

April 13, 1937.

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2,077,295

TIME DELAY DEVICE FOR AUTOMATIC SWITCHES

Original Filed April 12, 1930 2 Sheets-Sheet 1

Fig. 1

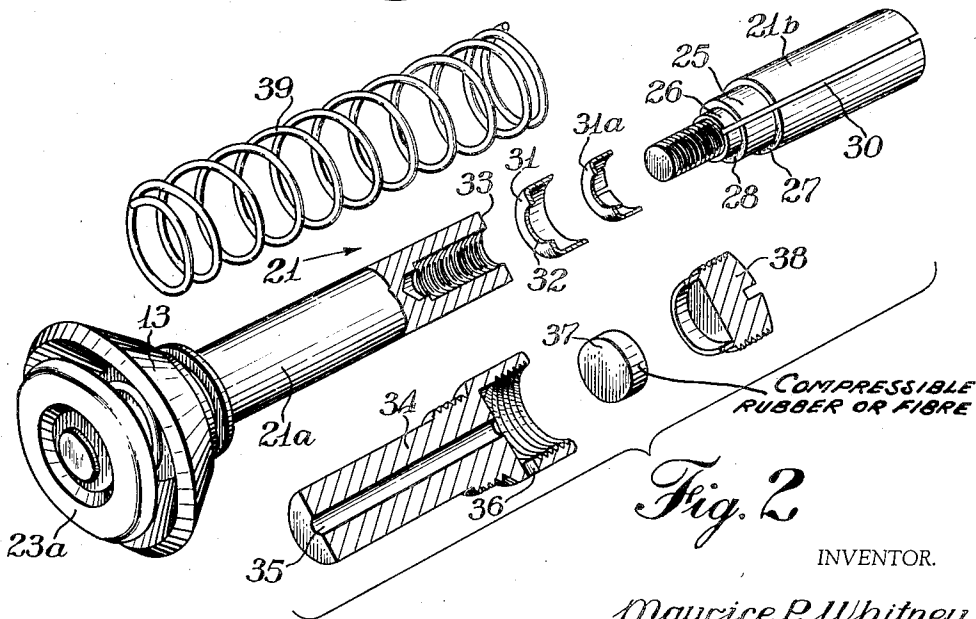
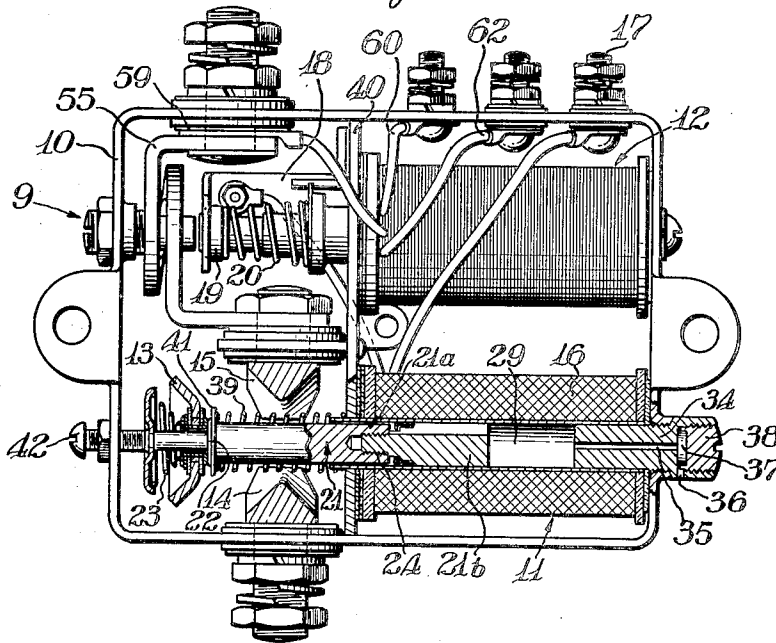


Fig. 2

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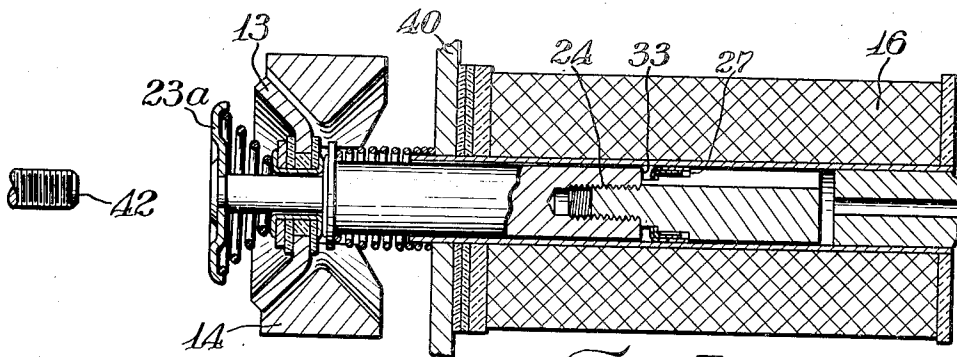
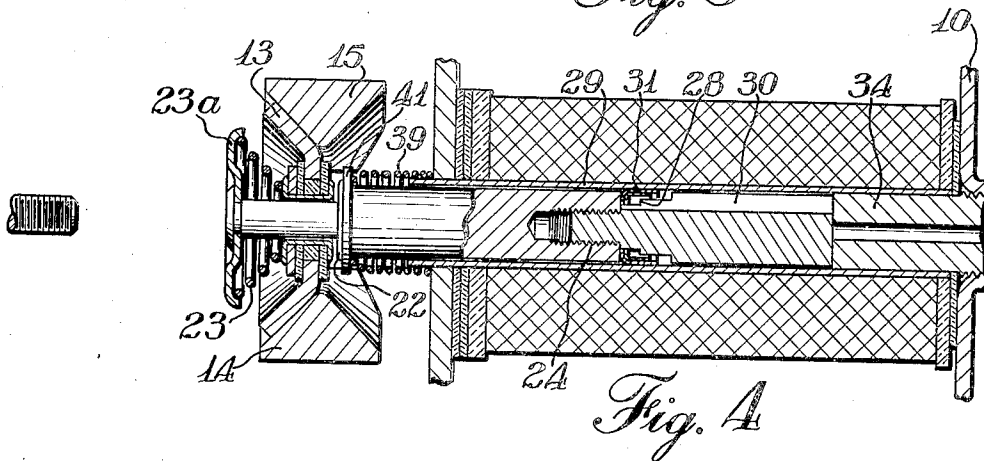
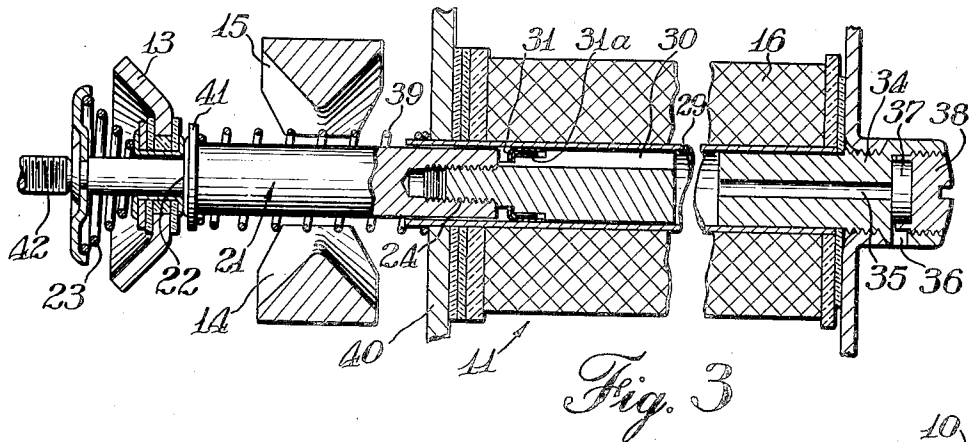
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UNITED STATES PATENT OFFICE

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TIME DELAY DEVICE FOR AUTOMATIC SWITCHES

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Original application April 12, 1930, Serial No.
443,833. Divided and this application October
30, 1935, Serial No. 47,463

4 Claims. (Cl. 188—94)

The present invention relates to a novel time delay device for an automatic switch and more particularly to a novel form of dashpot for delaying the closing of an automatic switch for starting mechanism.

This application is a division of my application, Serial Number 443,833, filed April 12, 1930; issued Nov. 19, 1935 as Patent Number 2,021,822.

It is an object of the present invention to provide a novel dashpot time delay for automatic switches which is reliable and efficient and generally superior to those heretofore known.

It is another object to provide such a dashpot which is adapted to delay the closing of the switch but which provides for a quick substantially unimpeded opening thereof.

Another object is to provide such a dashpot which is located within the body of the switch, thus rendering the device compact and well protected from accidental injury.

A further object is to provide such a device which is readily adjustable to regulate the timing thereof and which accurately maintains such adjustment.

A further object of the invention is the provision of such a device which is economical to manufacture, is easily assembled and requires but few parts to be added to the switch assembly.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is an elevation of an automatic switch embodying the present invention, some of the parts being in axial section;

Fig. 2 is an enlarged expanded view in perspective of certain of the parts;

Fig. 3 is an enlarged detail in section of certain parts of the switch shown in normal position;

Fig. 4 is a similar view showing the parts in operative position; and

Fig. 5 is a similar view showing the parts in their position at the instant the switch has been opened.

Referring first to Fig. 1 of the drawings, the switch 9 comprises a casing 10 of any convenient form having a switch controlling solenoid 11 and a contact controlling solenoid 12 rigidly mounted therein. Solenoid 11 is adapted to control the position of a switch member 13 which, when in its closed position, bridges a pair of contacts 14 and 15 to complete a starting motor circuit. One end of the coil 16 of solenoid 11 is connected to

a binding post 17, while the opposite end of said coil is connected to a bracket 18 mounted rigidly on casing 10 but insulated therefrom. Solenoid 12 is adapted to operate a plunger 19 which normally is held in contact with bracket 18 as by means of a spring 20, thus grounding the bracket to the casing 10 through spring 20 and the adjacent parts.

Switch member 13 is loosely mounted on plunger 21 of solenoid 11, electrically insulated therefrom, and is yieldably held against a shoulder 22 thereon as by means of a spring 23. Spring 23 is held in position and connected to plunger 21 by suitable means such as a dished washer 23a riveted on the end of plunger 21 and forming a seat for the outer end of said spring. Plunger 21 is formed in two parts 21a and 21b which fit loosely within a cylindrical core 29 of solenoid 11. Parts 21a and 21b are fixed together in any suitable way as by means of a threaded connection 24. Part 21b is provided, as best shown in Fig. 2, with portions 25 and 26 of progressively reduced diameters forming shoulders 27 and 28 respectively and cooperating with the end of part 21a to form annular chambers or spaces within the cylinder 29. Part 21b is also provided with a longitudinal slot 30 extending throughout its length.

A cup valve 31 of any suitable material is loosely mounted in the space between members 21a and 21b with its inturned portion 32 adapted to rest against shoulder 28 and its cylindrical portion adapted to surround the portion 25 of member 21b. Valve 31 has a working fit within cylinder 29, and may, if desired, be provided with an expander 31a therein to ensure an air-tight fit.

It will be noted that the space between the shoulder 28 of member 21b and shoulder 33 formed by the end of 21a is considerably greater than the thickness of the inturned portion 32 of the cup valve 31 and of expander 31a, so that the cup valve is mounted on the plunger 21 with considerable longitudinal lost motion. When cup valve 31 rests against shoulder 33, it forms with such shoulder an obturator preventing the escape of air past the member 21a, but when the valve rests against the shoulder 28, air can readily pass through the space between shoulder 33 and inturned portion 32 and traverse the longitudinal slot 30.

The end of cylinder 29 opposite that through which plunger 21 protrudes is closed by suitable means such as a plug 34 threaded within casing 10 and having a tight fit within said cylinder.

Plug 34 may be provided with an adjustable bleeder which, as illustrated, comprises a channel 35 axially traversing the same, and a radial opening 36 intersecting said channel. A plug 37 of suitable compressible material such as rubber or fibre is pressed against the opening of channel 35 as by means of threaded plug 38, the pressure being regulated by adjusting the plug to vary the rate of flow of air through said channel.

Plunger 21 is normally maintained in the position illustrated in Figs. 1 and 3 by means such as a spring 39 bearing against a partition member 40 of casing 10 at one end and against a collar 41 fixed on the plunger 21 at its other end. The length of the stroke of plunger 21 may be regulated by means such as the adjustable stop 42 mounted in casing 10 and forming an abutment for said plunger.

In the operation of this device, a delay of closure of switch contacts 13, 14, 15 is furnished by the dash-pot action of the valve 31 in cylinder 29 since during the inward stroke of plunger 21, valve 31 rests against the shoulder 33 and forms therewith a tight piston. The time delay may be regulated either by adjusting the plug 38 to vary the rate of escape of air through the channel 35 or by varying the stroke of plunger 21 by means of the adjustable stop 42.

When large amounts of current are carried through the switch, it is obvious that contacts 13, 14 and 15 will be subject to heavy arcing if the break of said contacts is not instantaneous. With this purpose in view, the valve 31 is given the lost motion referred to with respect to plunger 21, so that return movement of plunger 21 is unimpeded by the friction of said valve in the cylinder 29.

This operation is best illustrated in Figs. 4 and 5 of the drawings. Fig. 4 illustrates the position of the parts when the switch is closed. It will be noted that valve 31 rests against shoulder 33, and spring 23 is slightly compressed in holding switch member 13 against contacts 14 and 15. When the circuit through coil 16 is broken by the control solenoid 12 (Fig. 1), spring 39 immediately expands and moves plunger 21 outwardly to the position shown in Fig. 5. As there illustrated, it will be seen that a clean break of the contacts is obtained by the time the lost motion between valve 31 and plunger 21 has been taken up.

Although but one embodiment of the invention has been illustrated and described in detail, it will be understood that this structure is not exclusive and further embodiments will now suggest themselves to those skilled in the art and certain parts may be combined, altered or omitted and changes made in the arrangement and

mode of operation thereof without departing from the spirit of the invention.

Reference will therefore be had to the claims hereto appended for a definition of the scope of the invention.

What is claimed is:

1. In a device of the class described, a cylinder having a restricted opening, a plunger loosely mounted to reciprocate in said cylinder and provided intermediate its length with a circumferential groove forming a shoulder and a communicating longitudinal groove forming an air passage opening into said cylinder beyond the piston, an obturator within said cylinder having a lost motion mounting in said groove and adapted when resting against said shoulder to form with said plunger an air-tight piston but to open said air passage when at the other end of its lost motion.

2. In a device of the class described, a cylinder having a restricted opening, a plunger loosely mounted to reciprocate in said cylinder and having a longitudinal passage therein, a cup valve within said cylinder having a lost motion mounting on said plunger and arranged to form with said plunger an air-tight piston when at one end of its lost motion but to open said passage around said valve when at the other end of its lost motion, a compressible valve member adapted to cover said opening, and adjustable means for pressing said valve against said opening.

3. In a device of the class described, a cylinder having one end open and having a restricted opening at the other end, a plunger entering the open end of the cylinder and loosely mounted to reciprocate therein, a cup valve within the cylinder having a lost motion mounting in said plunger with the open end of the cup facing the restricted opening of the cylinder, said plunger having a shoulder and said cup having a flange adapted to cooperate therewith to form a fluid-tight piston when at one end of its lost motion, a compressible element arranged to obstruct the restricted opening of the cylinder, and adjustable means for pressing said element against the opening to control the flow of fluid therethrough.

4. An adjustable dashpot including a cylinder, a plunger freely slidable therein formed of two coaxial parts detachably fixed together and formed to provide a circumferential groove therebetween, one of said parts having a longitudinal passage communicating with said groove, a cup-shaped obturator mounted in said groove to form a seal with one of the parts of the plunger and having limited lost motion therein between the parts of the plunger, said passage extending through the obturator when the latter is in engagement with the part having the passage, and adjustable vent means for said cylinder.

MAURICE P. WHITNEY.