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Kamiyama et al.

[11] **3,711,808**

[45] **Jan. 16, 1973**

[54] **SNAP OPERATING DEVICE**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.**.....**337/135,** 337/138
[51] **Int. Cl.**.....**H01h 61/00,** H01h 71/18
[58] **Field of Search**.....337/135, 136, 137, 138, 139, 337/196

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Primary Examiner—David Smith, Jr.
Attorney—Fidelman, Wolfe & Leitner

[57] **ABSTRACT**

A snap operating vane of this invention constituting an automatic blinker particularly adapted to the control of automobile signals is characterized by a plurality of parallel bosses being aligned at predetermined positions and having the center lines forming a certain angle with the longitudinal axis of an electric heating belt, said electric heating belt being secured to the vane through slots in substantial extended elements of said vane where the longitudinal axis of said slot and extended elements are coincidental with the axis of said belts.

4 Claims, 8 Drawing Figures

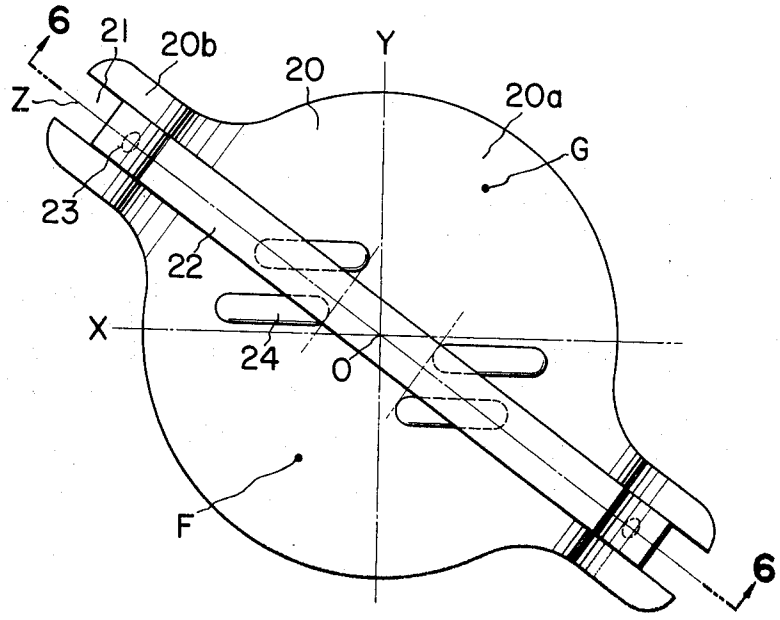


FIG. 1

Prior Art

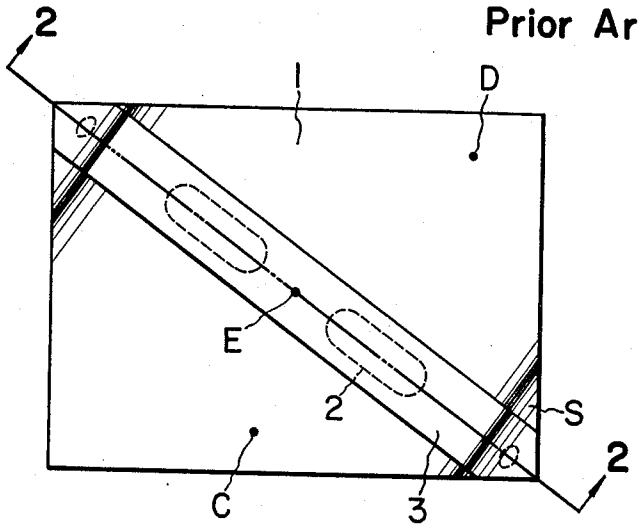


FIG. 2

Prior Art

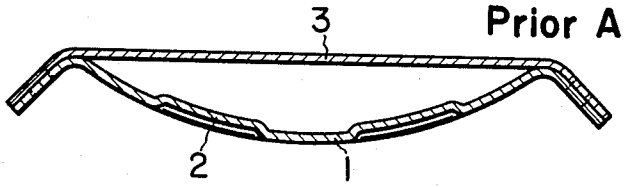


FIG. 3

Prior Art

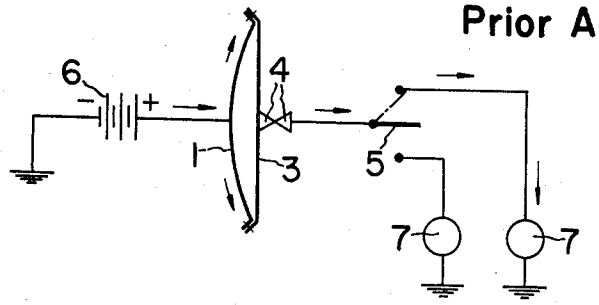


FIG. 4

Prior Art

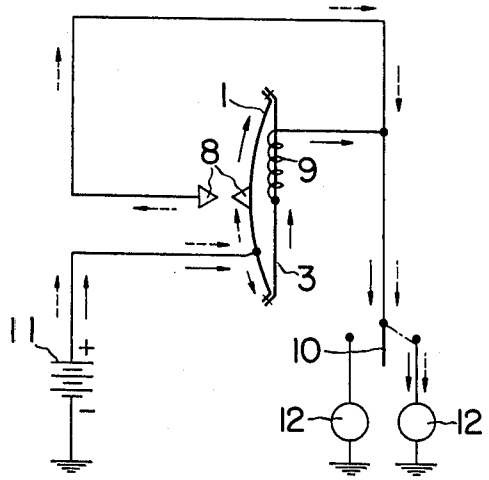


FIG. 5

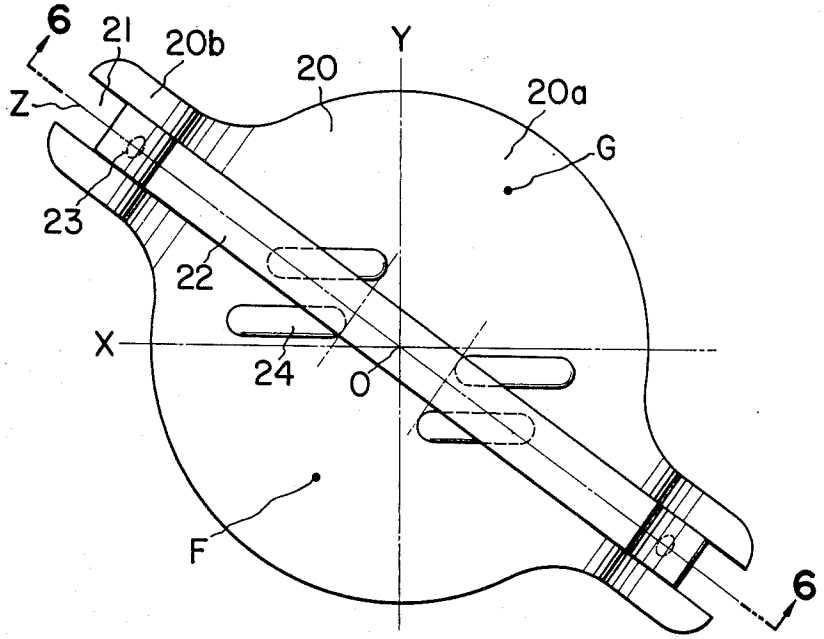


FIG. 6

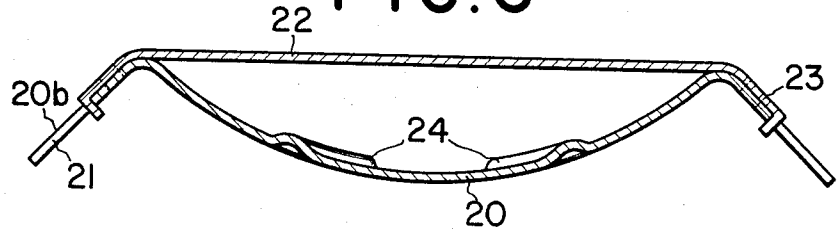


FIG. 7

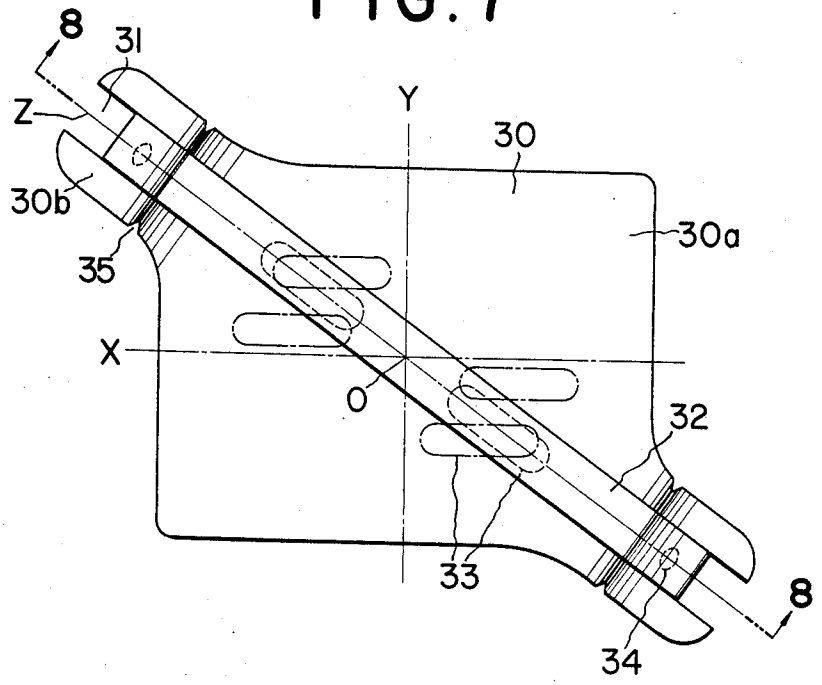
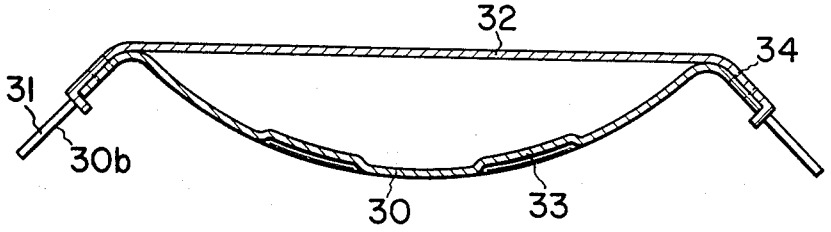


FIG. 8



SNAP OPERATING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to a structure of a snap operating vane. Heretofore in a general snap operating vane as explained later with reference to the accompanying drawings, two curves or bosses are arranged in series along a diagonal on a rectangular vane evading the center of the vane thereby to effect stress deformation. An electric heating belt which performs expansion and contraction by the temperature variation is secured to said vane along the line including previously provided bosses at the forward end of conductive metal fittings on the rear surface of a lower point of the central position of the vane. The lower end of said conductive metal fittings being fitted to the insulative base. The conventional snap operating vane having such construction is used in types of circuits, i.e. series type and parallel type. The desired features of a snap operating device are described:

1. The amount of the vane varied by the expansion and contraction of the electric heating belt must be large.

2. The electric heating belt must be long.

3. From the viewpoint of production, the same device must be adaptable to various bulb loads and their fine adjustments must be possible.

4. Stability in the production must exists.

SUMMARY OF THE INVENTION

The first object of the present invention resides in that projected elements are provided at both ends of the snap operating vane with engaging portions to suspend the electric heating belt and thereby permit the use of a longer electric heating belt and facilitate the fitting of the electric heating belt to the vane, thus the amount of the vane varies due to the expansion and contraction of electric heating belt is increased.

The second object of the present invention resides in that the projected parts at both ends of the snap operating vane are bent at their V-slot elements thereby to facilitate the precise bending of the projected elements about a line perpendicular to the longitudinal axis of said assembled electric heating belt.

The third object of the present invention resides in that a plurality of parallel bosses for stress deformation are provided in the vane, and by adjusting spaces between said parallel bosses the vane of the material having the same thickness can be adapted to various bulb loads in wide ranges.

The fourth object of the present invention resides in that, particularly in a parallel type direction-indicating blinker the gap produced upon opening and closing the contact as will be mentioned later is larger than that of the conventional one.

The fifth object of the present invention resides in that the center lines of said plurality of parallel bosses for stress deformation are arranged forming a certain angle with the longitudinal axis of the electric heating belt, and the line connecting the inner ends of said bosses is perpendicular to the with the longitudinal axis of the electric heating belt, whereby upon the bending of the vane excessive force is not applied to the vane and the electric heating belt.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a front elevation showing a snap operating vane which has heretofore been known;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a circuit diagram of a series type direction-indicating blinker which has heretofore been known;

FIG. 4 is a circuit diagram of a parallel type direction-indicating blinker which has heretofore been known;

FIG. 5 is a front elevation showing one embodiment of a snap operating vane according to the present invention;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 5;

FIG. 7 is a front elevation showing another embodiment of the present invention; and

FIG. 8 is a sectional view taken along line 8—8 of FIG. 7.

DETAILED DESCRIPTION OF THE INVENTION

This invention relates to a snap operating vane. Heretofore, in a snap operating vane, as shown in FIG. 1, in order to cause a rectangular vane 1 made of a conductive resilient material to precisely carry out a snap operation, two curves or bosses 2 are arranged on the surface of said vane 1 in series along a diagonal so as to evade the center of the vane 1 thereby to carry out stress deformation. An electric heating belt 3 for carrying out expansion and contraction by the variation of heat is extended over the bosses 2 and is secured to said vane 1 for bending said vane 1. Generally, the snap operating vane is secured to the forward end of conductive metal fittings fitted on the insulative base plate on the rear surface in the vicinity C at the lower part of the central position of the vane 1 as shown in FIG. 1. This is to achieve anti-vibration property, since anti-vibration property is deteriorated at a point spaced too far from the center, for example, in the vicinity of a point designated by D.

Two examples using the conventional snap operating vane having the aforementioned construction will be explained hereinbelow. Firstly, in a series type direction-indicating blinker a contact 4 is provided on the center of the electric heating belt 3, said contact 4 being constantly in contact with said electric heating belt 3 and arranged in the circuit shown in FIG. 3. In said circuit, when a direction-indicating switch 5 is fallen in either left or right direction, a current flows from a battery 6 as shown by arrow to instantly light a bulb 7, and simultaneously the electric heating belt 3 is heated and expanded by said current. When belt 3 has expanded a certain amount, the vane 1 is reversed to open the contact 4, whereby the bulb 7 is put off. When said bulb 7 is put off. When said bulb is put off, the electric heating belt 3 is cooled by ambient air and contracted, and the vane 1 is re-inverted at a certain time point and restored to its original position thereby to light the bulb 7. The aforementioned action is repeated hereinafter to carry out blinking of a bulb 7.

In a parallel type direction-indicating blinker which is the second example, a contact 8 opened constantly is provided on the rear surface of the center E of the vane 1. An insulated iron wire 9 for heating is wound around

the electric heating belt **3**, and its circuit is constructed as shown in FIG. **4**. More specifically, when a direction-indicating switch **10** is fallen in either left or right direction, a current flows from a battery **11** in the direction shown by arrow to heat and expand the electric heating belt **3** and a heating wire. The vane **1** is reversed at a certain time point so as to bring into contact with the contact **8**, whereupon a large current flows in the direction shown by dotted arrow to light a bulb **12**. Upon this occasion, since the electric heating belt **3** and the wire **9** for heating are short-circuited by the contact **8**, they are cooled by ambient air and contracted. The vane **1** is re-inverted at a certain time point, the contact **8** is opened thereby to put off the bulb **12**, and the electric heating belt **3** and the heating wire **9** are heated. The aforementioned action is repeated hereinafter to carry out the blinking of the bulb **12**.

As has been illustrated in the foregoing, the snap operating vane requires the following design criteria:

1. Since the switching movement of the contacts **4** and **8** is carried out by the expansion and contraction of the electric heating belt **3**, it is necessary that the amount the vane **1** varies at its contact positions with respect to the fulcrum be large.

2. It is desirable that the electric heating belt **3** be as long as possible (in the case where the material used is predetermined and the size of the vane is also predetermined).

3. Viewed from a productional angle, it is desirable to produce stress deformation for different the bulb loads respectively from material of the same quality and the same plate thickness and further finely adjust said stress deformation.

4. It is desirable that the stability in production is added.

It is, therefore, an object of the present invention to provide a snap operating vane which is improved in efficiencies particularly with respect to the items (1), (2) and (3) of preceding design criteria.

One embodiment of the present invention will be explained with reference to FIGS. **5** and **6**. Reference numeral **20** designates a vane whose main part **20*a*** is formed into a circular shape, and projected elements **20*b*** are provided in opposite to each other on the center line Z provided at an optional angle of less than 45° with respect to the center line X. These projected elements **20** substantially extend from the circumference of vane **20** by 20 to 30 percent of the vane diameter. Said projected part **20*b*** has a groove or slot **21** and is bent downward loosely. Reference numeral **22** designates an electric heating belt or expansible tractive member which is bent in the vicinity of both ends so that it is superimposed on the projected part **20*b***, and its end is further bent downward at an angle of 90°. The electric heating belt **22** flexibly bends the vane **20**, and both ends thereof are fitted in the groove **21** of the projected part **20*b*** and extended over the vane **20**. The projected part **20*b*** has a parallel width with respect to the center line Z or a tapered width decreasing or increasing difinitely toward the external direction, and if necessary, a groove in which the electric heating belt **22** is fitted may be provided. Reference numeral **23** designates a fixed portion due to spot welding or the like. Bosses **24**, two forming a set, which are provided in spot symmetry using the center **0** as a fulcrum so that the line connecting the ends of the bosses **24** near the center line Y is perpendicular to the center line Z and each boss **24** is arranged in parallel with the center line X.

The snap operating vane according to the present invention having the aforementioned construction is employed in the same manner as the conventional example.

Since the device according to the present invention has the aforementioned structure, it has such effects as will be described hereinbelow.

1. Since the groove **21** is provided in the projected part **20*b*** and an electric heating belt **22** is a junction fitted in said groove **21**, the quality is stable in the production and improvements in workability and durability can be obtained.

2. Since the device according to the present invention has a plurality of parallel bosses **24** for stress deformation, stress deformation can be adjusted by adjusting the space between said parallel bosses **24** and therefore a blinker adapted to a variety of load capacities can be manufactured by same plate thickness can be manufactured. When the space between the bosses **24** is made large, stress after the deformation becomes large accordingly.

3. Particularly in the parallel type direction-indicating blinker, the gap for switching contacts is selected to be wider as compared with devices that curve on the center line Z, because the point of stress deformation becomes equivalent to the center line of the boss **24** at the right-hand lower part of the center line Y (when a fixed point of the vane **20** is denoted by F and that of the contact by G).

4. Since the line connecting the ends of the bosses **24** near the center line Y is perpendicular to the longitudinal axis of the electric heating belt **22**, the line is coincident with the central direction of the curve of the vane **20** and therefore no excessive force is applied to the electric heating belt **22**.

As has been described in the foregoing, the conventional snap operating vane is shown in FIG. **1** and has following:

1. It is preferable to bend the curving portion about a line perpendicular to the diagonal. However, since the bent portion assumes a form of a scalene triangle S, upon bending operation during manufacture, it is liable to produce slide depending upon the shape thereof, and it is difficult to obtain a curved vane from a rectangular sheet and maintain the perpendicularity of the two diagonals. Therefore due to the instability of the diagonals the fulcrum position of the heating belt **3** does not become perpendicular to the heating belt **3**, whereby instability in operation is generated.

2. Upon the resistance welding operation of the heating belt **3** since the curved portion is scalene triangle, the precise welding position cannot be secured by eyesight and instability (slight distortion or twist to the boss on the vane **1**) is produced. Upon expansion and contraction of the heating belt **3**, twisting force is applied to the heating belt **3**, and it causes instability of blinking operation and break of the heating belt.

Another embodiment, as shown in FIGS. **7** and **8**, provides a snap operating vane which eliminates the aforementioned defects.

Reference numeral **30** designates a vane whose main body **30***a* is rectangular (in some cases, it may be circular or oval), and a projected element **30***b* having a groove **31** is provided at the diagonal portion. Said projected part **30***b* being gently curved downwardly and substantially extend from the rectangular vane by **20** to **30°** of the diagonal. Reference numeral **33** designates bosses projected on the surface of the main body **30***a* of the vane **30** and evaded the center **0** on the diagonal Z which is provided with the projected part **30***b* Two pairs of bosses **33** are arranged so that each boss is parallel to the center line X as shown with one-dotted chain line of FIG. **7**, and the inner ends thereof being arranged at both sides of the diagonal Z and the line connecting both inner ends is perpendicular to the line Z. Reference numeral **32** designates an electric heating or expansible tractive member which is bent so that it overlaps with the projected part **30***b* in the vicinity of both ends, and both ends in the belt are bent so that they are fitted in the groove **31**, and are spot welded at **34**. The central portion overlapped with the vane **30**. Reference numeral **35** designates a V-slot which facilitates the bending of the extended elements **30***b* and assures that the crease of the bend will be perpendicular to the longitudinal axis of the heating belt **32**.

The snap operating vane of the present invention constructed as described in the foregoing has the effects enumerated in the following:

1. The projected part can be easily bent perpendicularly to the diagonal Z. Since it has a predetermined width, the slide, etc. while bending operation can be prevented and the uniformity of the quality can be maintained. Furthermore, a V-slot **35** can be provided for obtaining the bending position, if necessary.

2. With respect to the securing operation of electric heating belt **32**, the electric heating belt **32** is coincident with a groove **31** thereby to easily obtain the normal position. Even when the groove **31** is not provided, it is sufficient if said electric heating belt is coincident with the center of the width of projected part **30***b*, and therefore the position can be secured by eyesight.

3. Improvement of workability as well as uniformity of the efficiency and safety of the product can be secured and simultaneously durability can also be improved.

We claim:

1. A snap operating device characterized in that said device comprises a vane made of resilient material having generally a single plane and an expansible tractive member secured to said vane at its both ends, said vane being bent and held in a stress-deformed state by the contracted state of said tractive member, said vane includes elements projecting substantially therefrom and being diagonally opposed, and said projected elements include hooking grooves for receiving said expansible tractive member's ends.

2. A snap operating device characterized in that said device comprises a vane made of a resilient material having generally a single plane and an expansible tractive member secured to said vane at its both ends, said vane being bent in a contracted state of said tractive member and maintained in a stress-deformed state, said vane includes projected parts extending substantially from both ends of said vane by **20** to **30** percent of said vane's diagonal, and hooking grooves are provided at the innersides of said projected parts, and slots are provided at the outsides of said projected parts to regulate bending of said project parts relative to said vane.

3. A snap operating device characterized in that said device comprises a vane made of a resilient material having generally a single plane and an expansible tractive member secured to said vane at its both ends, said vane being bent in a contracted state of said tractive member and maintained in a stress-deformed state around the line forming a certain angle against itself and further in a tensed state, and projected parts are provided at both ends of said vane extending substantially from said vane, and hooking grooves are provided in said projected part, said vane includes a plurality of substantially parallel bosses whose parallel axis form an acute angle with the longitudinal axis of said expansible tractive member, said bosses being arranged in two sets symmetric to the center of said vane, and being arranged so that a line tangential to the inner ends of a set of bosses is perpendicular to the longitudinal axis of said tractive member.

4. A snap operating device characterized in that said device comprises a vane made of a resilient material having generally a single plane and an expansible tractive member secured to said vane at its both ends, said vane being bent in a contracted state of said tractive member and maintained in a stress-deformed state, said vane includes a plurality of bosses each of whose longitudinal axis being substantially parallel and forming a certain angle with the longitudinal axis of said tractive member, said bosses being arranged in two sets symmetric to the center of said vane, and being arranged so that lines connecting inner ends of the bosses of a set are perpendicular to the longitudinal axis of said tractive member.

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