Aug. 18, 1959 W. F. DOWDLE 2,900,472

RELAY

Filed July 22, 1957 2 Sheets-Sheet 1

Fig. 1

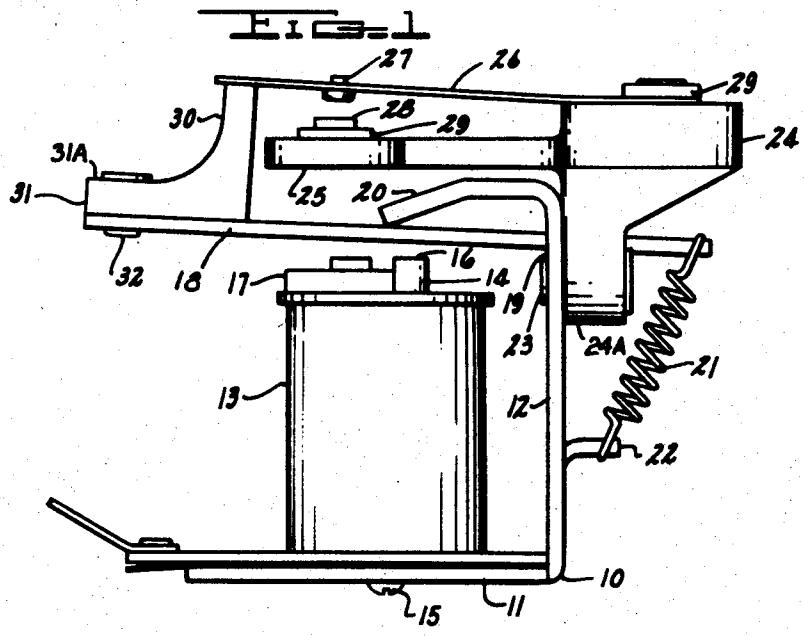
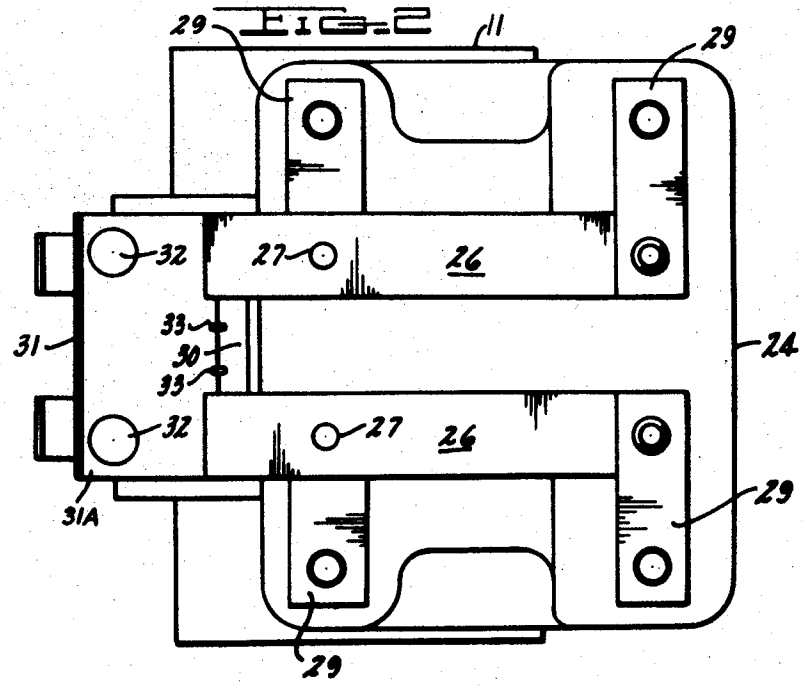


Fig. 2



Aug. 18, 1959 W. F. DOWDLE 2,900,472

RELAY

Filed July 22, 1957 2 Sheets-Sheet 2

FIG-3

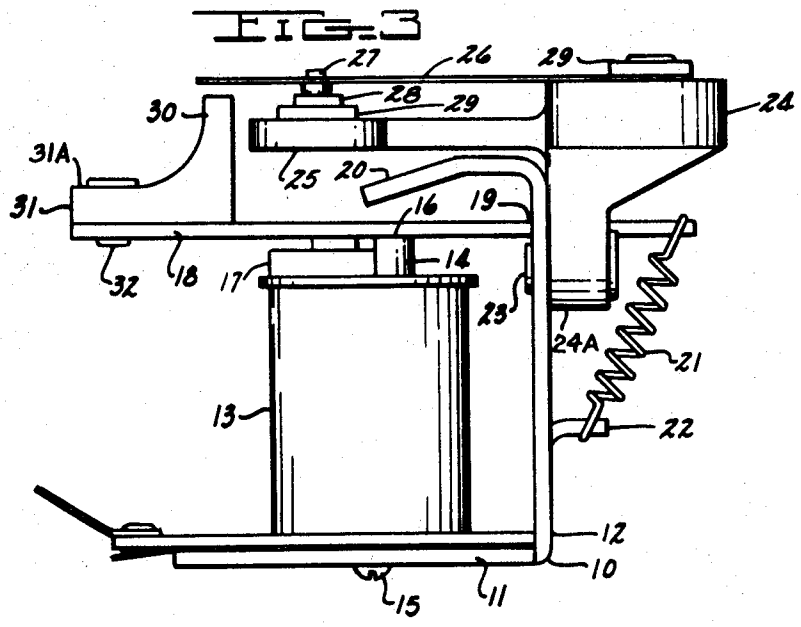


FIG-4

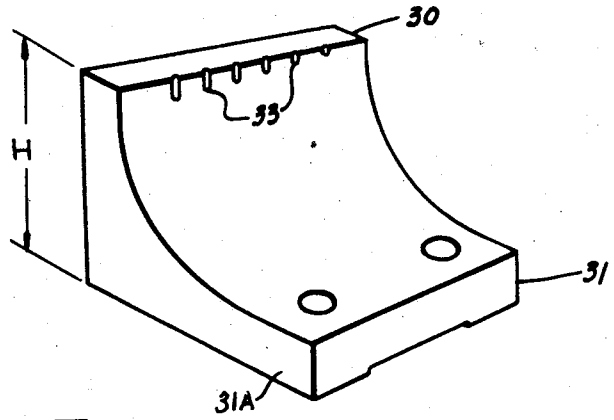
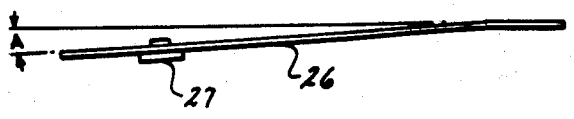


FIG-5



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2,900,472

RELAY

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Application July 22, 1957, Serial No. 673,246

2 Claims. (Cl. 200—87)

This invention relates to an improved construction of an electromagnetic relay and more particularly to an improved contact actuator for electromagnetic relays. The method of assembling electromagnetic relays disclosed herein is being claimed in application Serial No. 772,647, filed October 23, 1958, which is a division of the present application.

A principal object of this invention is to provide a relay which is rugged, simple, inexpensive to manufacture, assembly, and adjust.

Another object is to provide a relay which can be accurately and uniformly adjusted during its process of manufacture and assembly and before it has been completely assembled.

Other objects and advantages of the invention will appear in the following description and appended claims, reference being had to the accompanying drawings, in which:

Figure 1 is a side elevation of a relay embodying the invention.

Figure 2 is a top plan view of the relay.

Figure 3 is a side elevation similar to Figure 1 showing the armature in the attracted position.

Figure 4 is a perspective view of the insulating bracket.

Figure 5 is a side view of the contact spring.

Referring to the drawing, the electromagnetic relay there illustrated and embodying the features of the present invention includes a frame **10** formed from magnetic material and having a base portion **11** and a leg portion **12** bent at right angles to each other. Mounted on the frame base portion **11** is a coil **13** having a core **14** which is secured to the frame base portion **11** by screw **15**. Core **14** is split at its end **16** to accommodate a shading washer **17**. For D.C. operation of the coil **13**, the core **14** need not be split and the shading washer **17** may be omitted.

An armature **18** extends through an opening **19** providing in the frame leg portion **12** for movement from an unattracted position shown in Figure 1 to an attracted position shown in Figure 3 when the coil **13** is energized. In the unattracted position, the armature **18** is biased against a stop portion **20** integral with the frame leg portion **12** by spring **21** which is secured to the extending end of armature **18** and to a lug **22** stamped out of the frame leg portion **12**.

Secured to the frame leg portion **12** by rivets **23** are the feet **24A** of an insulating block **24** having a shelf portion **25** extending over the armature **18**. Mounted upon the insulating block **24** and extending over the shelf portion **25** are two flexible contact springs **26** carrying movable contacts **27** to engage with and disengage from the fixed contacts **28** located on the shelf portion **25**. Circuit connections to suitable conductors may be made by means of screws (not shown) threaded into the terminals **29** which are secured to the contact springs **26** and the fixed contacts **28**.

The free ends of the contact springs **26** extend beyond the insulating block shelf portion **25** and are engaged

by arm **30** of an insulating bracket or actuator **31** having a base **31A** attached to the armature **18** by rivets **32** to disengage the movable and fixed contacts **27** and **28** in the unattracted position. The contact springs **26** are preformed or bent to produce a desired contact force or pressure between the movable and fixed contacts in the attracted position. In the unattracted position, spring **21** biases the armature **18** against the stop portion with a greater force than the biasing force of the contact springs **26**.

Energization of the coil **13** causes the armature **18** and the arm **30** to move toward the core end **16**. As the armature approaches the attracted position, the movable contacts **27** engage the fixed contacts **28** and the arm **30** separates from the contact springs **26**. In the attracted position, the contact pressure between contacts **27** and **28** is determined solely by the biasing force of the contact spring **26**. The biasing force of the contact springs **26** aids the movement of the armature **18** in its initial movement toward the attracted position.

After deenergization of the coil **13**, the armature **18** and the arm **30** are returned to the unattracted position by spring **21**. Because of the separation between the arm **30** and the contact springs **26** in the attracted position, the armature **18** travels a given distance before the arm **30** strikes the contact springs **26**. The impact force of arm **30** upon the contact springs **26** is advantageous in that it breaks any contact weld which may have formed between contacts **27** and **28**.

By reason of the present construction, the assembly and adjustment of the relay has been greatly simplified. No bending or forming operations are required during or after assembly of the relay to adjust the contact pressure, the contact gap, or the contact closing voltage to within narrow specified limits. By eliminating the manual adjustments normally required, the manufacturing cost of the relay is considerably reduced.

The only adjustment necessary to obtain consistent contact pressures is performed before assembly of the relay. Before the contact spring **26** is secured to the insulating block **25**, its contact carrying end is bent to a specified angle A relative to the opposite end as illustrated in Figure 5. It is a relatively simple matter to manufacture the bent contact spring **26** with a high degree of uniformity and a corresponding high degree of uniformity in the contact pressure is obtained.

A consistent contact closing voltage is similarly obtained with no adjustment required during assembly of the relay by manufacturing the frame **10** with the protruding end of the stop portion **20** located at a specified distance from the base portion **11**. In the assembled relay, the protruding end of the stop portion **20** will be separated by a required distance from the end **16** of the core **14** which is also easily manufactured to have a specified length. Thus the gap between the armature **18** and the core end **16** is easily maintained within narrow limits to provide the relay with armature operating and contact closing voltages within equally narrow limits.

The required separation between the movable and fixed contacts **27** and **28** in the unattracted position is obtained by employing a selected insulating bracket **31** having an arm **30** of the height H necessary to provide the required contact separation. The selected bracket **31** having an arm **30** of the required height H is preferably secured to the armature **18** after the remainder of the relay is assembled. The required height H of the arm **30** may be determined by measuring the separation between the contact springs **26** and the armature **18** in the unattracted position before the bracket **31** is attached. The required bracket arm **30** will have a height greater than the separation by a fixed amount equal to the desired contact separation.

Because the distance of armature travel between the attracted and unattracted positions has a uniform value, the required bracket arm height H may also be determined by measuring the separation between the contact springs **26** and the armature **18** in the attracted position before the bracket **31** is attached. The bracket arm **30** is selected to have a height H less by a fixed amount than this separation to provide both a consistent separation between contacts **27** and **28** in the unattracted position and a consistent gap between the arm **30** and the contact springs **26** in the attracted position.

The contact separation in the unattracted position is generally not very critical and it has been found that the separation between armature **18** and the contact springs **26** need not be actually measured, but instead a selected bracket **31** is inserted between the armature **18** and the contact springs **26**. By visual inspection only, it can be readily determined if the selected bracket provides the desired separation between the contact springs **26** and the arm **30** in the attracted position. Furthermore, the bracket **31** may be selected from a group of brackets **31** having arms **30** and varying in height by increments of approximately .015 inch.

Figure 4 illustrates means by which the arms **30** of varying height may be readily distinguished. The brackets **31** are initially molded with all arms **30** having a specified height. On one side of the arms **30** is provided a number of indentations or grooves **33** having their bottom portions located at different specified distances from the armature-engaging surface of the bracket **31**. When a portion of the spring-engaging surface is removed to provide an arm **30** of a specified height, the number of detents **33** remaining indicates the height of the arm **30**.

While the invention has been illustrated and described in its preferred embodiment and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

What is claimed is:

1. In a relay of the type comprising a magnetic frame having a base portion and a leg portion extending at approximately right angles to said base portion; a magnetic core joined at one end with said base portion to extend in generally parallel, spaced relation with said leg portion; a coil surrounding said core; a magnetic armature pivotally supported on said leg portion for switch operating movement toward and away from the other end of said core; means biasing said armature in a direction away from said core; a block of insulating material having a foot portion secured to said leg portion to support the block and having a shelf portion disposed substantially at right angles to said foot portion to extend over said armature; a fixed contact supported on said shelf portion; a cantilever spring fixed at one end to said block and having its free end extending beyond the extending end of said shelf portion to overlie the free end of said armature; said cantilever spring being biased in a direction toward said fixed contact and carrying a movable contact arranged to engage said fixed contact; a contact actuator of insulating material secured to the free end of the armature adjacent the free end of said cantilever spring for engagement therewith when said armature is biased away from said core; and said armature biasing means having a force greater than the force of said cantilever spring biasing means to disengage said contacts when said armature is not attracted by said core; the improvement in said contact actuator wherein said contact actuator comprises an L-shaped bracket having an arm for engaging said cantilever spring and a base disposed at substantially right angles to said arm, said base being disposed upon and secured to the free end of said armature to permit securing of said bracket to said armature after the remainder of the relay is assembled, said arm having a selected height providing a desired separation between the free end of said cantilever spring and said arm when said armature is attracted by said core; and said arm being provided with a plurality of indentations having bottom portions located at different distances from the end of said bracket arm adjacent said armature to indicate the height of said bracket arm.

2. In a relay of the type of having a magnetic core structure; an energizing winding carried on said core structure; an armature supported by said core structure and movable between magnetically attracted and unattracted positions; a cantilever spring supported at one end on said core structure and having its free end extending over said armature; a relatively fixed contact supported by said core structure; said cantilever spring being biased in a direction toward said fixed contact and carrying a movable contact arranged to engage said fixed contact; and a contact actuator secured to the armature adjacent the free end of said cantilever spring for engagement therewith when said armature is in its unattracted position; the improvement in said contact actuator wherein said contact actuator comprises a substantially L-shaped bracket having an arm for engaging said cantilever spring and a base extending at substantially right angles to said arm; said base being secured on one side of said armature; said arm having a selected height providing a desired separation between the free end of said cantilever spring and said arm in the attracted position of said armature; and said arm being provided with a plurality of indentations having bottom portions located at different distances from the end of said bracket arm adjacent said armature to indicate the height of said bracket arm.

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