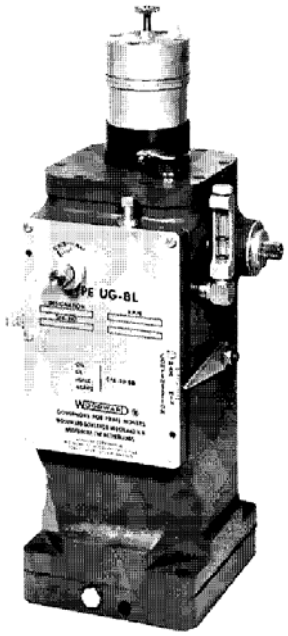
WOODWARD

Product Manual 03506
(Revision F)
Original Instructions



Pneumatic Speed Setting Device for the UG-8 Lever Governor

Operation Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

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Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Warnings and Notices

Important Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

⚠WARNING

Automotive Applications

On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

NOTICE

Battery Charging Device

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Pneumatic Speed Setting Device for the UG-8 Lever Governor

General

This pneumatic speed setting assembly is used to change the speed setting of a UG-8L (lever) governor by means of an air signal from a pressure regulator for simple remote speed adjustment. There is room left on the cover for a solenoid shutdown (manual 03013), low lube oil pressure shutdown (manual 03016), or a simple pneumatic shutdown. The normal speed adjusting shaft is retained. It should be locked in the minimum speed position. It may be used when no air pressure is available.

⚠WARNING

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

The direct speed setting assembly increases governor speed as the air pressure signal increases. The pressure range is from 10 to 78 psi (0.7 to 5.3 atm; 69 to 538 kPa; 0.7 to 5.4 bar) for a governor speed range of 375–1500 rpm. Speed can be set accurately only at one end of the speed setting range.

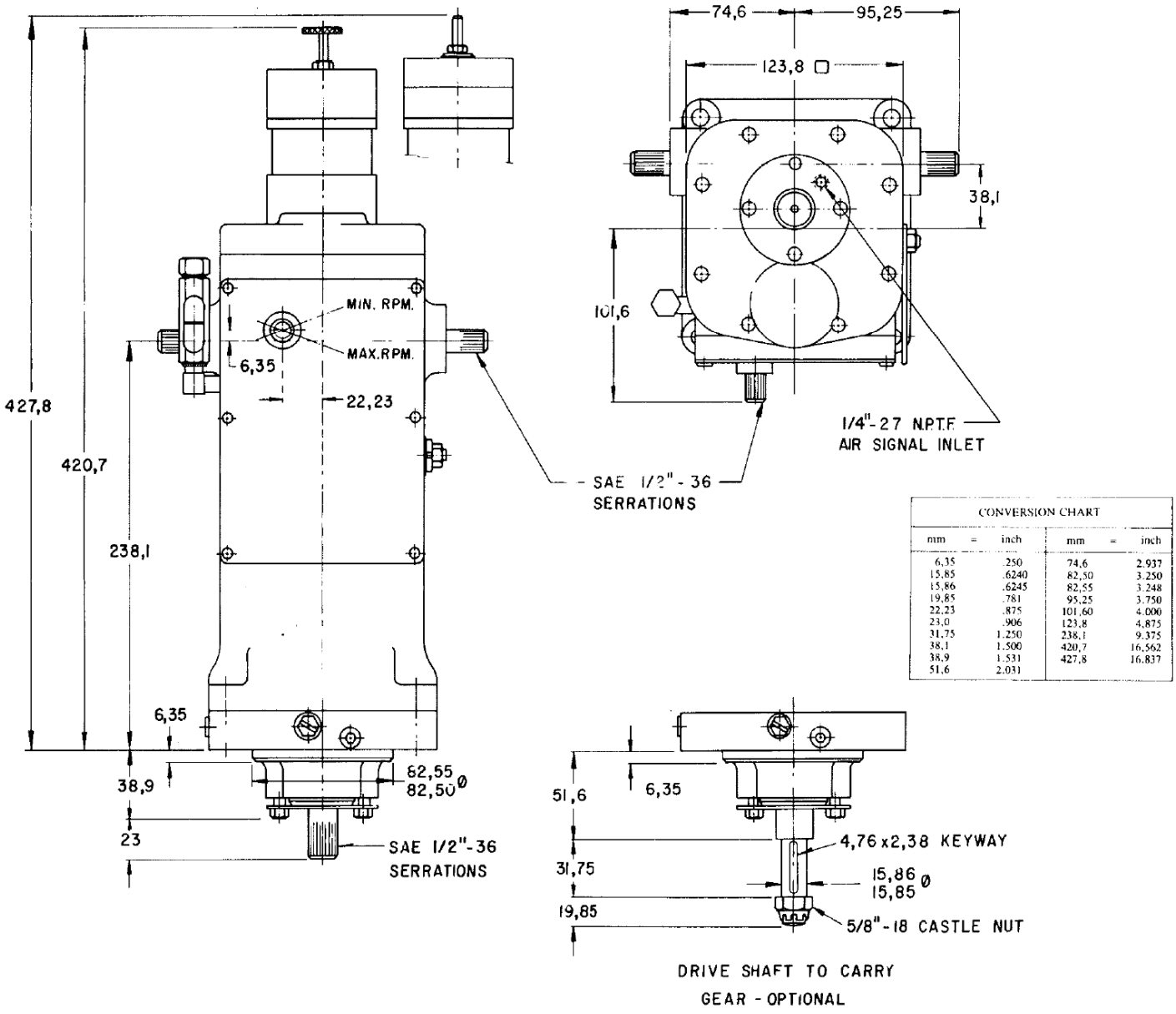
The assembly responds to an air pressure change as small as 0.2 psi (1.4 kPa). Hysteresis is small (1–3 rpm) with the smallest figures at the high end of the loop. (A hysteresis loop is a plot of the speeds obtained at various control signal pressures; one portion is recorded as speed setting signals are being increased, the other portion as the signals are being decreased.)

Operation

The pneumatic speed setting assembly consists essentially of a diaphragm, housing, oil reservoir, adjusting screws, and a long rod which is connected to the pilot valve plunger (Figure 2). When the control pressure is zero, the governor runs at minimum speed.

Increasing the air pressure causes the diaphragm (5) and piston (7) to move down against the forces of the opposing springs (9 and 22). The inner spring (22) pushes the speed setting rod (13) down. The pilot valve plunger opens the control ports in the pilot valve bushing, allowing governor pressure oil to flow to the power piston cylinder. The power piston moves up to increase fuel, gas or steam, resulting in higher prime mover speeds. The flyweights move out, lifting the pilot valve and speeder rod, closing the control ports in the pilot valve bushing, and restoring equilibrium at a higher speed in the usual way. In the new position, piston (7) has moved down slightly and the higher load of spring (22) equals the increase in flyweight force.

To prevent hunting, which could occur due to air compressibility if the air pressure were supplied directly to the diaphragm, the space above the diaphragm is filled with oil and is connected through an orifice with an oil reservoir. The air pressure signal is applied to the top surface of the oil reservoir and the pressure signal is transmitted by the oil to the diaphragm.



CONVERSION CHART

mm	=	inch	mm	=	inch
6,35		.250	74,6		2.937
15,85		.6240	82,50		3.250
15,86		.6245	82,55		3.248
19,85		.781	95,25		3.750
22,23		.875	101,60		4.000
23,0		.906	123,8		4,875
31,75		1.250	238,1		9.375
38,1		1.500	420,7		16,562
38,9		1.531	427,8		16.837
51,6		2.031			

Figure 1. Typical UG Governor with Pneumatic Speed Setting Assembly
(Do not use for construction)

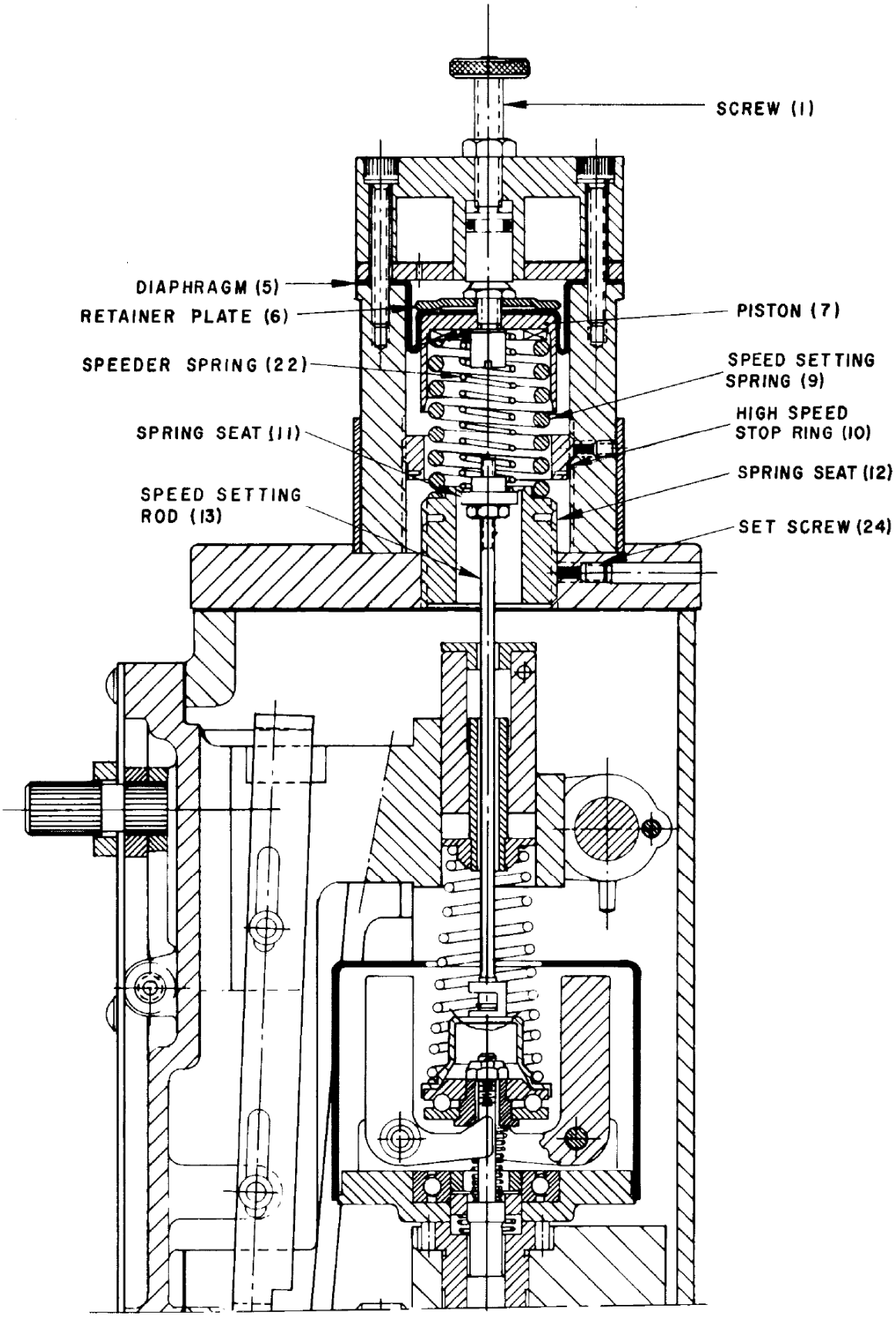


Figure 2. Pneumatic Speed Setting Assembly

Installation

When filling the oil reservoir, be sure that no air is trapped above the diaphragm. This can be achieved by applying pressure to the system and bleeding it several times.

⚠WARNING

During pneumatic speed setting operation, the speed adjusting shaft must be secured in the minimum speed position. Moving the shaft away from minimum position will add a speed rise above the speed setting of the pneumatic device. This can result in an overspeed condition and you must take care to prevent this.

Overhaul

When the pneumatic speed setting assembly is disassembled during overhaul of the governor, take care to avoid damaging the diaphragm. If cracks have begun to form in the diaphragm, it should be replaced. Note that the set screws (24) must be loosened before spring seat (12) can be removed. (The numbers in parentheses correspond to the identifying numbers in Figure 2.) Before reassembling diaphragm (5), coat all surfaces lightly with Molykote Z lubricant (Alpha-Molykote Corp., Stamford, Connecticut, USA.) or equivalent. Be careful to avoid wrinkling or twisting the diaphragm during assembly, or premature failures may result. Lubricate O-ring with petrolatum to prevent cutting during assembly.

Adjustment

There are five adjustments which affect the speed setting versus control air pressure curve. The position of the speed shaft and spring seats (11) and (12) determine the level of the curve. Changing their settings shifts the curve up or down (increases or decreases speed for the same pressure).

If a readjustment of this level is necessary, it is recommended to only change the setting of spring seat (12) and consider adjustment of speed setting shaft and spring seat (11) factory set. Part (12) can be turned up and down after loosening set screw (24). Inserting a punch in one of the holes allows seat (12) to readjust, resulting in a lower or higher speed for the same pressure. Lowest speed is set with screw (1), maximum speed with ring (10) limiting travel of piston (7). The slope of the speed setting pressure curve cannot be adjusted. Only one end can be set accurately. As a result, speeds at the other end, usually minimum speeds, will vary due to manufacturing tolerances.

Information and Parts Replacement

When requesting information concerning the pneumatic speed setting assembly, or when ordering replacement parts, be sure to include the following information:

1. Governor serial number as shown on name plate.
2. Manual number (this is manual 03506).
3. The part reference number and name or description of part.

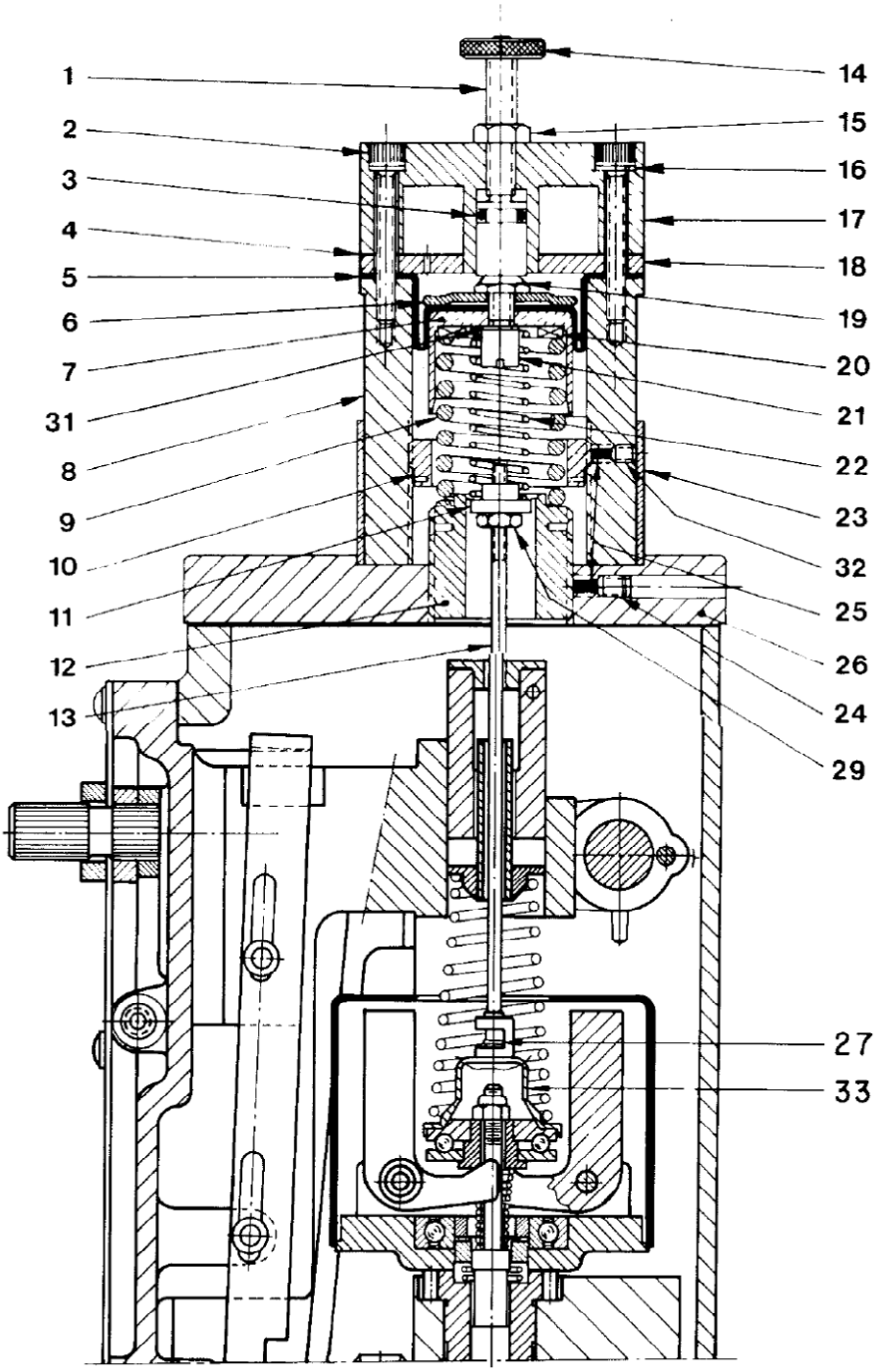


Figure 3. Pneumatic Speed Setting Assembly Parts

Ref. No.	Name of Part	Quantity
03506-1	Low speed stop screw	1
03506-2	#10-32x1.375 socket head cap screw	4
03506-3	O-ring	1
03506-4	Gasket	1
03506-5	Rolling diaphragm	1
03506-6	Retainer plate	1
03506-7	Piston	1
03506-8	Body	1

Ref. No.	Name of Part	Quantity
03506-9	Speed setting spring	1
03506-10	High speed stop ring	1
03506-11	Spring seat assembly	1
03506-12	Spring seat	1
03506-13	Speed setting rod	1
03506-14	Knob	1
03506-15	#1/4-28 Hex. nut	1
03506-16	#10 Splitlock washer	6

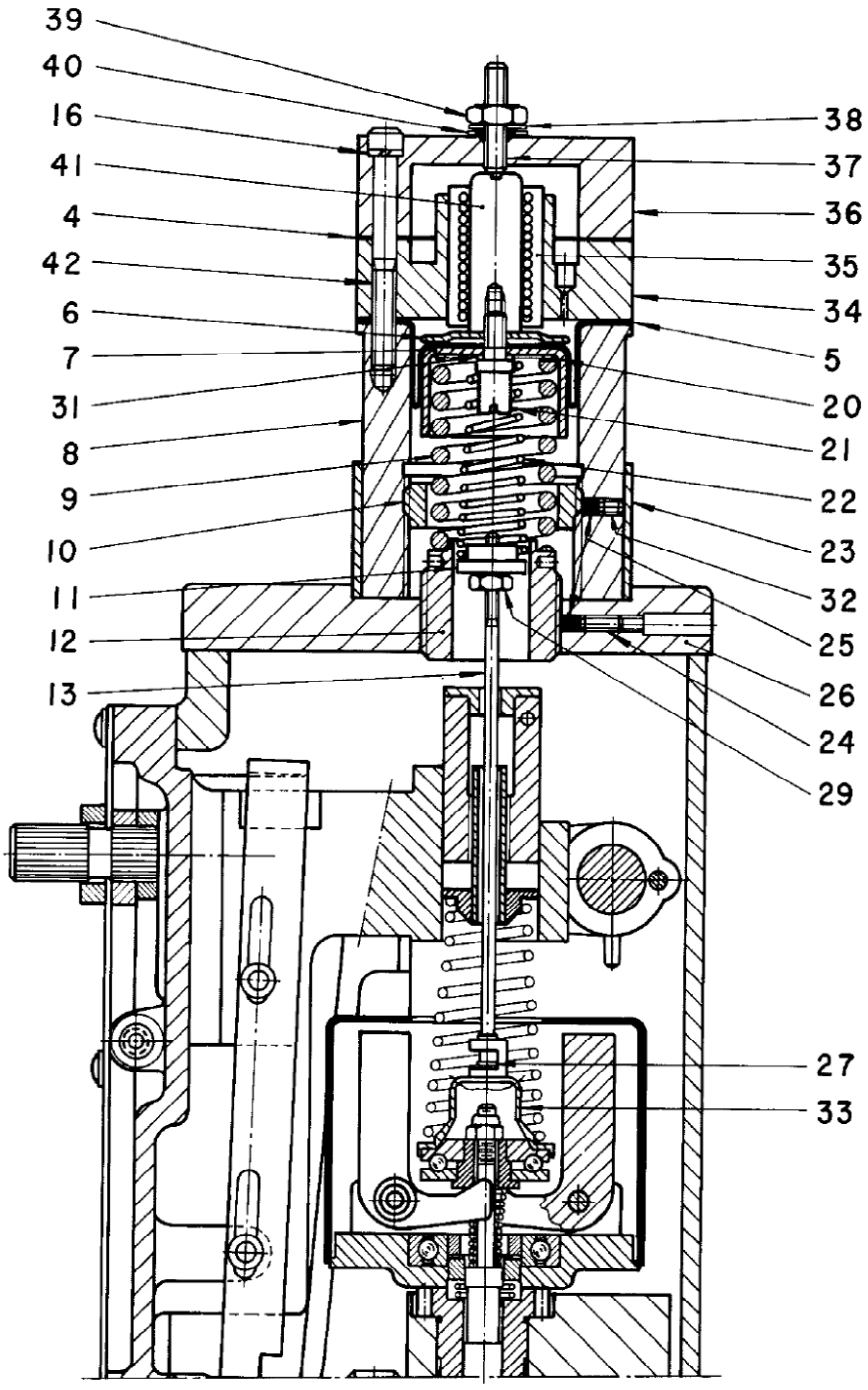


Figure 4. Pneumatic Speed Setting Assembly Parts

Ref. No.	Name of Part	Quantity
03506-17	Oil reservoir assembly	1
03506-18	Disc	1
03506-19	#10-32 Elastic stop nut	1
03506-20	Needle thrust bearing	1
03506-21	Spring seat	1
03506-22	Speeder spring	1
03506-23	Protecting ring	1
03506-24	#8-32x375 Set screw	3
03506-25	Nylon plug	2
03506-26	Cover	1
03506-27	Snap ring	1
03506-28	Speeder rod nut (obsolete)	1
03506-29	#0-32 Hex. nut	1

Ref. No.	Name of Part	Quantity
03506-30	#0-32x0.625 Socket head cap screw	2
03506-31	Copper washer	1
03506-32	#8-32x0.187 set screw	1
03506-33	Speeder spring assy	1
03506-34	Guiding cylinder	1
03506-35	Linear ball bearing	1
03506-36	Oil reservoir cover	1
03506-37	#10-32x1.000 Low speed stop screw	1
03506-38	Washer	1
03506-39	#10-32 nut	1
03506-40	Washer	1
03506-41	Guiding rod	1
03506-42	#10-32x2.000 screw	1

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Send comments to: icinfo@woodward.com

Please reference publication 03506F.

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