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METHOD OF MANUFACTURING A TELEPHONE DIAL GOVERNOR WEIGHT

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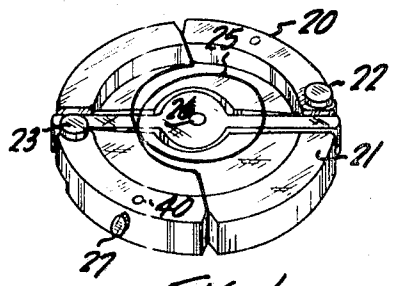


FIG. 1

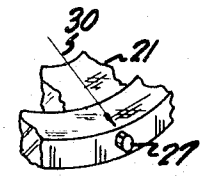


FIG. 1A

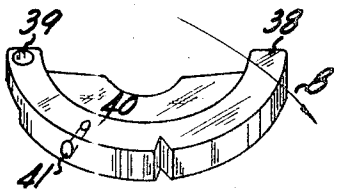


FIG. 2

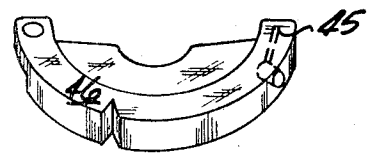


FIG. 4

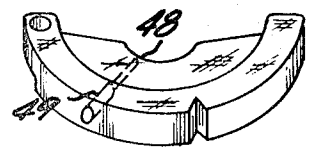


FIG. 5

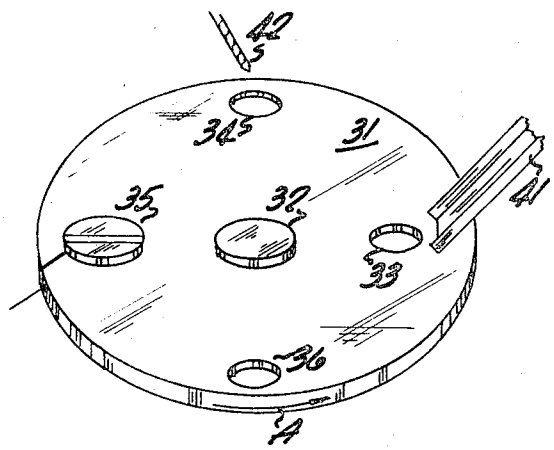


FIG. 3

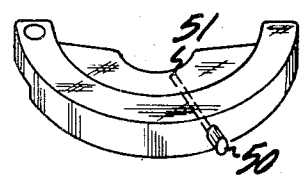


FIG. 6

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METHOD OF MANUFACTURING A TELEPHONE DIAL GOVERNOR WEIGHT

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ABSTRACT OF THE DISCLOSURE

During manufacture, wear resistant studs are molded into weights used in telephone dial governors. The molding process comprises the steps of (A) forming the weights with an input channel and a stud receiving area (B) placing the weight in a mold having internal contours matching the external contours of said weight plus said wear resistant stud, and (C) injecting a plastic material into the input port to form a stud on the weight.

This invention relates to methods of manufacture and more particularly to methods of manufacturing telephone dials.

A telephone dial is a very old and well known device. The present day devices have been improved throughout a period extending back over many years. A result is that most are identical in design, and they are already manufactured at very low cost (relatively speaking). The methods and processes used during the manufacture of standard, commercially available dials have been uniformely adopted by almost all manufacturers. This means that there has been a concerted effort to improve upon all existing methods and processes, and further that any significant cost reduction represents a major breakthrough which has brought a long sought after success where others have failed.

Among the more critical dial parts are governors which regulate the speed at which dials run down when they are released after wind up. These governors are critical devices since the dial pulses which are generated during rundown are sent out to control sensitive and complex switching mechanisms. Any unwanted deviation in dial speed or the make-break ratio will result in faulty operations of the switching mechanism. Therefore, governors have tended to remain relatively expensive as compared with other parts of the dial.

Accordingly, an object of the invention is to reduce the cost of dial governors without changing the operation of the governor in any significant manner. In this connection, an object is to manufacture a low cost piece-part which is completely interchangeable with other similar piece-parts made by any one of many manufacturers. Thus, an object is to reduce a cost without changing a part in any significant way. Here, an object is to automate the manufacture of a critical part which heretofore has had a high content of hand labor.

In keeping with an aspect of the invention, weights used in the governor of a telephone dial are manufactured on an automatic machine having a number of operating stations. At one station, an inlet hole is formed part way through the weight. At the next station, a second hole is drilled into the edge of the weight and perpendicular to the inlet hole until it intersects the first hole. At the following station, the weight is positioned in a mold, and a thermal setting plastic is injected through the inlet hole in the weight. As the plastic flows into and through the two holes in the weight, the mold forms it into a stud having a desired contour. The end product is a weight having a plastic stud adapted to ride against a brake drum, much as the lining on a brake shoe rides on an automobile brake drum.

The above mentioned and other features and objects of this invention and the manner of obtaining them will become more apparent, and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a dial governor;

FIG. 1A is a fragmentary view of FIG. 1 showing how governors were made heretofore;

FIG. 2 is a perspective view of a single governor weight depicting one of the steps of manufacture;

FIG. 3 schematically represents an automatic machine for automatically manufacturing governor weights; and

FIGS. 4–6 are perspective views of three governor weights showing alternative embodiments of the invention.

A dial governor weight assembly (FIG. 1) normally includes a pair of weights **20, 21**, each being pivotly connected at one end to a center supporting bar, as at **22, 23** for example. The weights **20, 21** are drawn inwardly toward the center of the governor responsive to the urging of a governor or hair spring **25**. Intermediate, between the weights, is a drive bar **26** adapted to impart a rotary motion to the governor. The entire structure (seen in FIG. 1) is mounted inside a brake drum (not shown) which restricts the excursion of the weights **20, 21** as they tend to fly outwardly from the pivot pins **22, 23** under centrifugal force. Each of the governor weights carries a wear resistant stud **27** which drags against the inside of brake drum, much as the lining of a brake shoe drags against an auto brake drum when the brakes are applied.

During operation, the governor is driven in a rotary motion responsive to turning forces imparted by the drive bar **26**. As the governor picks up speed, centrifugal forces hurl the weights **20, 21** outwardly against the tension of the governor spring **25**. The wear resistant studs **27** drag on the inside of the brake drum and help slow the rotary motion. The resulting mechanical system limits the rotary speed of the dial in a well known manner.

Heretofore (FIG. 1A), the weights **20, 21** were made by drilling a hole from the rim of the weight inwardly along a radius and inserting the resistant stud **27** in the hole. Thereafter, the weight and stud were inserted in a machine which struck them, as at **30** to deform the weight sufficiently to hold the stud **27** permanently in place. Thereafter, the end of the stud was machined to have a somewhat dome shape. Each of the above described manufacturing steps had some element of hand labor involving such things as feeding machines, inserting the studs in the previously drilled holes, transfer to other machines, etc. Each step involves a certain amount of human inspection. As a result of each step, there are a certain percentage of parts which fail to pass inspection due to human faults. Moreover, a certain percentage of faulty parts pass inspection incorrectly, and the mechanism controlled by the dial governor fails in the field.

According to the invention, these and other problems are eliminated and the hand labor content of the governor is reduced by the manufacturing process illustrated in FIG. 3.

FIG. 3 shows a turntable **31** which may be on any suitable multi-positioned machine tool (not shown). The turntable is mounted on an axle at a hub **32** for rotation—in the direction of arrow A—to at least four work positions. The turntable rotates a quarter turn and stops at a work position when a manufacturing step is performed; then, it rotates, another quarter turn.

At position **33**, a governor weight is deposited on the turntable. At position **34**, a hole is drilled in the weight

to receive the wear resistant stud. At position **35**, the stud is molded in position. At position **36**, the weight is ejected from the machine. Suitable other positions (not shown) may be provided between the positions **33–36** whereby automatic testing devices provide quality control functions. If so, the table would rotate an eighth of a turn on each step.

First, the governor weights **38** are prepared in any suitable manner, as by casting molton metal in a mold, for example, to form a somewhat semicircular shape as shown in FIG. 2. In this stage of its development, the weight **38** has a hole **39** extending entirely through one end to receive the pivot pin **23**. A first or input hole **40** extends partly through the weight to form an inlet port for receiving the plastic material which is used to form the wear resistant stud **27**. In the preferred embodiment, the hole **40** is parallel to the hole **39** for receiving the pivot pin **23** and perpendicular to the direction B in which the weight moves as it is thrown outwardly under the centrifugal force caused by rotation of the governor. The weights which are so formed are deposited on the turntable **31** at position **33** in any suitable manner, symbolically indicated by the chute **41**.

The second step in the manufacture process occurs when the turntable **31** takes a quarter step to the position **34**. Here a second hole **41** is drilled from the edge of the rim toward the center of the weight along a radius of the semi-circular shape, as is symbolically indicated by the drill **42**. This way, the two holes **40, 41** are formed perpendicular to each other, and they form generally L shaped passage extending through the weight.

The third step in the manufacturing process occurs when the turntable **31** takes another quarter step **35**, to place the weight in a mold position and inject a thermal setting plastic (such as "nylon") through the inlet port **40**, the second hole **41**, and out into the mold. The plastic is thereby formed into a wear resistant stud projecting outwardly from the rim of the weight and having a desired contour, which might be somewhat dome shaped, or otherwise shaped as required. After the molding step, the weight is ejected at position **36** from the turntable, and the process is complete.

The foregoing specification describes a preferred embodiment of the invention. However, alternative embodiments will readily occur to those who are skilled in the art. The inlet port might be placed in some other position, as the port **45**, is shown at the end of the weight **46** in FIG. 4. Another embodiment of the invention would include two somewhat aligned channels **48, 49** forming an I shaped port and a seat for the wear resistant stud of FIG. 5 The function of the hole **41** for receiving and supporting the wear resistant stud may be accomplished by the moulded shape of the wear resistant stud. For example, FIG. 6 shows that the stud **50** has a somewhat T shaped cross-section. The inlet port **51** forms the stem of the T and a cavity in the mold forms the stud as top **50** of the T. This way the stud sets on the outer edge surface of the weight and the top of the T prevents the stud from being forced back through the inlet port. The decision as to which embodiment is preferred will probably turn on the shape of the mold used to cast the weight shown in FIG. 2 and on the machine tools which are available. Still other embodiments will also occur to those who are skilled in the art. Therefore, the attached claims should be construed broadly enough to cover all equivalents falling within the true scope and spirit of the invention.

While the principles of the invention have been described above in connection with specific apparatus and applications, it is to be understood that this description is made only by way of example and not as a limitation on the scope of the invention.

I claim:

1. A method of manufacturing a telephone dial governor weight comprising the steps providing a somewhat dome-shaped governor weight having a hole extending entirely through one end and adapted to receive a pivot pin, forming an input hole extending part way through the weight to form an inlet port, forming a second hole substantially perpendicular to the input hole and extending from the edge of the rim towards the center of the weight and communicating with the input hole to form a passage extending through the weight, placing the weight in a mold having internal contours matching the external contours of said weight plus the wear resistant stud, and forcing a plastic material through said inlet port and into said mold whereby a wear resistant stud is molded onto said weight.

2. The method of claim **1** wherein said inlet port is formed as a first channel with a relatively small diameter and said second hole is formed as a second channel with a relatively large diameter.

3. The method of claim **2** wherein said first and second channels are perpendicular to each other in a somewhat L shape.

4. The method of claim **2** wherein said first and second channels are aligned with each other in a somewhat T shape.

5. The method of claim **1** wherein said weight is cast in a mold, said inlet port is formed as a channel through said weight, and said wear resistant stud is molded in a cavity in said mold and abuts against the circumferential edge of said weight.

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