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Worrall

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[54] **INDICATOR MEANS FOR ELECTROMAGNETIC DEVICES**

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[51] **Int. Cl.**.....**H01f 7/08**

[58] **Field of Search**.....335/251, 255, 260, 335/258, 278; 251/129; 137/554, 556, 625.63

[56] **References Cited**

UNITED STATES PATENTS

3,056,421	10/1962	Carls	251/129 X
3,329,159	7/1967	Herion	137/625.63 X
3,092,145	6/1963	Brinkel	251/129 X
2,919,590	1/1960	Griswold	137/556 X

FOREIGN PATENTS OR APPLICATIONS

1,273,067	7/1968	Germany	335/255

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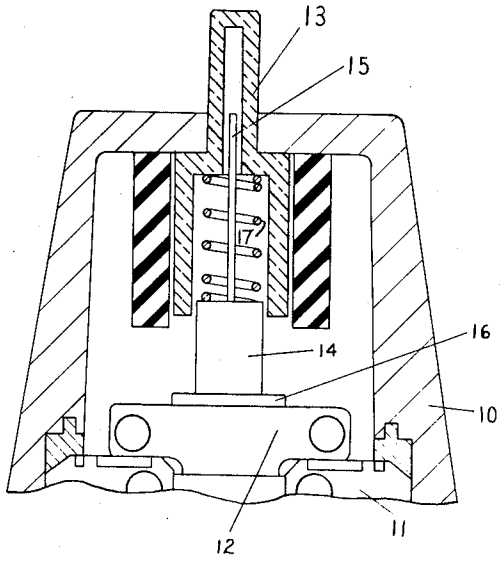
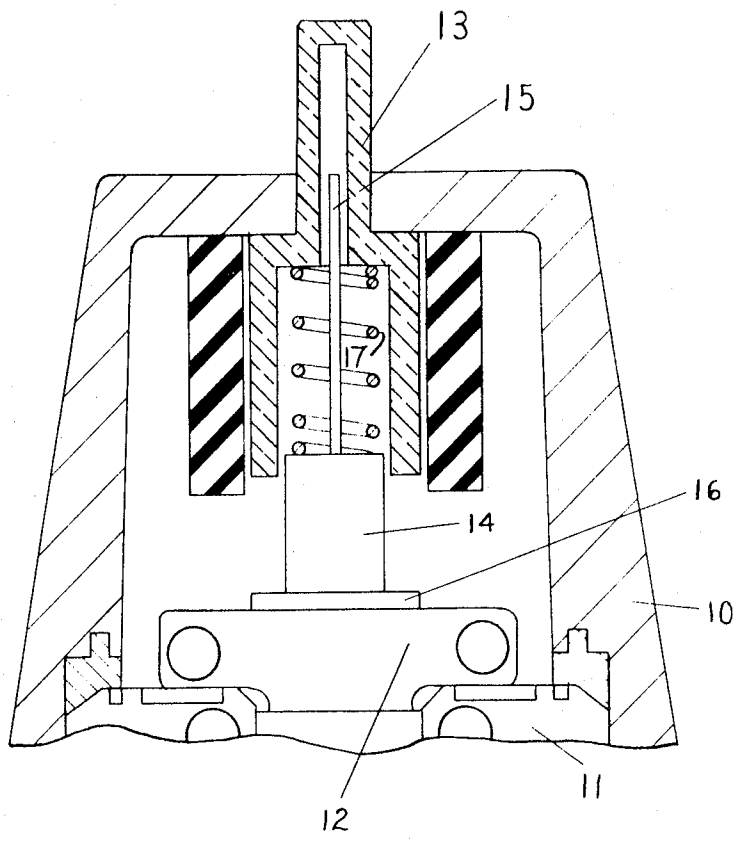
[57] **ABSTRACT**

An electromagnetic device includes a casing in which is mounted a solenoid which when energized moves an armature. For manual operation of the armature a manually operable knob is provided which effects movement of the armature through the intermediary of a spring and a push piece. To enable a visual indication to be given of the position of the armature the push piece mounts an indicator rod which is visible through the manually operable knob and the position of the indicator rod indicates the position of the armature.

7 Claims, 1 Drawing Figure





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INDICATOR MEANS FOR ELECTROMAGNETIC DEVICES

This invention relates to electro-magnetic devices of the kind comprising in combination a casing, a solenoid disposed within the casing, an armature mounted within the casing and movable in a direction away from an end wall of the casing by the action of the solenoid and in the opposite direction by the action of resilient means and a manually operable plunger mounted in the end wall and movable to effect movement of the armature against the action of the resilient means.

The object of the invention is to provide such a device in a form in which the position of the armature can be determined from the exterior of the casing.

According to the invention in a device of the kind specified the plunger is of hollow form and there extends therethrough an indicator rod movable with the armature, the rod being visible from the exterior of the casing to indicate the position of the armature.

One example of a device in accordance with the invention will now be described with reference to the accompanying drawing which shows part of the device in section. There is provided a hollow casing **10** within which is mounted a solenoid which includes a core **11** and slidable relative to the core is an armature **12.** The armature is spring loaded by a spring not shown and is moved against the action of the spring loading and away from an end wall of the casing, when the solenoid is energized. As shown the solenoid is energized and the armature is in contact with the core **11.**

Slidable within the aforesaid end wall is a hollow plunger **13** of stepped form the larger portion of the plunger being accommodated within the casing. The plunger is formed from transparent material and the narrower portion extends from the end wall of the casing. Located within the casing **10** is a push piece **14** upon which is mounted an indicator rod **15** slidable within the narrower portion of the plunger. The push piece **14** can enter into the wider portion of the plunger **13** and includes a sole plate **16** approximately equal in diameter to the wider portion of the plunger. The sole plate contacts the end face of the armature **12** and it is loaded into contact therewith by a coiled compression spring **17** disposed intermediate the step between the wider and narrower portions of the plunger and the push piece **14.** The strength of the spring being less than that of the spring loading of the armature.

In operation, when the solenoid is de-energized the sole plate **16** and push piece **14** are moved towards the end wall of the casing against the action of the spring

17 and the indicator rod **15** assumes a particular position within the exposed portion of the plunger **13.** When the solenoid is energized as shown, the sole plate and push piece move with the armature and the indicator rod assumes another position. The different positions of the indicator rod can be clearly seen from the exterior of the casing. Thus an indication is provided of the position of the armature. Moreover, the plunger **13** can be depressed to effect manual movement of the armature for test purposes. In a modification not shown,- the exposed portion of the plunger is provided with a shield to prevent accidental operation.

In a further modification (not shown) the end of the plunger may be shaped to form a lens system which when the solenoid is deenergized provides an enlarged image of the end of the indicator rod. In this case the plunger need not project from the end of the casing.

I claim:

1. An electromagnetic device comprising a solenoid, a casing within which the solenoid is mounted, an end wall forming part of the casing, an armature operable by the solenoid and arranged to move when the solenoid is energized away from said end wall, a manually operable plunger mounted in the end wall and movable to effect movement of the armature away from said end wall, a bore formed in the plunger, an indicator rod located in said bore and movable with the armature, the rod being visible from the exterior of the casing to indicate the position of the armature.

2. A device according to claim **1** including a push piece connected to the indicator rod, said push piece serving as an abutment, and a coiled compression spring, one end of said coiled compression spring bearing against said abutment and acting to load the push piece into contact with the armature.

3. A device as claimed in claim **2** in which the plunger has a stepped internal surface, the other end of said spring engaging with a step on the internal surface of the plunger.

4. A device as claimed in claim **3** in which the narrower portion of the plunger accommodates the indicator rod and the wider portion of the plunger accommodates the push piece.

5. A device as claimed in claim **4** in which the push piece includes a sole plate bearing on the armature.

6. A device as claimed in claim **5** in which the narrower portion of the plunger extends from the casing.

7. A device as claimed in claim **1** in which the plunger is formed from transparent material.

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