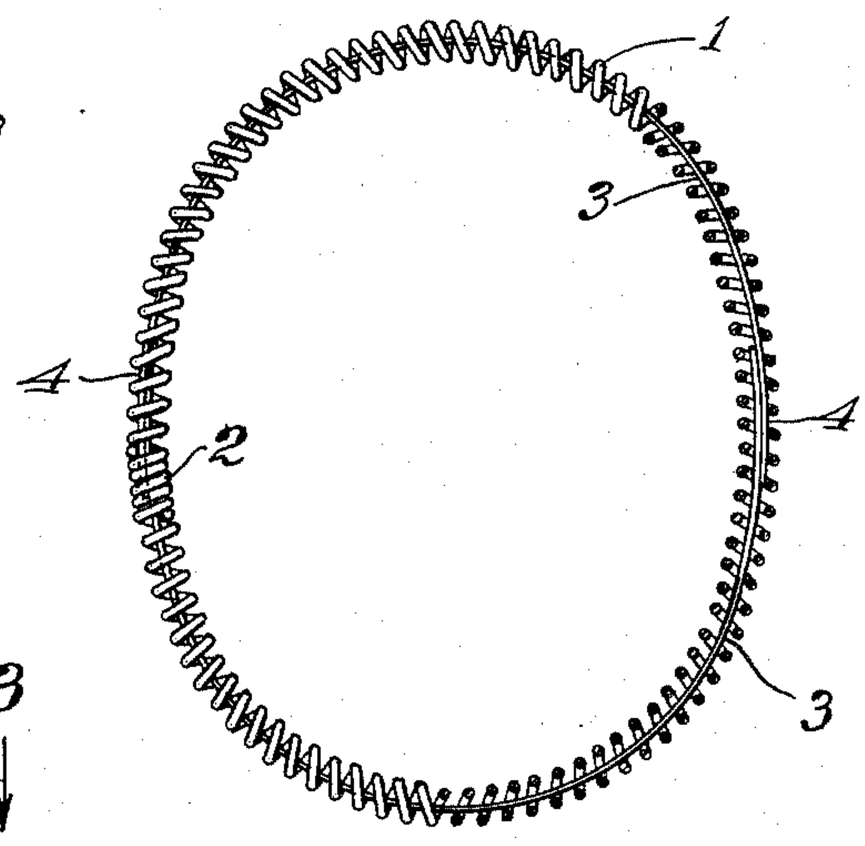

Fig. 5

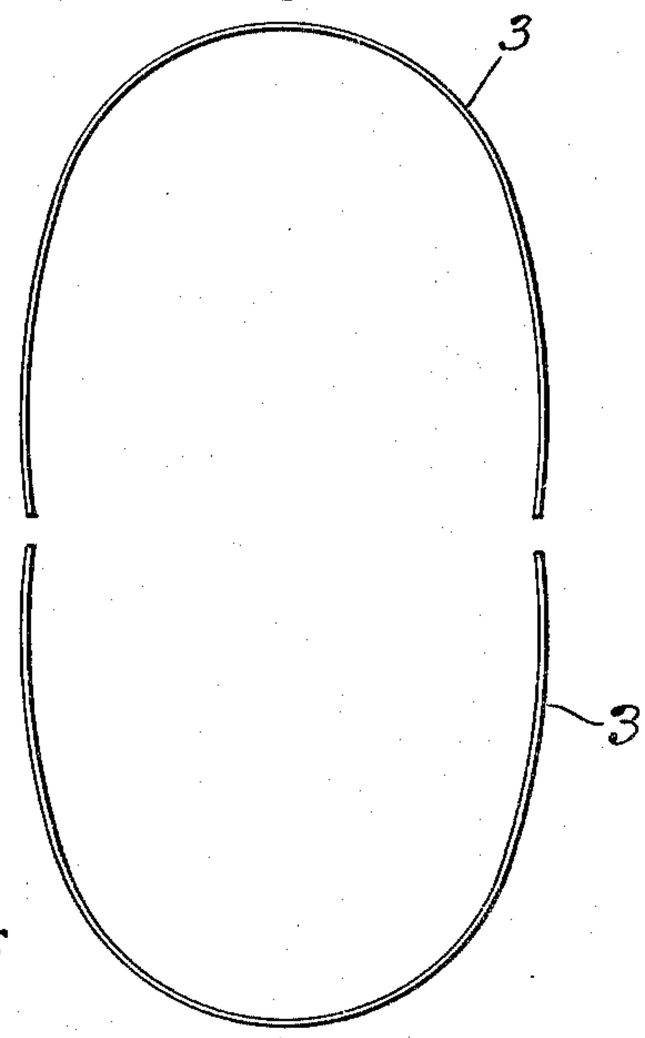

Fig. 7

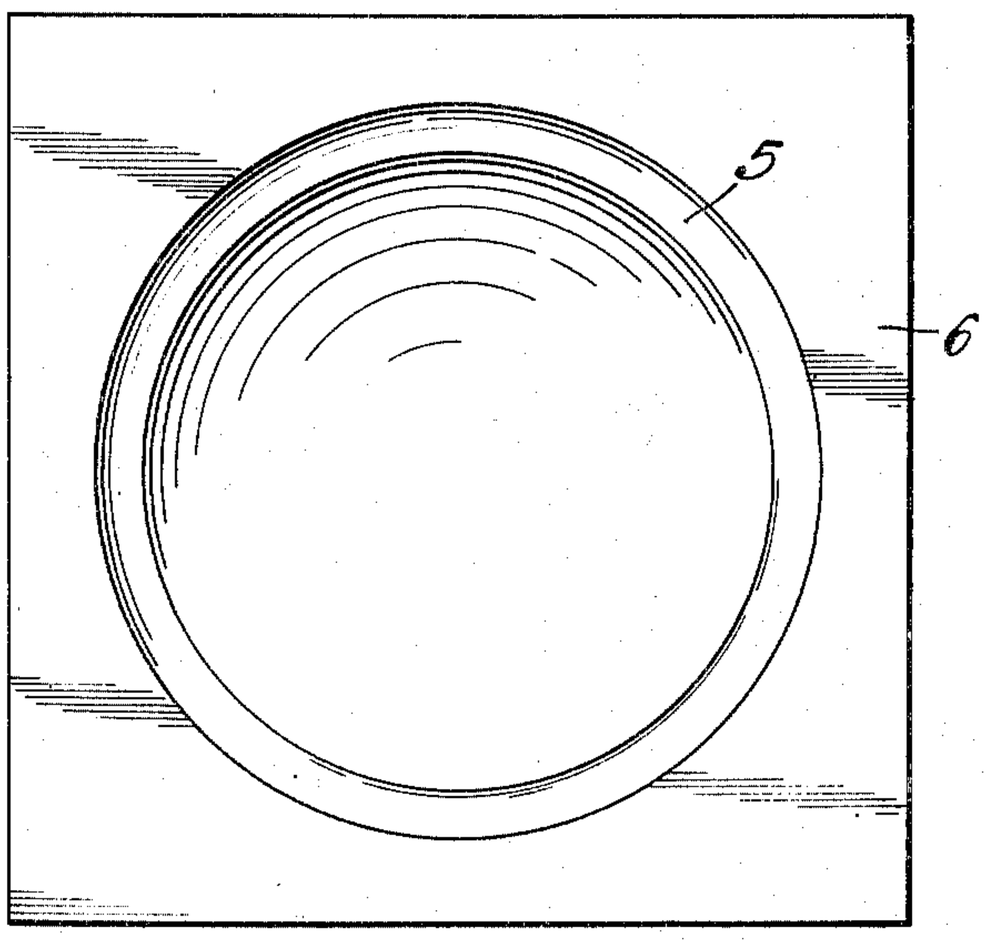

Fig. 6

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METHOD OF MAKING OVAL DIAPHRAGMS

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7 Claims. (Cl. 18—59)

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This invention relates to a diaphragm and a spring structure and to a method for making them. It has for one object to provide a method for making a spring structure and for joining a diaphragm to it.

Another object is to provide a method for forming an oval or elliptical diaphragm and spring structure by the use of a round or non-elliptical die or mold.

Other objects will appear from time to time throughout the specification and claims.

This invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a side elevation of a diaphragm, with parts in section and parts broken away;

Figure 2 is a plan view of the diaphragm of Figure 1;

Figure 3 is a sectional detail taken at line 3—3 of Figure 2 on an enlarged scale;

Figure 4 is a plan view of the spring structure before its inclusion in the diaphragm;

Figure 5 is a plan view of two flat springs which form a part of the composite spring structure;

Figure 6 is an end elevation of one of the flat spring members; and

Figure 7 is a plan view of a portion of a die.

Like parts are indicated by like characters throughout the specification and the drawings.

As formed the spring structure includes a coil spring 1 which may initially be straight. In the final structure its ends are joined, as at 2, to form an endless coil spring.

Two flat springs 3, 3 are formed generally in the shape indicated in Figure 5 and are biased to assume that shape. These flat spring members are inserted in the coil spring 1, and they are preferably so dimensioned with respect to the coil spring that their ends overlap, as shown at 4 in Figure 4.

After they have been inserted and the coil spring brought to the shape of Figure 4, the ends of that spring are secured together at 2. The ends are secured together in this position either by threading the convolutions of the two ends together, or otherwise.

After the spring structure has been made as shown in Figure 4, it is laid into the circular cavity or depression 5 in a mold or die 6. A corresponding upper die member is used. This is not shown, as such dies are generally known in the art and the invention is not limited in carrying out the method to the use of any particular die.

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With the spring structure in the round cavity 5, rubber is placed in the mold and upon suitable treatment, such as the application of heat, the composite diaphragm is formed. The relatively thin section 7 is formed in the mold and the tubular enlargement 8 is also formed. This tubular enlargement 8 encloses the spring structure. As initially formed in the mold, the entire device is round in plan. When the device is completed and removed from the mold, the springs move to the position shown in Figures 2 and 4 and assume a generally elliptical or oval shape.

The method of this invention provides a simple spring structure in which an oval spring is formed, and it provides also a simple method for making an oval diaphragm structure by the use of standard and conventional round die mechanisms. It is well known in the art to make a diaphragm round in plan. For many purposes a diaphragm of oval or elliptical plan is desirable and it is one of the objects of the invention to provide a method for making a diaphragm of oval or elliptical plan by using the conventional molds of round plan.

Although I have shown an operative form of my invention, it will be recognized that many changes in the form, shape and arrangement of parts can be made without departing from the spirit of the invention, and my showing is therefore to be taken as, in a sense, diagrammatic.

I claim:

1. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of partially elliptical springs, forming a coil spring, positioning said springs within said coil spring, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume an elliptical shape, placing said composite spring in a circular position, and molding rubber-like material about said spring structure within a mold, and thereafter removing said diaphragm and said spring from said mold and freeing said spring to assume an elliptical shape.

2. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of partially elliptical springs, forming a coil spring, positioning said springs within said coil spring, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume

an elliptical shape, placing said composite spring in a circular position, and molding rubber-like material about said spring structure within a mold, and molding an integral diaphragm across the space bounded by said spring structure, thereafter removing said diaphragm and said spring from said mold and freeing said spring to assume an elliptical shape.

3. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of flat, partially elliptical springs, forming a coil spring, positioning said flat springs within said coil spring, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume an elliptical shape, placing said composite spring in a circular position, and forming rubber-like material about said spring structure, and thereafter freeing said spring to assume an elliptical shape.

4. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of partially elliptical springs, forming a coil spring, positioning said springs within said coil spring with their ends overlapping, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume an elliptical shape, placing said composite spring in a circular shape, and forming rubber-like material about said spring structure, and thereafter freeing said spring to assume an elliptical shape.

5. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of flat, partially elliptical springs, forming a coil spring, positioning said flat springs within said coil spring, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume an elliptical shape, placing said composite spring in a circular position, and forming rubber-like material about said spring structure, and molding an integral diaphragm across the space bounded by said spring structure, thereafter freeing said spring to assume an elliptical shape.

6. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of flat, partially elliptical springs, forming a coil spring, positioning said flat spring within said coil spring with their ends overlapping, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume an elliptical shape, placing said composite spring in a circular position, and forming rubber-like material about said spring structure, and thereafter freeing said spring to assume an elliptical shape.

7. The method of producing a generally elliptical spring structure and diaphragm which comprises the following steps: forming a pair of flat, partially elliptical springs, forming a coil spring, positioning said flat springs within said coil spring with their ends overlapping, and securing the ends of said coil spring together to form an endless coil spring, said partially elliptical springs being biased to assume an elliptical shape, placing said composite spring in a circular position, and forming rubber-like material about said spring structure, and simultaneously molding an integral diaphragm across the space bounded by said spring structure, thereafter freeing said spring to assume an elliptical shape.

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