

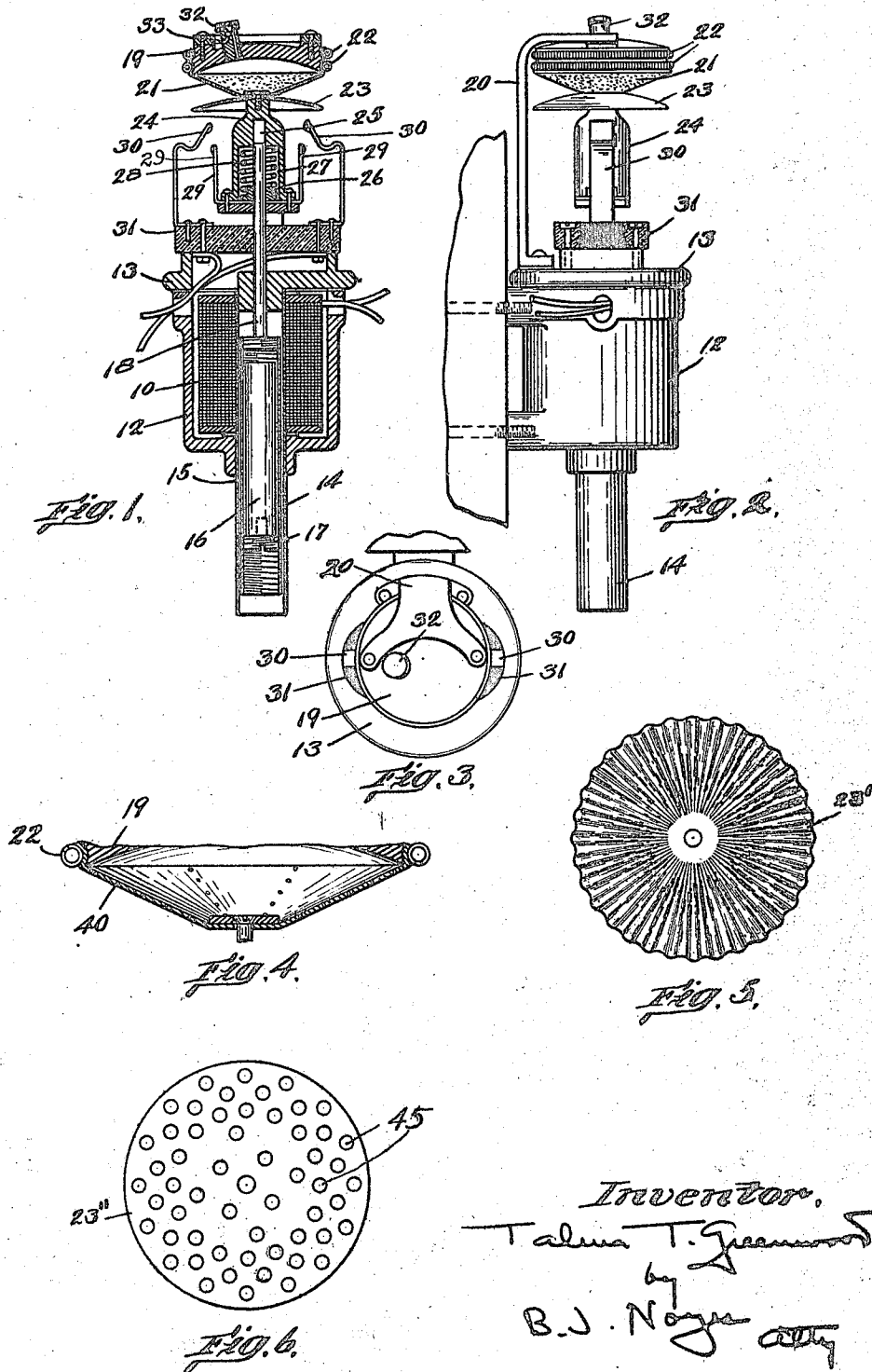
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T. T. GREENWOOD

RETARDING DEVICE FOR TIME LIMIT RELAYS

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UNITED STATES PATENT OFFICE.

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RETARDING DEVICE FOR TIME-LIMIT RELAYS.

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To all whom it may concern:

Be it known that I, TALMA T. GREENWOOD, a citizen of the United States, residing at East Templeton, in the county of Worcester and State of Massachusetts, have invented an Improvement in Retarding Devices for Time-Limit Relays, of which the following is a specification.

My invention relates to time limit relays adapted for the protection and control of electric circuits and apparatus connected thereto.

The invention has particular reference to time limit relays having a flexible or yielding diaphragm which is actuated by the plunger of a solenoid to force air through an orifice, the rate of flow of air through said orifice determining the time element of the relay.

The object of my invention is in the provision of a relay which is simple and inexpensive in design and construction, and which is positive and reliable in operation.

Fig. 1 is a sectional elevation of a relay embodying my invention.

Fig. 2 is a side elevation of the relay.

Fig. 3 is a plan view of the relay.

Fig. 4 is a modified form of diaphragm.

Figs. 5 and 6 are modified forms of diaphragm engaging members.

As here shown the relay comprises the solenoid or coil 10 which is arranged within the casing 12 formed of magnetic material, and which has a top pole piece 13 extended within said coil and magnetically connected with said casing 12.

The solenoid or coil 10 is wound upon, or is provided with, a central tube 14, of brass or other non-magnetic material in which is slidably arranged a similar tube 15. A core or plunger 16 is disposed within said tube 15 and is adjustable therein to vary the current value at which the solenoid will operate by means of a screw threaded end cap 17 which fits in similar threads of the tube 15. A rod 18 is secured in the upper end of said tube 15 and slidably extended through the top pole piece 13 of the solenoid and serves as means whereby a movement of the core is transmitted to the time element of the relay.

The time element includes a cup shaped pot 19 which is disposed above the solenoid and supported in such position, by the standard 20. A flexible or yielding diaphragm 21, which forms an object of my invention, is secured over the cup shaped end of said pot 19, in any suitable manner, such for instance, as by means of the helical springs 22. A diaphragm-engaging member 23, suitably curved to conform to the cupped end of the pot 19 is secured to the centre of said diaphragm 21, and when moved upward by the movable element of the solenoid serves to force said diaphragm into said cup shaped opening. The diaphragm-engaging member 23 is secured at substantially its central portion, to a downwardly extending stem 24 which has a central recess 25 in which the rod 18 of the movable element of the solenoid is slidably arranged.

Said rod 18 is provided with a flange 26 pinned or otherwise secured thereto between which and the bottom of a recessed opening 27 in said stem a spring 28 is arranged and through which movement of the movable element of the solenoid is transmitted to the diaphragm-engaging member. This arrangement of yielding connection of the movable element of the relay and the diaphragm-engaging member of the time element provides means whereby a substantial uniform pressure may be exerted against the diaphragm of the time element regardless of the varying energization of the solenoid with differing current values.

Upwardly extended spring contact members 29 are secured to said stem 24 which are adapted in the extreme operated position of the diaphragm-engaging member to make contact with suitable spring contact members 30 upwardly extended from and secured to an insulating base 31, and which are adapted to be connected to the circuit to be controlled.

It is desirable that after the diaphragm-engaging member has moved upward to force the diaphragm into the cup shaped opening in the pot 19 and to force the air from between said pot and the diaphragm, as will be hereinafter described, that means

be provided, after the contact members have been made to control the circuit connected thereto, to rapidly admit air to the space between said pot and diaphragm and permit the rapid return of the relay to its normal condition in readiness for a subsequent operation.

For this purpose a check or automatic inlet valve 32 is arranged in the pot 19 and serves, during the return of the diaphragm 21 to its normal condition, to rapidly admit air through the opening 33 to the space between the diaphragm and the pot 19.

It has heretofore been common to provide time elements of the type described with a leak valve through which the air is forced on the upward movement of the diaphragm-engaging member, and to provide a fluid tight diaphragm, the rate of flow of air through the leak valve determining the time element.

Instead of providing a fluid tight diaphragm and a leak valve, I prefer to omit the leak valve and to form a yielding diaphragm of a suitable pervious material through which the air may flow at a suitable rate when said diaphragm is moved upward into the cup shaped opening of the pot 19.

The pervious diaphragm may be of any suitable material which will satisfactorily answer the purpose. It may be for instance, of a material, as suitably compressed felt, which is uniformly porous as shown in Fig. 1, or it may be of a material as gold bearte's skin which is impervious to air and which has a plurality of mechanically formed air openings or relatively minute pores or perforations 40 therethrough, such for instance as shown in Fig. 4. These openings or perforations may be arranged in any suitable or desired pattern.

In connection with a porous or pervious diaphragm, I prefer to use a diaphragm-engaging member having a corrugated diaphragm contacting surface or having a plurality of perforations therethrough.

In Figs. 1 and 2, I have shown a substantially uniformly porous diaphragm and a diaphragm-engaging member which has a smooth diaphragm contacting surface. With such an arrangement it is seen that as the diaphragm-engaging member, is moved upward, it engages more and more of the surface of the diaphragm and so progressively closes the pores of the diaphragm and there-

by progressively restricts the flow of air therethrough and consequently the time element progressively increases.

In Fig. 5, I have shown a diaphragm-engaging member 23' provided with a plurality of corrugations. The depth of these corrugations is arranged to be such that the diaphragm does not fill the corrugations and the actual contacting surfaces of the corrugations of the diaphragm is arranged to be comparatively small so that as the diaphragm-engaging member is moved upward into increasing contact with the diaphragm the flow of air from that portion of the diaphragm in contact with the diaphragm-engaging member is not appreciably retarded.

In Fig. 6, I have shown a diaphragm-engaging member 23'' provided with a plurality of perforations 45 through which air is adapted to pass from that portion of the diaphragm in contact with the diaphragm-engaging member.

It is evident that many modifications of diaphragms may be employed through which the air is adapted to be forced in the upward movement of the diaphragm and many forms of diaphragm-engaging members may be also employed in conjunction with said diaphragms, all without departing from the scope of my invention.

I claim:

1. A retarding device comprising a fluid reservoir, a fluid permeable diaphragm forming a wall of said reservoir, and a diaphragm-engaging member adapted to contact with said diaphragm for its actuation having fluid passages therein for the flow of fluid from said reservoir.

2. A retarding device comprising a fluid reservoir a fluid permeable diaphragm forming a wall of said reservoir, and a diaphragm-engaging member adapted to contact with said diaphragm for its actuation formed with corrugations therein for the flow of fluid from said reservoir.

3. A retardation device comprising a fluid reservoir, a flexible fluid-permeable diaphragm forming a wall of said reservoir, and a diaphragm-engaging member engageable with said diaphragm for its actuation.

In testimony whereof, I have signed my name to this specification, in the presence of the subscribing witness.

TALMA T. GREENWOOD.

Witness:

H. B. DAVIS.