Sept. 2, 1958 H. M. MORGAN 2,849,884

CONTROLLER FOR DIAPHRAGM VALVE

Filed July 21. 1955 2 Sheets-Sheet 1

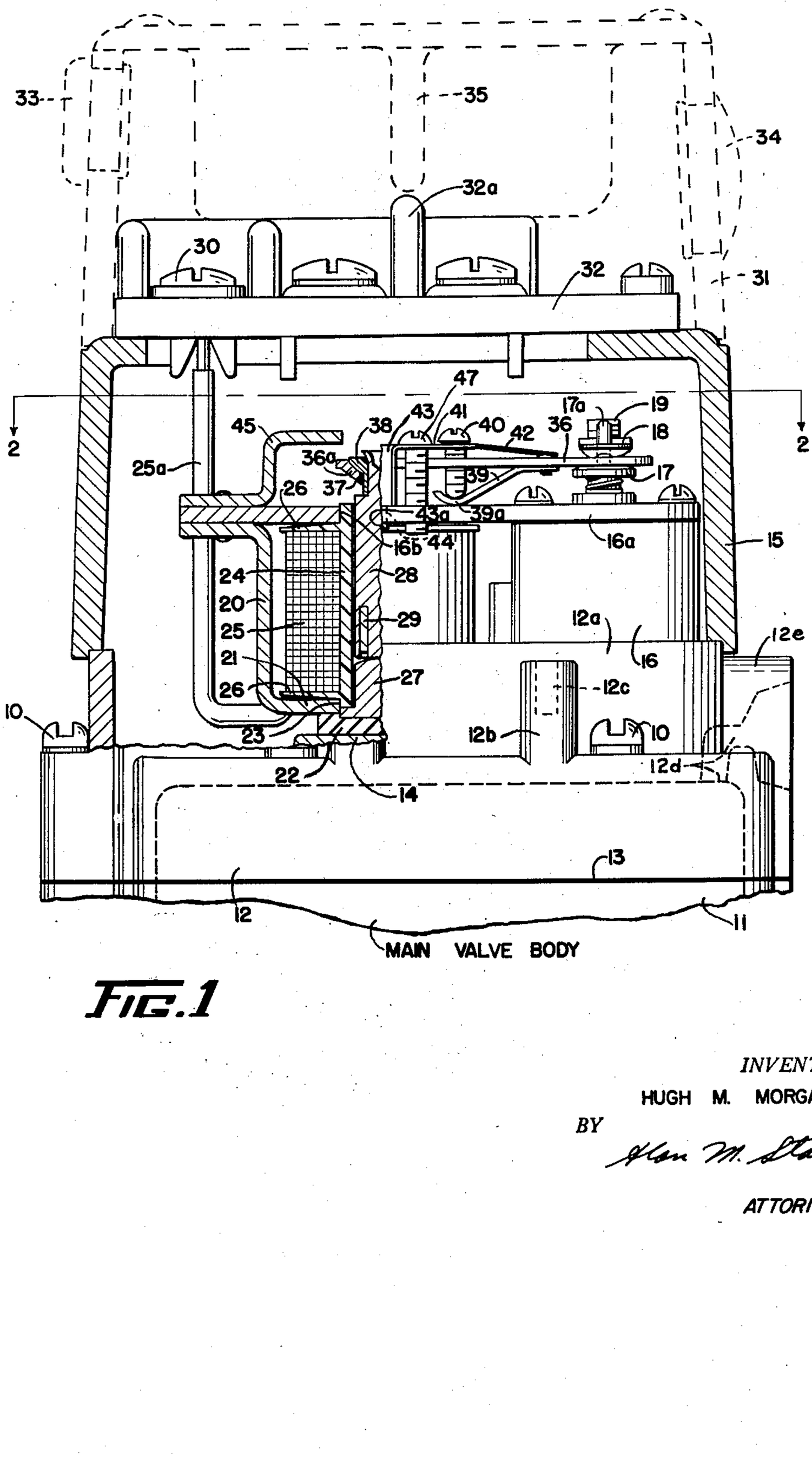

FIG. 1

INVENTOR.

HUGH M. MORGAN

BY

Hugh M. Stanley

ATTORNEY

Sept. 2, 1958 H. M. MORGAN 2,849,884

CONTROLLER FOR DIAPHRAGM VALVE

Filed July 21. 1955 2 Sheets-Sheet 2

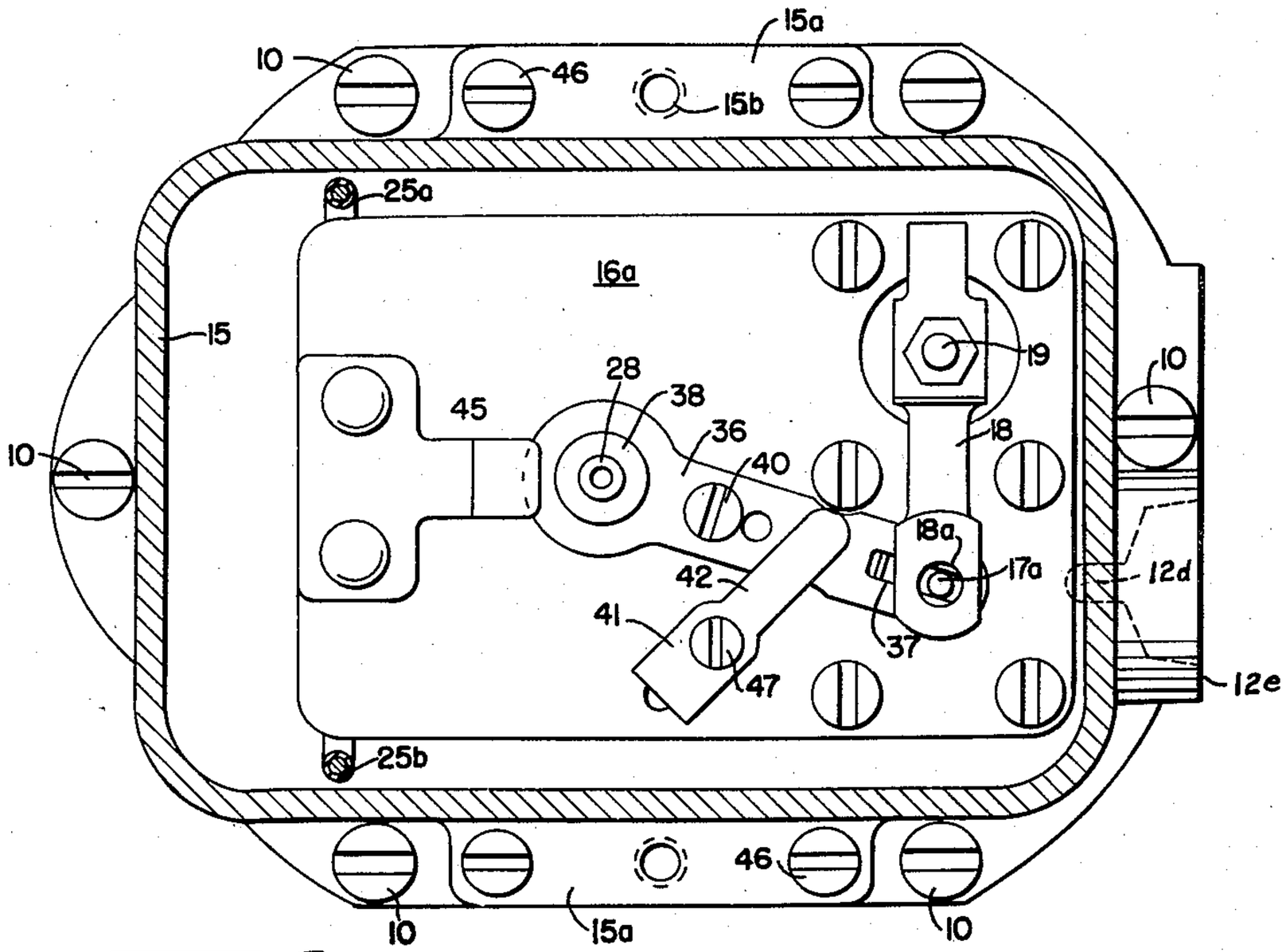

FIG. 2

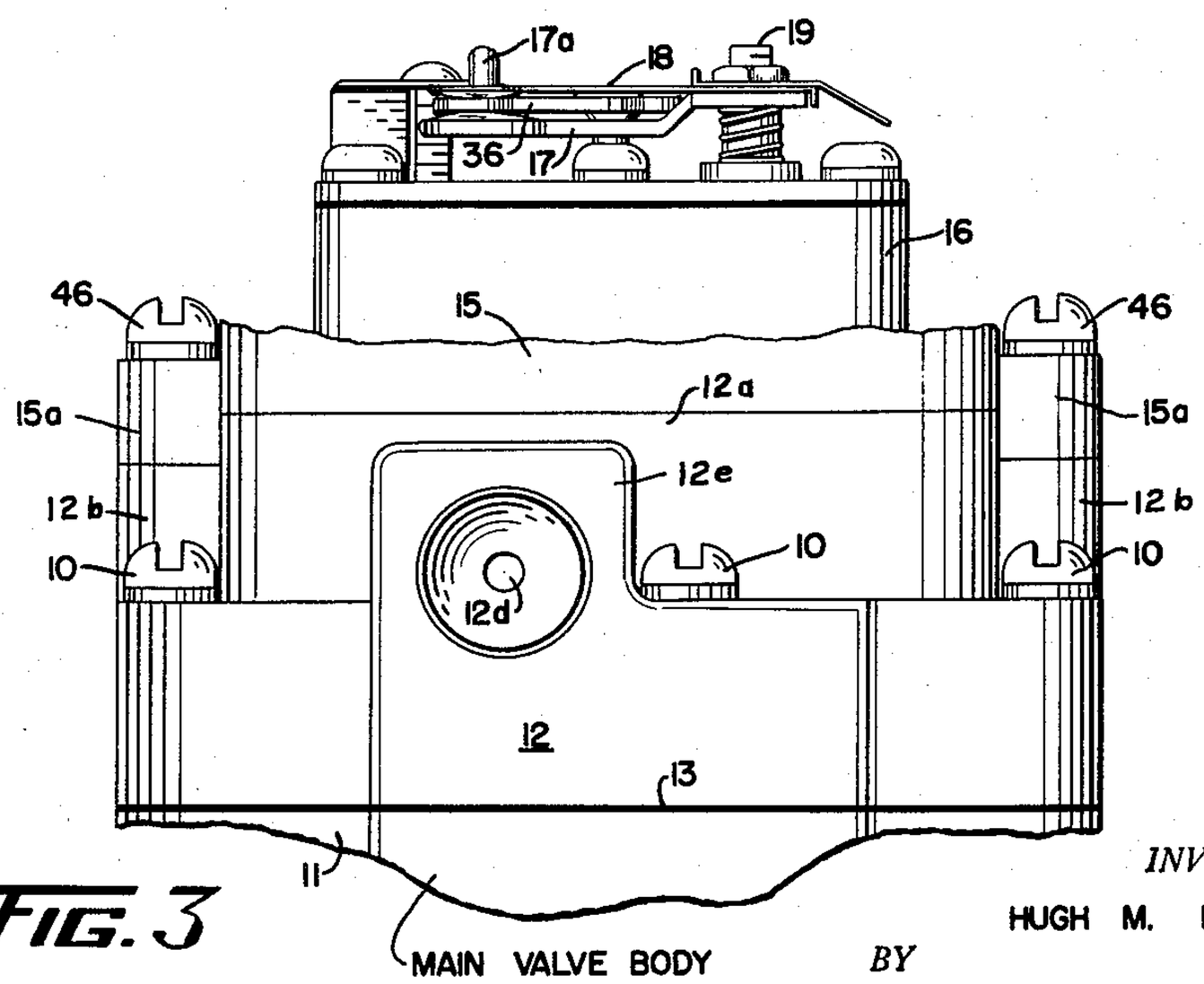

FIG. 3

INVENTOR.
HUGH M. MORGAN
BY
Alan M. Stanbly
ATTORNEY

United States Patent Office

2,849,884

Patented Sept. 2, 1958

2,849,884

CONTROLLER FOR DIAPHRAGM VALVE

Hugh M. Morgan, Culver City, Calif., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

Application July 21, 1955, Serial No. 523,425

3 Claims. (Cl. 74—110)

This invention relates to diaphragm valves and, more particularly, to a new and improved diaphragm valve controller, generally known as a pilot valve.

One of the objects of the invention is to provide a more quiet and reliable diaphragm controller which is of inexpensive yet sturdy construction.

Another object of the invention is to provide a diaphragm valve controller which makes use of a solenoid type of motor means to actuate the controller, but which is quiet in operation, as compared to similar commercial motor means.

A further object of the invention is to provide a mechanical motion transmitting means between a plunger of a solenoid and a control member which aids in rendering the operation of the solenoid quiet.

A still further object of the invention is to provide, in a diaphragm controller valve, an adjustable sliding pivot for a lever transmitting motion from a motor means to a pilot valve, so that the friction between the pivot and its support provides a dampening effect to reduce the noise of the motor means.

Still other objects of the invention will become apparent upon reading the following detailed description of the invention in conjunction with the drawings wherein:

Figure 1 is a side elevational view of the invention with a major portion of the diaphragm valve body broken away, portions of the controller broken away and the cover shown in phantom;

Figure 2 is a cross-sectional plane view of the invention taken along line **2—2** of Figure 1; and

Figure 3 is an end view of the invention with a major portion of the valve body broken away and part of the controller housing broken away.

Referring to Figure 1 of the drawing, the numeral **11** designates a conventional diaphragm valve body while the numeral **12** designates a top casting therefor. The casting has a hollowed out lower portion, forming a pressure chamber above a diaphragm **13**, which is clamped between the main valve body **11** and the upper casting **12** by means of bolts **10**. Located on the upper surface of the top wall **14** of the casting **12** and within the confines of an upwardly extending side wall **12***a* of the upper casting and a cover **15**, clamped to the casting **12** by means of bolts **46** extending through lugs **15***a* and into threaded bores **12***c* in ribs **12***b*, is a diaphragm controller valve **16** which is substantially the same as that disclosed in Huntington Patent No. 2,667,897.

The valve or controller has a relatively rigid actuating arm **17** and a relatively resilient actuating arm **18** secured to an actuating stem **19** of a valve (not shown) within the body of the controller **16**. A plate **16***a*, which forms part of the top of the diaphragm controller **16** extends laterally therefrom and supports at its left-hand end a bracket **20**. The bracket **20** has an arm **21** which extends toward the diaphragm controller **16** and parallel to the plate **16***a* and rests on a block of rubber **22** located between it and the upper surface of the wall **14**. The

arm **21** has a hole **23** therein which receives the lower end of a bobbin **24** made of nylon or any other suitable nonmagnetic material.

The bobbin **24** carries a coil of wire **25** thereon between two annular flanges **26** spaced inwardly a short distance from each end of the bobbin **24**. The upper end of the bobbin **24** extends through a hole **16***b* in the plate **16***a*. A stop **27**, made of suitable magnetic material, has an annular flange thereon at its lower end which rests against the lower end of the bobbin **24**, with the remainder thereof extending upwardly into the bobbin **24** with a slidable fit. The stop **27** also rests on the rubber block **22** so that when a solenoid plunger **28** located within the bobbin **24** is pulled inwardly thereof, due to energization of the coil **25**, the plunger will strike the stop **27**, which will yield by compressing the rubber block **22**, and thus absorb the shock and reduce the noise that would otherwise be caused by the impact. The plunger **28** has a conventional shading ring **29** of nonmagnetic material. The coil **25** is connected to a suitable source of electricity by means of lead wires **25***a* and **25***b* connected to terminals and connectors **30**, which are adapted to receive lead wires (not shown) connected to a source of electricity and a thermostat or other suitable control means.

A cover **31** shown in phantom in Figure 1 of the drawing encloses a terminal block **32** through which lead terminals **30** extend. This cover has openings at each end thereof, with rubber bushings **33** and **34** therein, through which the external wiring of the control system may pass to connect to the terminals. The bushing **34** may be removed to receive a conduit coupling in the event that such a coupling is required. A partition **35** also extends downwardly from the upper wall of the cover **31** to cooperate with an upwardly extending partition **32***a* on the terminal block to effectively divide the space over the terminal block into two separate chambers, one to receive safety device leads and the other to receive other leads or wiring.

The diaphragm controller or pilot valve is arranged to be actuated by the solenoid plunger **28** by means of a lever **36** having one end thereof extending between the arms **17** and **18**. A longitudinally extending slot **37** in this end of the lever has a pin **17***a* extending upwardly therethrough from the arm **17** and through an opening **18***a* in the resilient arm **18**. This connection permits axial sliding movement of the lever **36** with respect to the levers or arms **17** and **18** but no lateral movement of the lever **36** with respect to the pin **17***a*. The other end of the lever **36** has a socket portion **36***a* and a hole **37** therein through which a headed sleeve **38** extends, the sleeve **38** being secured to a reduced diameter portion of the plunger extending upwardly from the upper end of the main body portion of the solenoid plunger **28**. A relatively stiff strip of metal **39** is riveted to the lever **36** intermediate its ends and has a downwardly inclined portion terminating in an arcuate bearing portion **39***a*, which engages the upper surface of the plate **16***a* to serve as a pivot for the lever **36**. The distance between the bearing surface of the portion **39***a* and the lever **36** may be varied by rotating an adjusting screw **40** screw-threaded through an opening in the lever **36** and bearing against the upper surface of the portion **39***a*. A generally L-shaped leaf spring **41** has a long arm **42**, the outer end of which bears downwardly on the rivet that holds the pivot member **39** to the arm **36**. This spring normally holds the actuated arms **17** and **18** of the diaphragm controller **16** in the position which causes the diaphragm valve to close. When the coil **25** is energized, the plunger **28** will be pulled into the plunger tube **24** against the stop **27** and move the arms **17** and **18** against the bias of spring **41**, by pivoting the lever **36** counterclockwise about the pivot portion **39***a* and moving the diaphragm

controller to the position which permits the diaphragm valve to open.

The elements of the apparatus are disclosed in Figure 1 as being in the energized condition of the coil **25**. The short leg **43** of the spring **41** rests at its lower end on the top of plate **16***a* and has a stud projection **43***a* therein which extends into a hole **44** in the plate **16***a* so as to prevent rotation of the spring **41** about an adjusting screw **47**. The adjusting screw extends through a hole in the spring **41** and is screw-threaded through a hole in the plate **16***a* for adjusting the tension of the spring on the lever **36**.

In order to prevent damage to the spring **41** during shipment, a bracket member **45** is secured to the upper surface of the plate **16***a* by means of the same rivet that holds the bracket **20** to the plate. The upper free end of the bracket **45** extends over the socketed end portion **36***a* of the lever **36** so as to limit the outward movement of the plunger **28** and the lever **36** with respect to the plate **16***a*.

Operation

With the valve body **11** connected to a source of gas and with a furnace and with the coil **25** connected to a source of electricity through a suitable control switch, the elements of the invention will be in the position shown in the drawings, that is, the plunger **28** will be pulled into the plunger tube or bobbin **24** and against the stop **27** so that the diaphragm controller **16** will permit gas to be bled out from above the diaphragm **13** through a vent passage **12***d* extending through a rib **12***e* on the casting **12** which will permit gas at inlet pressure in the valve body **11** to raise the diaphragm **13** and thus raise a valve head (not shown) off its valve seat (not shown) to permit gas to flow to the furnace, in a conventional manner. Should the control switch be opened to de-energize the coil **25**, the spring **42** will pivot the lever **36** clockwise about the pivot **39***a* to raise the plunger **28** off the stop **27** and move the arms **17** and **18** of diaphragm controller toward the plate **16***a*. This movement of the arms **17** and **18** will cause a shifting of the valve of the diaphragm controller so as to permit gas under supply pressure to enter the chamber above the diaphragm **13** and to simultaneously cut off the escape of gas from above the diaphragm through the vent **12***d*.

It will be noted that in the movement of the lever **36** between the "on" and "off" positions of the valve, there is sliding movement between the lever **36** and the arms **17** and **18** and between the bearing surface of the pivot **39***a* and the top surface of the plate **16***a* as well as some friction between the plunger **28** and the plunger tube **24**, due to the fact that the effective lever lengths between the pivots **39***a* and the arms **17** and **18** and between the pivot **39***a* and the plunger connection to the lever **36** change as the lever moves between open and close positions. It is this friction between these parts of the device that produces a dampening or retarding movement of the parts and which materially aids in reducing the amount of noise produced by the operation of the solenoid, even though a large portion of the noise is eliminated by the rubber pad **22** supporting the stop **27**.

It will also be noted that the above mentioned arrangement and construction of parts makes the assembly thereof relatively easy and the manufacture of the elements inexpensive, which permits the manufacture of a highly reliable, inexpensive and quiet valve.

While I have described the preferred embodiment of the invention above, it is deemed to be obvious to those skilled in the art how structural changes may be made therein without departing from the spirit of the invention. Therefore, it is to be understood that the scope of the invention is to be determined solely from the appended claims.

I claim:

1. A controller comprising a control member, a plate, an actuator for said member movable toward and away from said plate, a lever having a transversely adjustable pivot rectilinearly slidable on said plate, said lever having operating engagement with said actuator, a solenoid secured to said plate and having a plunger operably engaging said lever, and means for biasing said lever in a direction to withdraw said plunger from said solenoid and to actuate said control member.

2. A control device comprising a control member, a lever having a slidable pivotal connection at one of its ends with said control member, motor means operably engaging the other end of said lever, and a transversely extending pivot secured to said lever intermediate its ends and having rectilinearly slidable movement on a flat surface adjacent said motor means.

3. A control device comprising a control means, a lever having a pivotal connection at one of its ends with said control means, motor means operably engaging the other end of said lever, and an adjustable pivot secured to and spaced laterally from said lever intermediate its ends and having rectilinearly slidable engagement with a flat bearing surface within said device.

References Cited in the file of this patent

UNITED STATES PATENTS

1,680,245	Penn	Aug. 7, 1928
1,735,511	Shrode	Nov. 12, 1929
1,780,713	McEwan	Nov. 4, 1930
2,280,390	Ensign	Apr. 21, 1942
2,635,632	Mayer	Apr. 21, 1953
2,635,635	Eimermann	Apr. 21, 1953
2,687,738	Thornbery	Aug. 31, 1954

FOREIGN PATENTS

656,037	Great Britain	Dec. 22, 1949