Westinghouse

THE LEADER OF THE TRANSFORMER INDUSTRY

Westinghouse • Sharon Transformer Division • Sharon, Pennsylvania

Printed in U.S.A. (W.P.D.)

Instructions for Automatic Resetting Relief Device

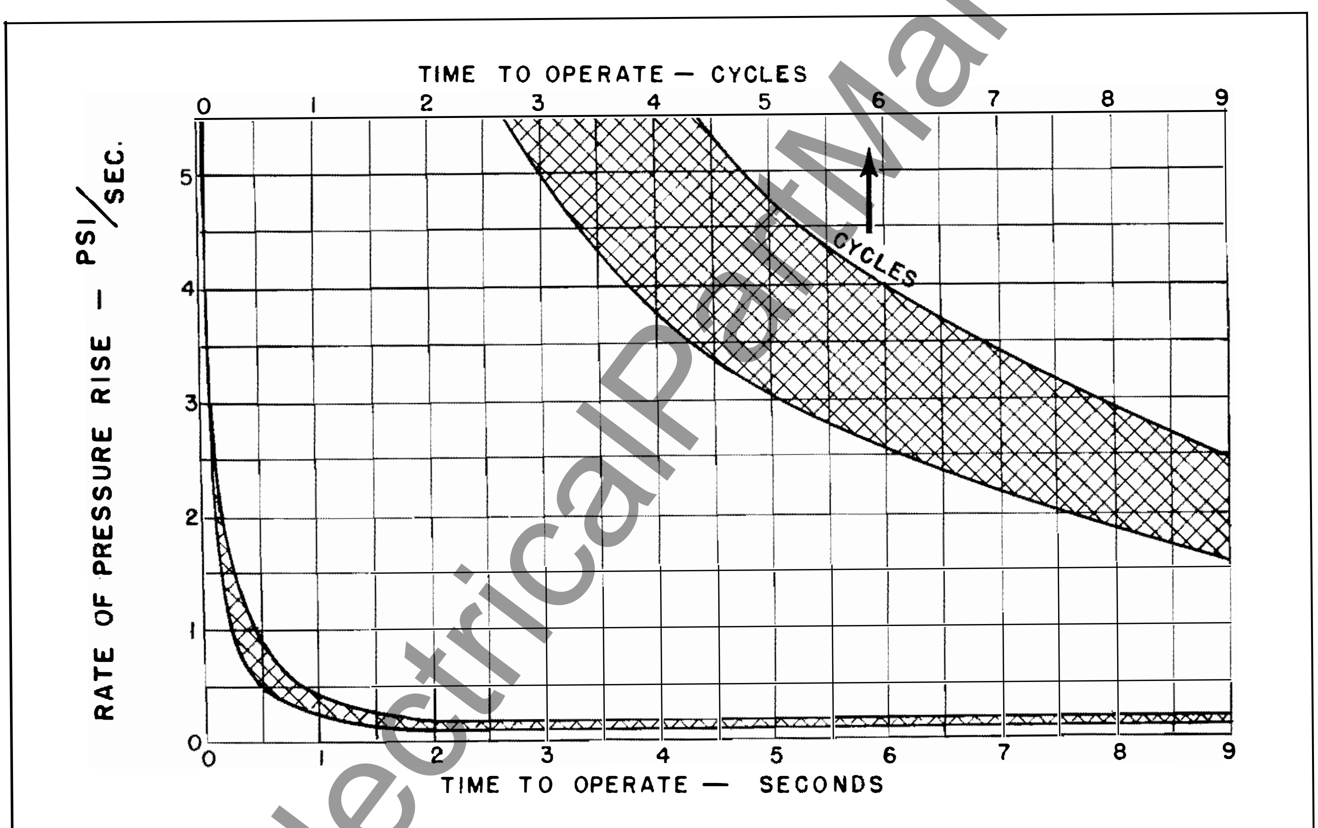
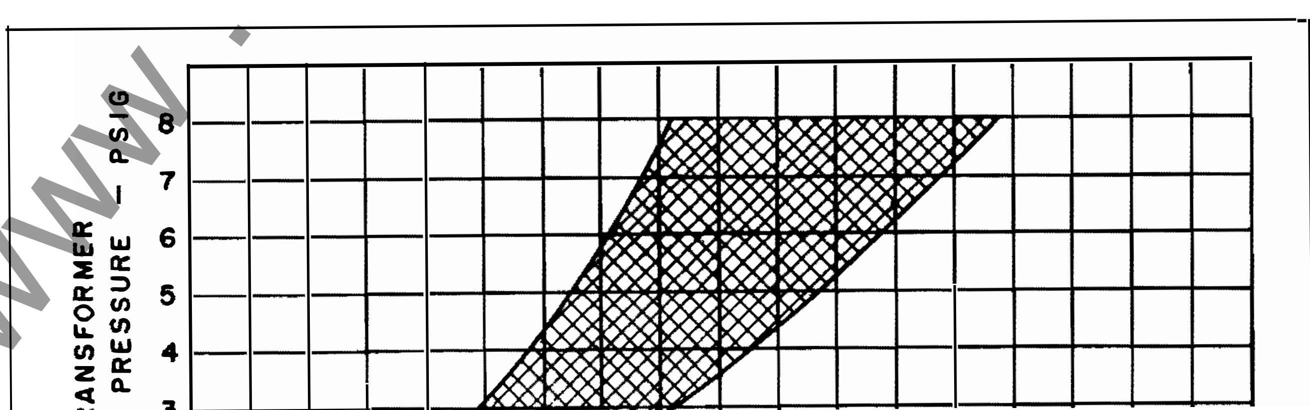


Fig. 3 *Operating Characteristics of Sudden Pressure Relay*



before suffering additional severe damage. If the transformer is not badly damaged, it might carry load for some time. The transformer might not even be damaged at all. The decision must be made by the user, but the following steps are suggested to help determine the extent of damage:

1. Check the Combustible Limit Relay (CLR). Determine whether an increase in combustible gas has occurred. This would indicate internal arcing and damage. Refer to the CLR Instruction Leaflet.

If the transformer does not have a CLR, the alternative is to use a portable Combustible Gas Detector to check for combustible gas products of decomposition in the gas space. Refer to the operating instructions for the Gas Detector.

2. Make the Field Tests of the Sudden Pressure Relay and its Panel as described on pages 3 and 4. This will determine whether the Relay is in proper operating condition.

3. Make insulation power factor and insulation resistance tests and check the Transformer Turns Ratio.

4. Remove the manhole cover for observation. Sometimes the odor of burning is obvious.

5. Make any other tests which may be suggested by the results of the above checks.

After the condition of the transformer and Relay have been checked, and if no damage has been found, it is necessary to decide whether the breaker should be reclosed to put the transformer back into service. The risk of possible further internal damage must be balanced against the possibility that there is no serious internal damage and the urgency for restoring service.

One possibility is that the internal fault might have been self-healing. Sparkovers can occur between turns or even between taps or terminal connections which normally operate at low voltage between points; a sparkover may be cleared because the normal operating voltage is simply not sufficient to restrike the arc. While such a sparkover should not occur with modern designs and lightning arresters, they do occur.

Another possibility is that the Relay operation was caused by extraneous electrical or mechanical disturbances. These might be caused by an electrical storm, or might even be side effects of constantly changing transformer, station, and system practices. Whenever a cause of a false operation has been identified, changes have been made in the design or application of the Relay to prevent a recurrence from that cause. One example is the new Panel circuit in Figure 2. It offers protection against electrical flashover in the Relay circuit, the result of field experience which has shown that severe voltage surges do appear in alarm circuits.

If the breaker is reclosed and it remains closed, there may still be some suspicion that an arc did occur inside the transformer. In this case, gas and oil samples may be sent to the Sharon Transformer Division for Gas Composition Analysis. This Analysis will indicate conditions inside the transformer. Arrangements for the Analysis should be made through Power Transformer Components Marketing at Sharon.

REPLACEMENT

In the event it becomes necessary to replace the Sudden Pressure Relay or its Panel, give the serial number and style number of the Relay along with the stock order and serial number of the transformer. Address all correspondence to the nearest Westinghouse Office.

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Power Transformer Division, Sharon, Pa. 16146

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3. At high rates of rise: 30 to 40 psi per second, it will operate in a half cycle.

4. It will not operate on changes in pressure due to normal transformer operation.

5. It will detect abnormal disturbances which are insufficient to operate the conventional pressure relief device.

6. Mounting of the Relay is rigid and well braced to prevent false operation due to the vibrations which accompany through short circuits.

7. The new Seal-in relay circuit (See Figure 2) protects against flashover of the Microswitch or Seal-in relay contacts due to severe electrical disturbances.

When an operation occurs, the Seal-in relay 63X will keep the alarm and trip circuits closed until the manual reset switch 63RS is opened. It is necessary to open this switch for a fraction of a second only to interrupt the circuit and release the Seal-in relay. Opening and closing the reset switch will restore the alarm and trip circuits to their original condition, ready for detection of further sudden pressure rises in the transformer.

IMPORTANT: Solenoids, relays and motors are inductive loads. When an inductive circuit is opened, a voltage is induced which tends to maintain current flow. The resultant arcing causes severe contact duty and may result in failure of the contacts to interrupt current. Limit Seal-in relay loads to the values in Table 1.

MAINTENANCE

It is desirable to check the operation of the Relay when it is installed and every six months or a year afterwards. There is a definite relationship between the transformer gas pressure and the time required to equalize the pressures between the transformer and the Relay. This relationship is shown graphically in Figure 4 and is the basis for checking the operation of the relay. The following test may be made on the Relay while the transformer is in service, providing the transformer is operating at a positive tank pressure in excess of 3/4 psig.

FIELD TEST PROCEDURE

1. Disconnect the Relay supply voltage.

2. Record the transformer operating pressure. (Note: The pressure must be greater than 3/4 psi for the following tests.)

3. Connect a circuit tester across terminals 1 and 2 on terminal strip. (B and C on Fig. 2)

4. Remove the test plug from the Sudden Pressure Relay case. The Microswitch will operate and the circuit tester will indicate an open contact.

5. Close the test plug and record the time in seconds required for these same contacts to close.

6. Using the recovery time recorded in (5) and the pressure recorded in (2) as coordinates on

TABLE NO. 2
BZ-2RD-T Microswitch Rating

Voltage	RATED CAPACITY OF CONTACTS (AMPS)				
	Make & Carry (Amps)	Break (Max. Amps)		Incandescent Lamp Load, Max. Heated Filament Amps.	
		Resistive	*Inductive	N.C. Contact	N.C. Contact
115 V.A.C.	15	15	15	1.5	3.0
230 V.A.C.	15	15	15	1.25	2.5
24 V.D.C.	15	2	1	1.5	2.0
48 V.D.C.	15	.8	.05	0.8	0.8
125 V.D.C.	15	.3	.03	0.3	0.3
250 V.D.C.	15	.2	.02	0.2	0.2

* Where $\frac{L\ (\text{Henrys})}{R\ (\text{Ohms})} \leq .026$

Instructions for Sudden Pressure Relay

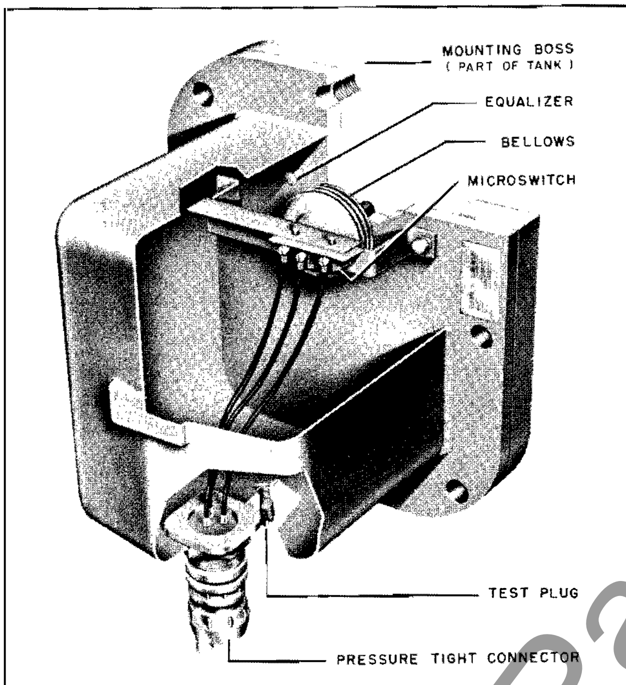

Fig. 1 *Sudden Pressure Relay*

GENERAL DESCRIPTION

The Westinghouse Sudden Pressure Relay is a device designed to respond to the sudden increase in gas pressure in a power transformer which would be caused by an internal arc. The Relay consists of three main parts: a pressure sensing bellows, a Microswitch, and a pressure equalizing orifice (Figure 1), all enclosed in a sealed case and mounted on the gas space at the top of the transformer.

When an arcing internal fault in the transformer produces an abnormal rise in gas pressure, the bellows will expand, operating the Microswitch and signaling the occurrence of the fault. The equalizing orifice is a non-corrosive plug with a very small hole, which will equalize the pressures in Relay and gas space during the slow pressure variations associated with transformer load changes. It will throttle an abnormal increase in transformer pressure, however, and cause a signal. Figure 3 shows the operating characteristic of the Relay.

A Seal-in relay, reset switch, and the associated circuitry is mounted on a panel in the transformer control cabinet. The Seal-in relay is a hermetically sealed, fast acting, high impedance relay with alarm contacts. It is energized by the Microswitch; its purpose is to close alarm and/or trip circuits and seal itself closed until manually reset with the reset switch. Refer to Table 1 for current ratings of the Seal-in relay contacts. Figure 2 shows a typical schematic wiring diagram of the Sudden Pressure Relay and its associated panel.

NOTE: There are many variations of this circuit. Always check the transformer Wiring Diagram.

The Sudden Pressure Relay may be used without the control panel if a customer wishes to use his own alarm circuit, auxiliary relay, and reset switch. For this situation, Table 2 gives the current ratings of the Microswitch contacts. A high impedance relay should always be used between the Microswitch and the low impedance tripping switch to prevent false trips due to electrical flashover of the Microswitch contacts.

The present standard panel circuit (figure 2) includes a Voltrap across trip contacts 9-10 of the Seal-in relay. This Voltrap acts like a nonlinear resistance which will discharge induced voltages before they become high enough to flashover these trip contacts. Most users shield the long alarm and trip leads between transformer and station house; where shielding may be inadequate, the Voltrap provides backup protection. The Voltrap must be disconnected if trip circuit voltage is higher than 270 volts.

The panel circuit also incorporates a shunt path around the Seal-in relay, through the normally-closed side of the Microswitch. This guards against closing of the Seal-in relay due to electrical flashover in the Microswitch. The resistor R_1 is used to limit follow current, in the event of a flashover in the Microswitch, to a value which the Microswitch contacts can readily interrupt. One normally-closed contact of the Seal-in relay is used to hold the shunt circuit open when the Seal-in relay is energized.

Effective November, 1970 Supersedes I.L. 48-065-1E, February, 1970

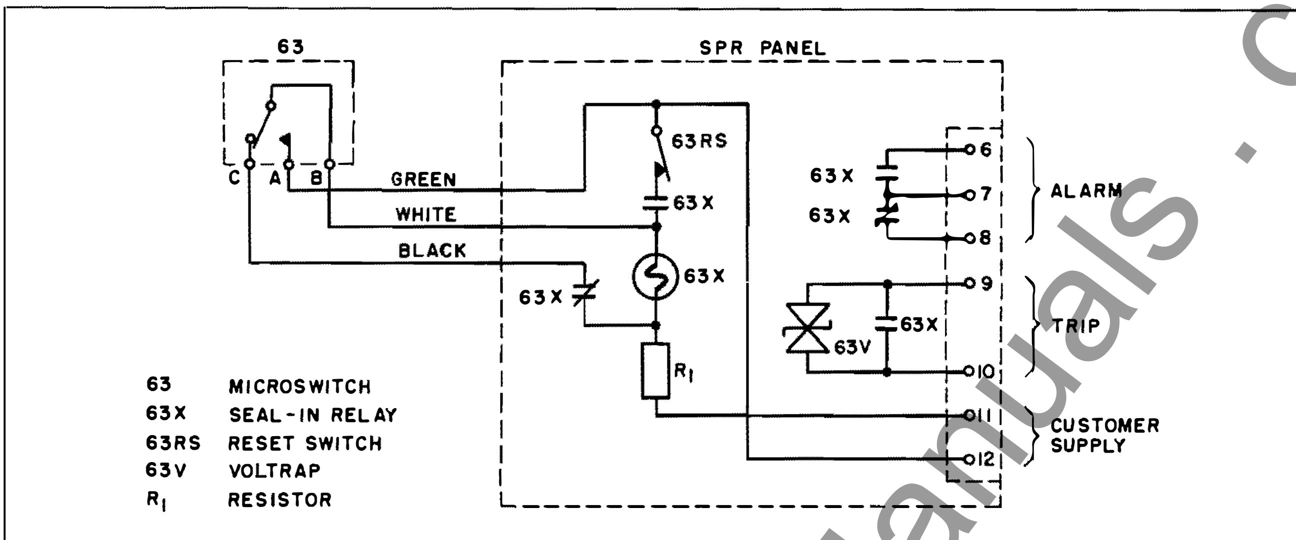

Fig. 2 *Sudden Pressure Relay Schematic Wiring Diagram*

INSTALLATION

The Sudden Pressure Relay is mounted above the maximum oil level in the gas space when applied on transformers. The Relay can be satisfactorily mounted on the transformer cover, particularly when applied to transformers in the field.

When vacuum filling a transformer on which a Sudden Pressure Relay is mounted, *care must be taken that the Relay is not filled with oil.* Also pull vacuum and break vacuum at 1/4 psi/second maximum to avoid any possibility of straining the bellows. If the transformer is shipped with a dummy plate mounted in place of the Sudden Pressure Relay, the transformer should be filled with oil before the Relay is mounted. If the Relay should accidentally be filled with oil, it should be replaced.

OPERATION

The Sudden Pressure Relay will accomplish the following: (See Figure 3).

1. It will operate on a sudden increase of gas pressure regardless of the operating pressure on the transformer.

2. A pressure rise of 5.5 psi per second will operate the Relay in three to four cycles on a 60 Hertz circuit.

TABLE NO. 1
Seal-In Relay Characteristics

SEAL-IN RELAY			
Style Number	Coil Current (MA)		Coil Voltage
	In-Rush	Cont.	
590A807H01	120	62	115 AC
590A807H02	62	27	230 AC
590A807H03	. . .	96	48 DC
590A807H04	. . .	39	125 DC
590A807H05	. . .	170	24 DC
590A807H04(1)	. . .	39	250 DC

(1) Used With 3500 OHM Resistor Style No. 56D6468H04 For 250 V.D.C.

SEAL-IN RELAY CONTACT RATINGS				
Make (Amps)	Carry (Amps)	Break (Amps)		Open Contact Voltage
		Resistive	*Inductive	
20	10	10	5	115 AC
20	10	5	2.5	230 AC
20	10	5	3.0	24 DC
20	10	2	1	48 DC
20	10	.5	.25	125 DC
20	10	.1	.05	250 DC

* Where $\frac{L(\text{Henrys})}{R(\text{Ohms})} \leqq .026$

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Westinghouse Electric Corporation

Sharon Transformer Division, Sharon, Pa.

Printed in U.S.A.
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Instructions for HCL Gas Absorbers for Westinghouse Inerteen® Transformers

I.L. 48-065-8

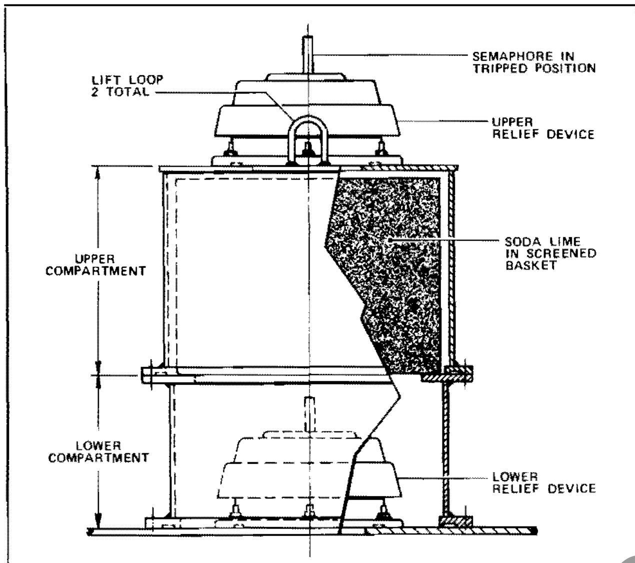

Fig. 1 *Cutaway of HCL Gas Absorber*

The Westinghouse HCL Gas Absorber is a device designed to absorb the gases generated by an arc in Inerteen. The absorber upper compartment is normally removed from the transformer for shipment. The device is supplied with the proper amount of soda lime for installation when the transformer is in place.

DESCRIPTION

The HCL Gas Absorber consists of two compartments and two relief devices. See Figure 1. The lower compartment contains the lower relief device which separates the transformer tank from the absorber. The basket of soda lime sets on the upper flange of the lower compartment. The upper compartment with the upper relief device mounts over the basket and is bolted to the upper flange of the lower compartment.

INSTALLATION

1. Lower compartment, which protects the lower relief device, is usually shipped in place. If not shipped in place, assemble lower compartment around lower relief device.

2. Remove blind flange from the bottom of the upper compartment and prepare to mount after basket is in place.

3. Load the screen basket with soda lime and set the basket on the top flange of the lower compartment over the lower relief device.

4. Mount upper compartment with upper relief device over the screen basket.

OPERATION

An arc under Inerteen generates enough gas to operate the lower pressure relief device. The gas passes into the upper compartment and the HCL gas is absorbed by the soda lime. Residual gases are vented through the upper pressure relief device. (Reference: I.L. 48-065-4, Instructions for Automatic Resetting Relief Device.)

MAINTENANCE

The condition of the soda lime is of primary importance in the maintenance if the HCL Gas Absorber. Check the soda lime at periodic intervals for evidence of dampness, bluishness or a caked condition by removing the upper relief device. These conditions required that the soda lime be replaced.

The hygroscopic nature of soda lime causes it to be ineffective after prolonged exposure to humid air. Keep the soda lime in storage containers and in the absorber free from exposure to humid air. Refill under dry conditions and as quickly as possible.

To refill the absorber proceed to:

1. Remove the upper compartment at the flange between the upper and lower compartments.

2. Clean out the basket and the absorber compartments.

3. Inspect relief devices.

4. Refill basket and relocate on upper flange of lower compartment.

5. Remount upper compartment with upper relief device over screen basket.

Effective June, 1973 Supersedes I.L. 3196, May 1942

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Instructions for HCL Gas Absorbers for Westinghouse Inerteen® Transformers

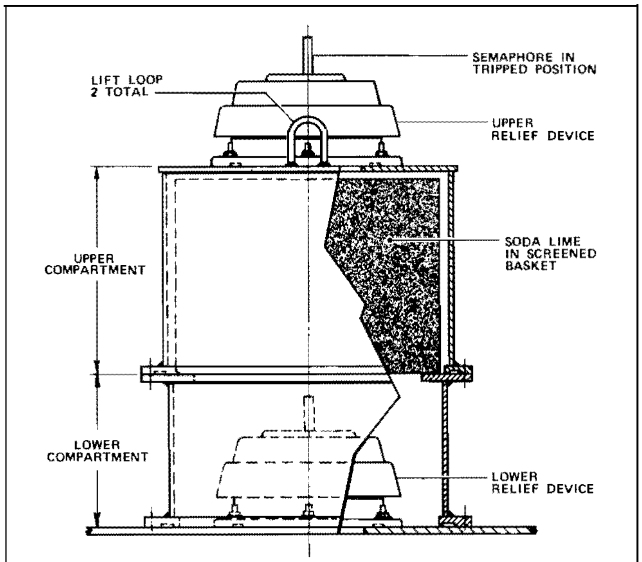

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Figure 4, Time and Pressure Curve, check to see that the point is within the allowed operating area. Wide deviation of this field test point from the allowed area of the curve should be referred to the nearest Westinghouse office.

7. Disconnect any external trip or alarm circuit.

8. Check the reset switch to be sure it is closed.

9. Reconnect the Relay supply voltage.

10. Connect the circuit tester across terminals 7 and 8.

11. Remove the test plug. The relay will operate and the circuit tester will indicate an open circuit.

12. Replace the plug and allow sufficient time (see 5 above) for the Relay to equalize.

13. Operate the reset switch and note that the circuit of 7 and 8 recloses.

14. This check should be made on each of the alarm and trip circuits.

15. Following the correct operation of the Relay, reconnect the trip or alarm circuits.

It will be necessary to remove the Sudden Pressure Relay only if a fault is found when testing the Microswitch and bellows (steps 1 to 6). If this is required the gas space in the transformer tank must be brought to atmospheric pressure. The Sudden Pressure Relay can then be removed and replaced by a new Relay.

If a fault is found in the Seal-in relay, it should be removed from the panel and replaced by another of the same style number. The style number can be found on the side of the relay case below the circuit diagram.

FACTORY TESTS

The factory tests made on the Sudden Pressure Relay are more conclusive than that necessary for field testing to insure that the Sudden Pressure Relay is in operating condition and properly calibrated.

The following tests are made on all Sudden Pressure Relays at the factory:

1. A 1500 Volt, 60 Hertz insulation test to ground is applied to the electrical circuit of the Sudden Pressure Relay and the panel for one minute.

2. An operation test is made to determine the "make" and "break" pressure of the Microswitch:

(a) The maximum "make" pressure, at which point the normally-open contacts of the Microswitch close, is 0.44 psi or 12 inches of water.

(b) The minimum "break" pressure, at which point the normally-open contacts of the Microswitch reopen, is 0.29 psi or 8 inches of water.

3. An orifice test is made in the same manner as outlined under Field Test Procedure.

The above tests check the operating characteristics of the Sudden Pressure Relay without actually making a rate-of-rise pressure test.

4. A 20 pound pressure test is made to insure that the Relay case is pressure tight. During this test it is necessary to apply pressure to both the tank side and the Relay case so as not to damage the bellows.

5. The Seal-in relay must operate at 80% of rated voltage within 12 milliseconds. The bellows is tested at 15 pounds pressure while positioned in a fixture to limit its travel to a maximum of 1/16" from free length. When the pressure is released the bellows must return to within .005 inch of its original free length. The maximum pressure applied to the bellows in the completed Sudden Pressure Relay should be limited to 8 psi.

PROCEDURE FOLLOWING A RELAY OPERATION

After a Sudden Pressure Relay has tripped the circuit breaker and disconnected the transformer, it becomes necessary to decide whether to reclose the breaker and put the transformer back in service. If the transformer is severely damaged, it would probably trip again immediately but not

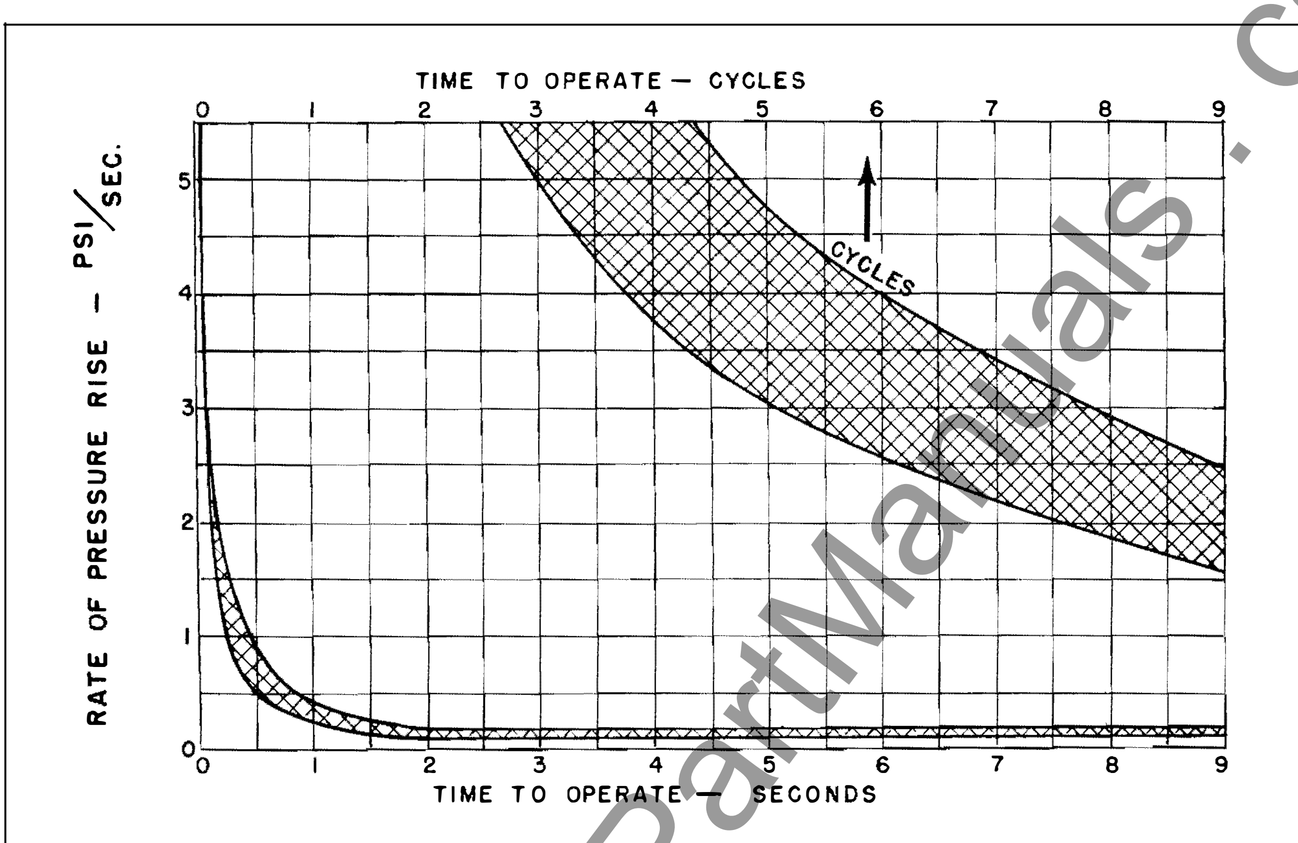

Fig. 3 *Operating Characteristics of Sudden Pressure Relay*

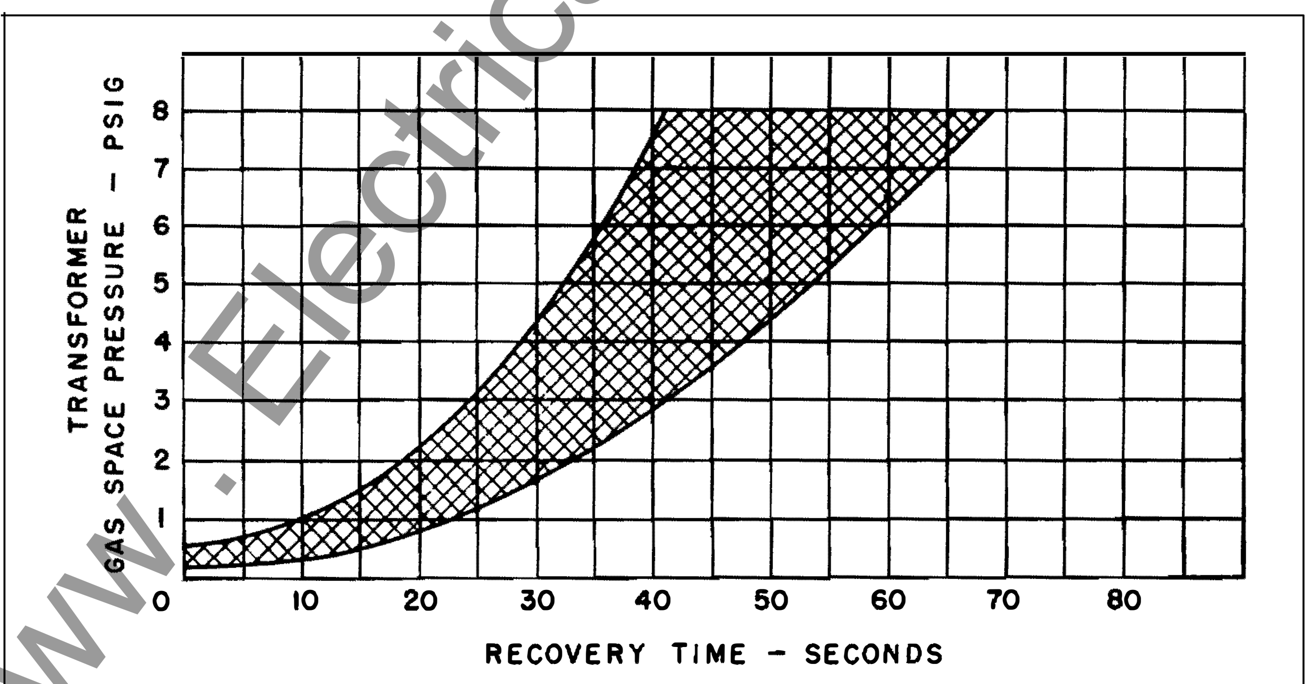

Fig. 4 *Time and Pressure Curves*

3. At high rates of rise: 30 to 40 psi per second, it will operate in a half cycle.

4. It will not operate on changes in pressure due to normal transformer operation.

5. It will detect abnormal disturbances which are insufficient to operate the conventional pressure relief device.

6. Mounting of the Relay is rigid and well braced to prevent false operation due to the vibrations which accompany through short circuits.

7. The new Seal-in relay circuit (See Figure 2) protects against flashover of the Microswitch or Seal-in relay contacts due to severe electrical disturbances.

When an operation occurs, the Seal-in relay 63X will keep the alarm and trip circuits closed until the manual reset switch 63RS is opened. It is necessary to open this switch for a fraction of a second only to interrupt the circuit and release the Seal-in relay. Opening and closing the reset switch will restore the alarm and trip circuits to their original condition, ready for detection of further sudden pressure rises in the transformer.

IMPORTANT: Solenoids, relays and motors are inductive loads. When an inductive circuit is opened, a voltage is induced which tends to maintain current flow. The resultant arcing causes severe contact duty and may result in failure of the contacts to interrupt current. Limit Seal-in relay loads to the values in Table 1.

MAINTENANCE

It is desirable to check the operation of the Relay when it is installed and every six months or a year afterwards. There is a definite relationship between the transformer gas pressure and the time required to equalize the pressures between the transformer and the Relay. This relationship is shown graphically in Figure 4 and is the basis for checking the operation of the relay. The following test may be made on the Relay while the transformer is in service, providing the transformer is operating at a positive tank pressure in excess of 3/4 psig.

FIELD TEST PROCEDURE

1. Disconnect the Relay supply voltage.

2. Record the transformer operating pressure. (Note: The pressure must be greater than 3/4 psi for the following tests.)

3. Connect a circuit tester across terminals 1 and 2 on terminal strip. (B and C on Fig. 2)

4. Remove the test plug from the Sudden Pressure Relay case. The Microswitch will operate and the circuit tester will indicate an open contact.

5. Close the test plug and record the time in seconds required for these same contacts to close.

6. Using the recovery time recorded in (5) and the pressure recorded in (2) as coordinates on

TABLE NO. 2
BZ-2RD-T Microswitch Rating

Voltage	RATED CAPACITY OF CONTACTS (AMPS)				
	Make & Carry (Amps)	Break (Max. Amps)		Incandescent Lamp Load, Max. Heated Filament Amps.	
		Resistive	*Inductive	N.C. Contact	N.C. Contact
115 V.A.C.	15	15	15	1.5	3.0
230 V.A.C.	15	15	15	1.25	2.5
24 V.D.C.	15	2	1	1.5	2.0
48 V.D.C.	15	.8	.05	0.8	0.8
125 V.D.C.	15	.3	.03	0.3	0.3
250 V.D.C.	15	.2	.02	0.2	0.2

* Where $\frac{L\,(\text{Henrys})}{R\,(\text{Ohms})} \leq .026$

before suffering additional severe damage. If the transformer is not badly damaged, it might carry load for some time. The transformer might not even be damaged at all. The decision must be made by the user, but the following steps are suggested to help determine the extent of damage:

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2. Make the Field Tests of the Sudden Pressure Relay and its Panel as described on pages 3 and 4. This will determine whether the Relay is in proper operating condition

3. Make insulation power factor and insulation resistance tests and check the Transformer Turns Ratio.

4. Remove the manhole cover for observation. Sometimes the odor of burning is obvious.

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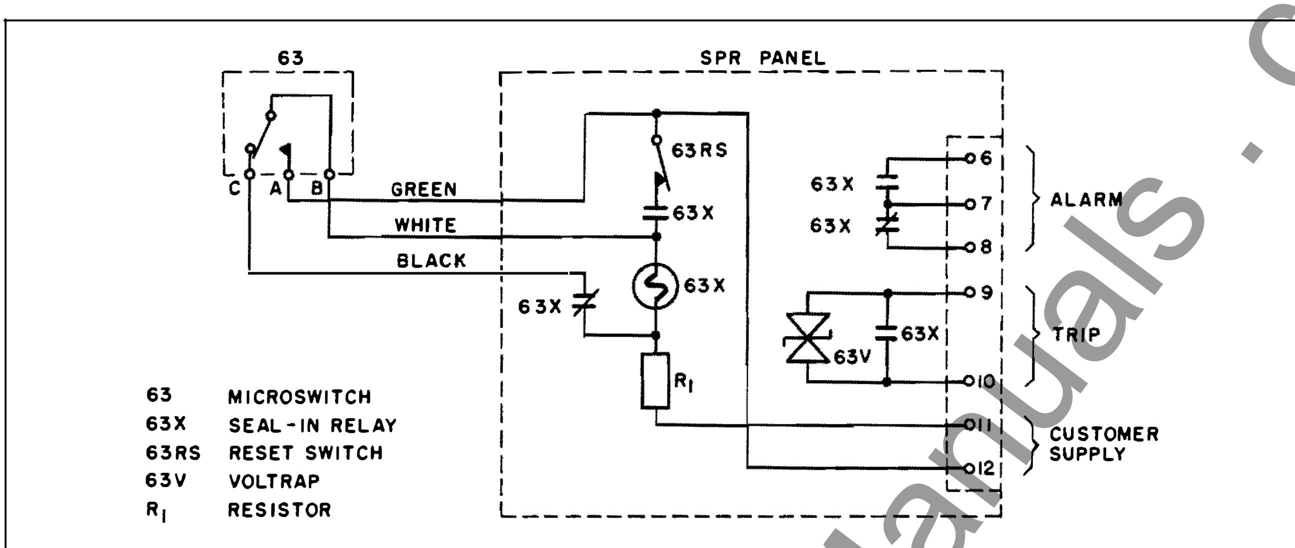

Fig. 2 *Sudden Pressure Relay Schematic Wiring Diagram*

INSTALLATION

The Sudden Pressure Relay is mounted above the maximum oil level in the gas space when applied on transformers. The Relay can be satisfactorily mounted on the transformer cover, particularly when applied to transformers in the field.

When vacuum filling a transformer on which a Sudden Pressure Relay is mounted, *care must be taken that the Relay is not filled with oil.* Also pull vacuum and break vacuum at 1/4 psi/second maximum to avoid any possibility of straining the bellows. If the transformer is shipped with a dummy plate mounted in place of the Sudden Pressure Relay, the transformer should be filled with oil before the Relay is mounted. If the Relay should accidentally be filled with oil, it should be replaced.

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2. A pressure rise of 5.5 psi per second will operate the Relay in three to four cycles on a 60 Hertz circuit.

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SEAL-IN RELAY			
Style Number	Coil Current (MA)		Coil Voltage
	In-Rush	Cont.	
590A807H01	120	62	115 AC
590A807H02	62	27	230 AC
590A807H03	...	96	48 DC
590A807H04	...	39	125 DC
590A807H05	...	170	24 DC
590A807H04(1)	...	39	250 DC

(1) Used With 3500 OHM Resistor Style No. 56D6468H04 For 250 V.D.C.

SEAL-IN RELAY CONTACT RATINGS				
Make (Amps)	Carry (Amps)	Break (Amps)		Open Contact Voltage
		Resistive	*Inductive	
20	10	10	5	115 AC
20	10	5	2.5	230 AC
20	10	5	3.0	24 DC
20	10	2	1	48 DC
20	10	.5	.25	125 DC
20	10	.1	.05	250 DC

* Where $\frac{L(\text{Henrys})}{R(\text{Ohms})} \leq .026$

Instructions for Sudden Pressure Relay

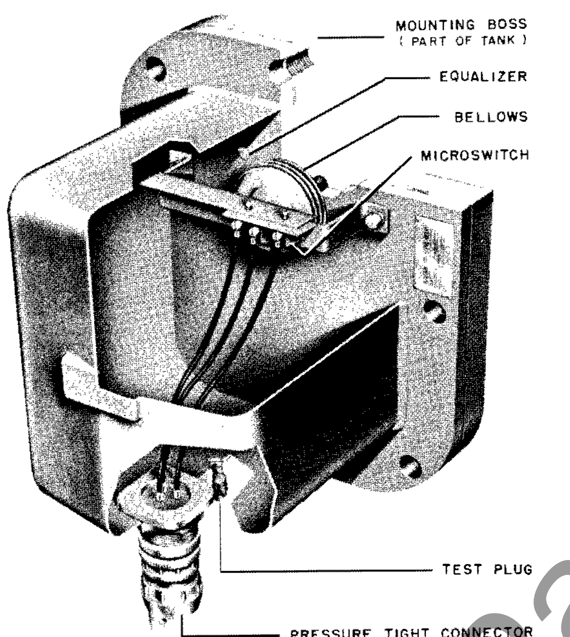

Fig. 1 *Sudden Pressure Relay*

GENERAL DESCRIPTION

The Westinghouse Sudden Pressure Relay is a device designed to respond to the sudden increase in gas pressure in a power transformer which would be caused by an internal arc. The Relay consists of three main parts: a pressure sensing bellows, a Microswitch, and a pressure equalizing orifice (Figure 1), all enclosed in a sealed case and mounted on the gas space at the top of the transformer.

When an arcing internal fault in the transformer produces an abnormal rise in gas pressure, the bellows will expand, operating the Microswitch and signaling the occurrence of the fault. The equalizing orifice is a non-corrosive plug with a very small hole, which will equalize the pressures in Relay and gas space during the slow pressure variations associated with transformer load changes. It will throttle an abnormal increase in transformer pressure, however, and cause a signal. Figure 3 shows the operating characteristic of the Relay.

A Seal-in relay, reset switch, and the associated circuitry is mounted on a panel in the transformer control cabinet. The Seal-in relay is a hermetically sealed, fast acting, high impedance relay with alarm contacts. It is energized by the Microswitch; its purpose is to close alarm and/or trip circuits and seal itself closed until manually reset with the reset switch. Refer to Table 1 for current ratings of the Seal-in relay contacts. Figure 2 shows a typical schematic wiring diagram of the Sudden Pressure Relay and its associated panel.

NOTE: There are many variations of this circuit. Always check the transformer Wiring Diagram.

The Sudden Pressure Relay may be used without the control panel if a customer wishes to use his own alarm circuit, auxiliary relay, and reset switch. For this situation, Table 2 gives the current ratings of the Microswitch contacts. A high impedance relay should always be used between the Microswitch and the low impedance tripping switch to prevent false trips due to electrical flashover of the Microswitch contacts.

The present standard panel circuit (figure 2) includes a Voltrap across trip contacts 9-10 of the Seal-in relay. This Voltrap acts like a nonlinear resistance which will discharge induced voltages before they become high enough to flashover these trip contacts. Most users shield the long alarm and trip leads between transformer and station house; where shielding may be inadequate, the Voltrap provides backup protection. **The Voltrap must be disconnected if trip circuit voltage is higher than 270 volts.**

The panel circuit also incorporates a shunt path around the Seal-in relay, through the normally-closed side of the Microswitch. This guards against closing of the Seal-in relay due to electrical flashover in the Microswitch. The resistor R_1 is used to limit follow current, in the event of a flashover in the Microswitch, to a value which the Microswitch contacts can readily interrupt. One normally-closed contact of the Seal-in relay is used to hold the shunt circuit open when the Seal-in relay is energized.

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Westinghouse

THE LEADER OF THE TRANSFORMER INDUSTRY

Westinghouse • Sharon Transformer Division • Sharon, Pennsylvania

Printed in U.S.A. (W.P.D.)

Resetting is accomplished by pushing the semaphore down until it is flush with the top of the cover. The alarm switch is reset by pushing in the switch reset lever to its limit (see Figure 2.)

IMPORTANT

Replace the Relief Device with a blind flange before testing the transformer tank for leaks with pressure greater than 8 psi. The Relief Device will withstand full vacuum and need not be removed from the transformer tank during any vacuum treatment.

Relays, solenoids, and motors are inductive loads. When an inductive circuit is opened, a voltage is inducted in the circuit tending to maintain current flow. The resultant arcing causes severe contact duty and may result in failure of the contacts to interrupt current.

When checking circuits through this device, it is necessary to follow Table 1. This means that a low voltage bell ringer cannot be used unless switched through a high impedance relay. An indicating light type device is generally recognized as best for checking circuits through instruments containing microswitches or similar switches.

Table 1
Switch Interrupting Ratings

Voltage	Non-Inductive Load-Amps.	Inductive Load-Amps. L/R = .026*
125 A-C	10	10
250 A-C	5	5
125 D-C	0.5	0.05
250 D-C	0.25	0.025

* Equal to or less than .026. If greater, refer to factory for adjusted rating.

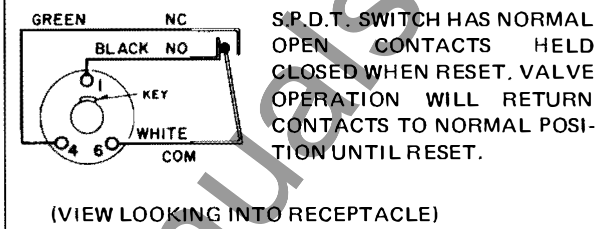

Fig. 3 *Alarm Device Wiring Diagram*

MAINTENANCE

Necessary maintenance is the resetting of the semaphore and alarm switch (if supplied) after each operation. If the gasket between the transformer boss and the relief device is to be replaced, remove the old gasket and clean out the gasket recess in the relief device. Replace with a nitrile gasket S#4340D99H03. No cement is required.

Keep spare gasket on hand. For additional parts, order from the nearest Westinghouse Office, giving the serial and stock order number of the complete transformer as stamped on the nameplate.

CAUTION

Should disassembly of the Relief Device be necessary, caution must be exercised when removing the protective cover because the springs are under compression.

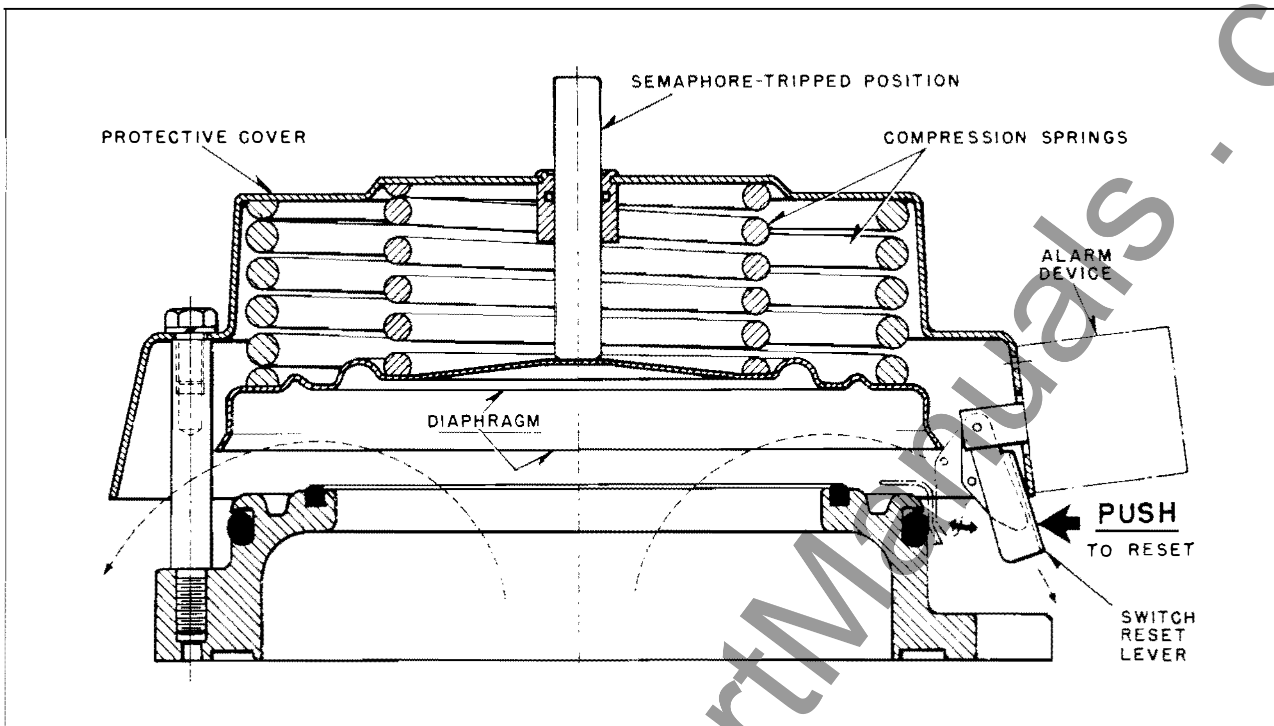

Fig. 2 *Relief Device in Maximum Venting Position*

SIGNALS

The Relief Device is equipped with a lightweight, plastic semaphore which rests upon the diaphragm before operation. (Figure 1) When the diaphragm rises during operation, it lifts the semaphore into view and indicates the Relief Device has operated. Alarm contacts can also be supplied to indicate the unit has operated.

When electrical alarm contacts are ordered, the alarm device is mounted on the side of the cover. The alarm device incorporates a double throw microswitch. The button of this switch is depressed to open a normally closed circuit for the untripped position of Relief Device. When Relief Device operates, movement of the diaphragm releases the button on the switch and the switch transfers back to the normally closed circuit. (Figure 2) Closing this circuit actuates the alarm. (Figure 3) The switch ratings appear in Table 1.

OPERATION

The mechanism is shown in the sealed position in Figure 1. Figure 2 shows maximum venting position.

When the pressure in the tank rises above normal to tripping pressure of 10 ± 1 psi, the diaphragm lifts slightly, exhausting into the space between the outer ring and the body of the Relief Device. The tank pressure thus spreads over the entire diaphragm area, which is twice the area of the center section, causing the device to open rapidly and remain open until the pressure within the tank falls well below the tripping pressure. This differential between tripping and closing pressures assures positive sealing upon closure.

The Relief Device resets itself and reseals when the pressure in the gas space has fallen to approximately one-half the tripping pressure.

The Relief Device hasn't any moving parts during normal transformer conditions. Operation of the Relief Device occurs only under excess pressure. Diaphragm travel, which is limited by compression springs in the protective cover, serves to lift the semaphore and operate the alarm device if one is attached.

After operation it is unnecessary to reset the Relief Device but the semaphore and alarm device should be reset as soon as convenient.

Instructions for Automatic Resetting Relief Device

I.L. 48-065-4D

The Automatic Resetting Relief Device, mounted on the transformer cover, is designed to relieve dangerous pressures which may build up within the transformer tank. When a predetermined pressure is exceeded, a pressure reaction lifts the diaphragm and vents the transformer tank.

Occasionally a fault under oil may result in a primary explosion. The wave front of pressure created is not as steep as that of a secondary explosion of hydrogen or acetylene and air above the oil, nor the results as violent. The abnormal pressure following an arc is often great enough to rupture the tank if a Relief Device has not been provided.

DESCRIPTION

The construction of the Automatic Resetting Relief Device is shown in Figures 1 and 2. Its operating parts consist of a dome-shaped diaphragm, compression springs, gaskets, and protective cover.

The sturdy parts allow the Relief Device to operate numerous times without damage.

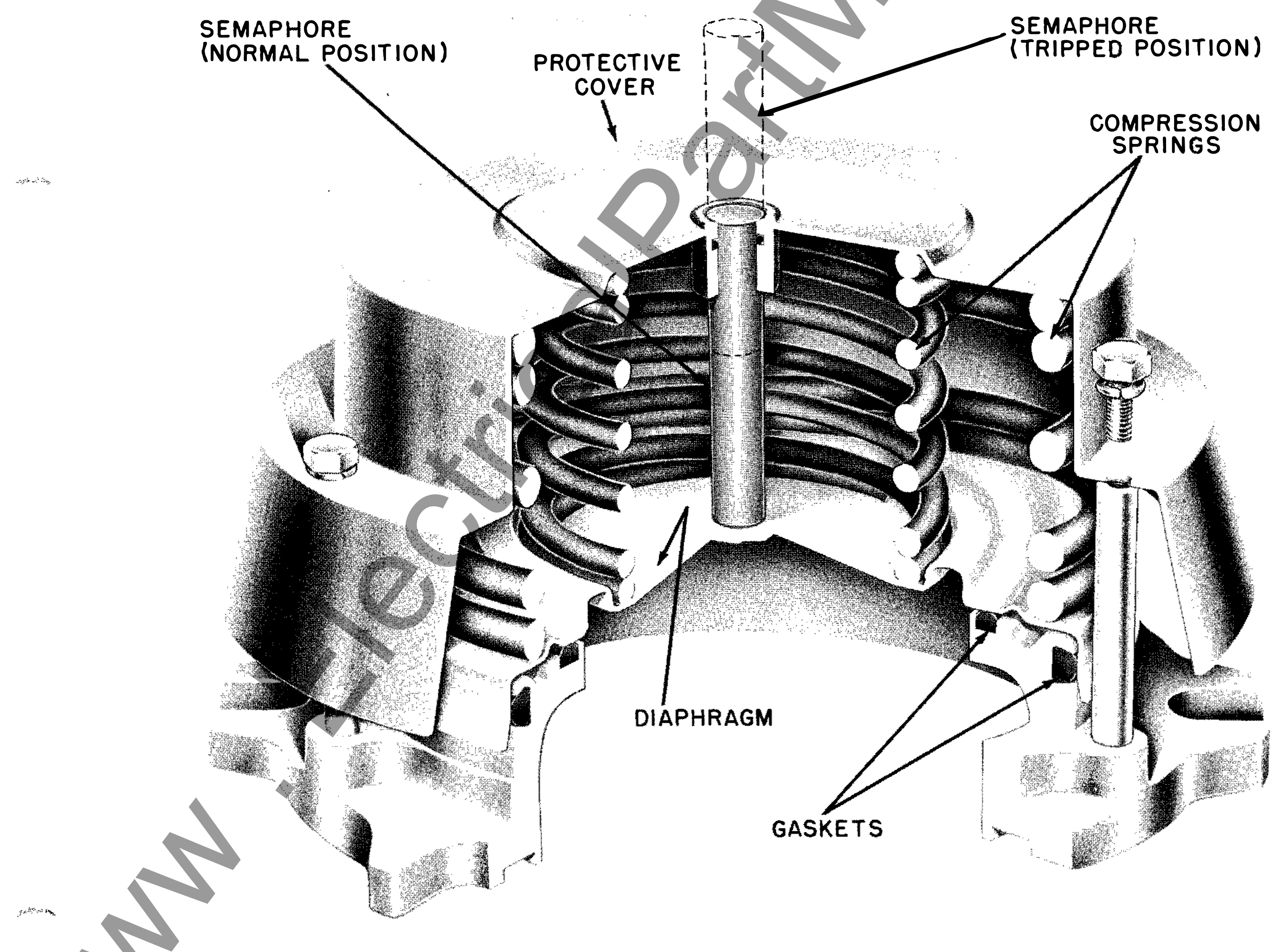

Fig. 1 *Relief Device in Sealed Position*

Effective July, 1975 supersedes I.L. 48-065-4C, January, 1969

Westinghouse Electric Corporation
Power Transformer Division, Sharon, Pa.

Printed in U.S.A.

tions. Operation of the Relief Device occurs only under excess pressure. Diaphragm travel, which is limited by compression springs in the protective cover, serves to lift the semaphore and operate the alarm device if one is attached.

After operation it is unnecessary to reset the Relief Device but the semaphore and alarm device should be reset as soon as convenient.

Resetting is accomplished by pushing the semaphore flush with the top of the cover. The alarm switch is reset by pulling out the reset lever to its limit and releasing it. (Fig. 2)

IMPORTANT

Replace the Relief Device with a blind flange before testing the transformer tank for leaks with pressure greater than 8 psi. The Relief Device will withstand full vacuum and need not be removed from the transformer tank during any vacuum treatment.

Relays, solenoids, and motors are inductive loads. When an inductive circuit is opened, a voltage is inducted in the circuit tending to maintain current flow. The resultant arcing causes severe contact duty and may result in failure of the contacts to interrupt current.

When checking circuits through this device, it is necessary to follow Table No. 1.

VOLTAGE	NON-INDUCTIVE LOAD-AMPS.	INDUCTIVE LOAD-AMPS. L/R = .026*
125 A-C	10	10
250 A-C	5	5
125 D-C	0.5	0.005
250 D-C	0.25	0.025

* Equal to or less than .026. If greater, refer to factory for adjusted rating.

Table No. 1 *Switch Interrupting Ratings*

This means that a low voltage bell ringer cannot be used unless switched through a high impedance relay. An indicating light type device is generally recognized as best for checking circuits through instruments containing microswitches or similar switches.

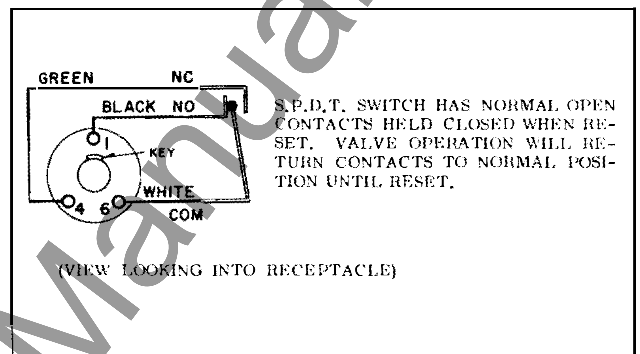

Fig. 3 *Alarm Device Wiring Diagram*

MAINTENANCE

Necessary maintenance is the resetting of the semaphore and alarm switch (if supplied) after each operation. If the gasket between the transformer boss and flange has to be replaced, coat all over with cement #7486. After applying first coat of cement let dry for 15 minutes, apply a light second coat of cement to the same surfaces, wiping excess cement off edges of the gasket.

Keep spare gaskets and cement on hand. A limited supply is furnished with the transformer. For additional parts, order from the nearest Westinghouse Office, giving the serial and stock order number of the complete transformer as stamped on the nameplate.

CAUTION

Should disassembly of the Relief Device be necessary, caution must be exercised when removing the protective cover because the springs are under compression.

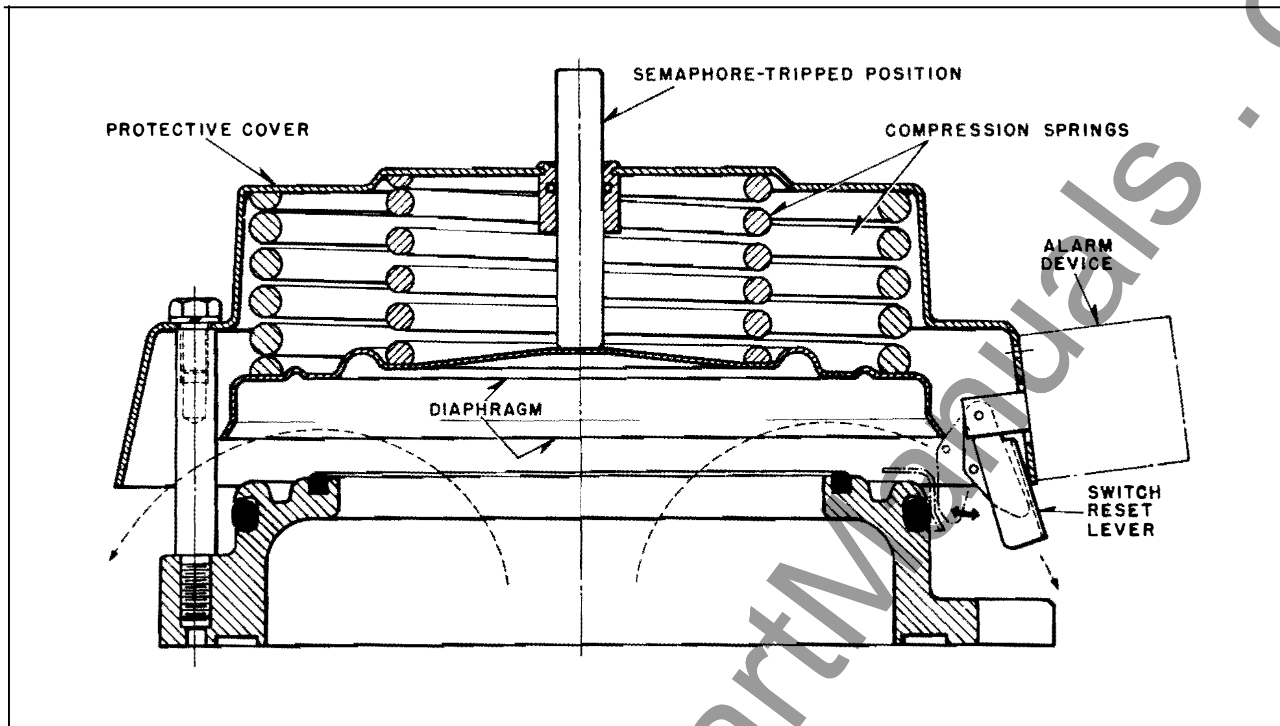

Fig. 2 *Relief Device in Maximum Venting Position*

The sturdy parts allow the Relief Device to operate numerous times without damage.

SIGNALS

The Relief Device is equipped with a lightweight, plastic semaphore which rests upon the diaphragm before operation. (Fig. 1) When the diaphragm rises during operation, it lifts the semaphore into view and indicates the Relief Device has operated. Alarm contacts can also be supplied to indicate the unit has operated.

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OPERATION

The mechanism is shown in the sealed position in Fig. 1. Figure 2 shows maximum venting position.

When the pressure in the tank rises above normal to tripping pressure of 10±1 psi, the diaphragm lifts slightly, exhausting into the space between the outer ring and the body of the Relief Device. The tank pressure thus spreads over the entire diaphragm area, which is twice the area of the center section, causing the device to open rapidly and remain open until the pressure within the tank falls well below the tripping pressure. This differential between tripping and closing pressures assures positive sealing upon closure.

The Relief Device resets itself and reseals when the pressure in the gas space has fallen to approximately one-half the tripping pressure.

The Relief Device hasn't any moving parts during normal transformer condi-

Instructions for Automatic Resetting Relief Device

I.L. 48-065-4A

The Automatic Resetting Relief Device, mounted on the transformer cover, is designed to relieve dangerous pressures which may build up within the transformer tank. When a predetermined pressure is exceeded, a pressure reaction lifts the diaphragm and vents the transformer tank.

Occasionally a fault under oil may result in a primary explosion. The wave front of pressure created is not as steep as that of a secondary explosion of hydrogen or acetylene and air above the oil, nor the results as violent. The abnormal pressure following an arc is often great enough to rupture the tank if a Relief Device has not been provided.

DESCRIPTION

The construction of the Automatic Resetting Relief Device is shown in Figures 1 and 2. Its operating parts consist of a dome-shaped diaphragm, compression springs, gaskets, and protective cover.

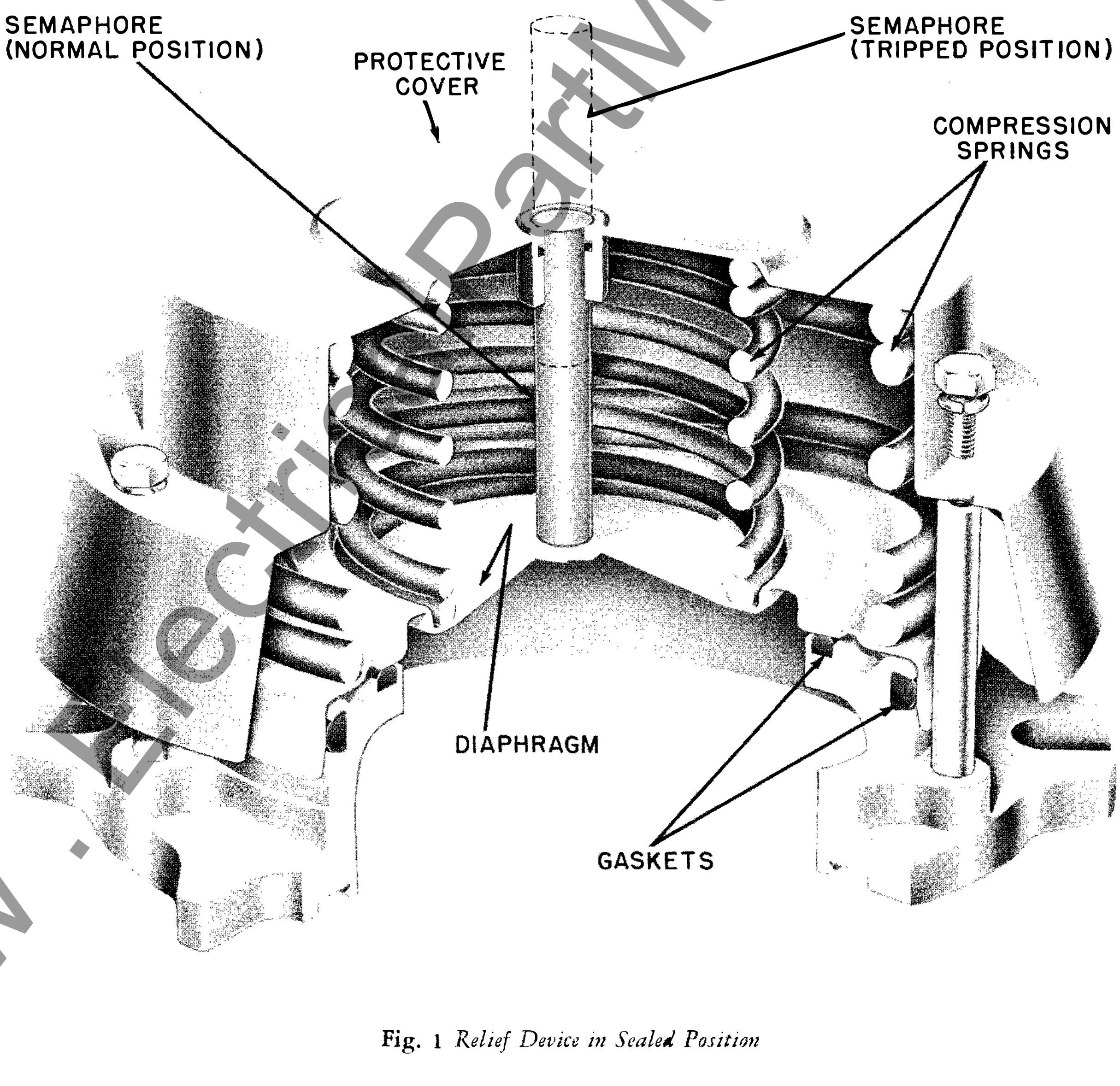

Fig. 1 *Relief Device in Sealed Position*

Effective May, 1963
Supersedes I.L. 48-065-4, February, 1962

DETECTION OF ACETYLENE GAS

Acetylene is one of the primary products of decomposition due to any arc under oil, and its presence is an indication that a fault has occurred. The Westinghouse Acetylene Gas Detector is an elementary form of gas analyzer which detects acetylene gas in the gas space by bubbling gas from the transformer through a solution of ammonia and Cuprous Chloride. If acetylene is present a brick red precipitate will be formed which will indicate that a fault has occurred.

The Gas Detector may be connected directly to the test plug of the Sudden Pressure Relay by means of plastic tubing and the flow of gas through the ammonia solution can be controlled by pinching the tubing.

A complete set of Operating Instructions is included with each Westinghouse Acetylene Gas Detector.

REPLACEMENT

In the event it becomes necessary to replace the relay, give the serial number and style number of the relay along the with stock order and serial number of the transformer. Address all correspondence to the nearest Westinghouse Office.

OPERATING PROCEDURE AFTER A RELAY OPERATION

What to do after the transformer bank is tripped out due to a relay operation is a difficult question. Theoretically a fault has occurred and the bank should be taken out of service until the trouble has been repaired. In actual practice a number of faults within a transformer can be self-clearing. Sparkovers can occur between turns or even between taps or terminal connections which normally operate at relatively low voltage between points and these sparkovers will be cleared because the normal operating voltage simply is not sufficient to maintain an arc through the oil. While such impulse sparkovers should never occur with modern transformers and modern lightning arresters, they can and do occur because of defects in the transformer or in the arrester protection. In addition, there is the possibility of incorrect breaker tripping resulting from difficulties in the relays, wiring, and circuit breakers or some unforeseen combination of circumstances which can cause an outage where there is no fault.

After a transformer has been disconnected as a result of relay operation it is always desirable to get it back into service as soon as possible. It is, of course, desirable to make certain that the transformer is not faulted, but in many instances the necessity of getting the transformer bank into service outweighs the risk of additional consequential damage which may be incurred by putting a faulted transformer bank on the line, and the risk of reconnecting the transformer immediately without making additional tests to determine the nature of the fault is justified. In fact, even though it may be known that a sparkover has occurred inside the transformer, it is still true that if the transformer can be reconnected even temporarily and will carry the load for even a short period the risk of reconnecting a damaged transformer can be justified. The penalty for reconnecting a damaged transformer is, of course, that if a second fault occurs the damage to the transformer and possibly to associated equipment will be larger than it would be after only one fault.

However, with the most modern relay protection and especially the Sudden Pressure Relay, the sensitivity to a fault is such that very little consequential damage can occur without causing relay operation. This will be true even for single turn shorts in the winding for the fault current in these faults will be in the order of full load current. The relay will operate, in the first place, before appreciable consequential damage can occur and if the transformer is reclosed it is fairly certain that the relay will operate again before serious consequential damage is done in addition to that caused by the first fault. Accordingly, it seems that it is generally good policy to reclose after operation of relays if the transformer is protected with sensitive relay protection.

As soon as the transformer can be taken out of service for additional inspection and test the following procedure should be followed.

1. Connect the Westinghouse Acetylene Gas Detector to the test plug of the Sudden Pressure Relay as outlined in the section for "Detection of Acetylene Gas." If this is not available take samples of the gas from the gas space for analysis to determine whether there are present excessive products of decomposition.

2. Remove the manhole cover to see what can be observed visually. Sometimes the odor of burning is quite obvious.

3. Make the regular insulation power factor and insulation resistance tests together with a check on the ratio of the transformer.

4. Any other tests which might be desirable after these first tests have been made.

5. Check the operation of the Sudden Pressure Relay as outlined in the "Field Test Procedure" section.

check to see that the point is within the allowed operating area. Wide deviation of this field test point from the allowed area of the curve should be referred to the nearest Westinghouse office.

7. Disconnect any external trip or alarm circuits.

8. Check the reset switch to be sure it is closed.

9. Reconnect the relay supply voltage.

10. Connect the circuit tester across (3) and (4).

11. Remove the test plug. The relay will operate and the circuit tester will indicate an open circuit.

12. Replace the plug and allow sufficient time (see 5 above) for the relay to equalize.

13. Operate the reset switch and note that the circuit of (3) and (4) recloses.

14. This check should be made on each of the alarm circuits.

15. Following the correct operation of the relay, reconnect the trip or alarm circuits.

It will be necessary to remove the Sudden Pressure Relay only if a fault is found when testing the micro-switch and bellows (tests 1 to 6). If this is required the gas pressure in the transformer tank must be brought to atmospheric pressure.

The Sudden Pressure Relay can then be removed and replaced by a new relay. All Sudden Pressure Relays are now one style number. If a fault is found in the seal-in-relay, the relay should be removed, and replaced by one of the same style number. The style number can be found on the side of the relay case below the circuit diagram.

FACTORY TESTS

The factory test made on the Sudden Pressure Relay are more conclusive than that necessary for field testing to ensure the Sudden Pressure Relay is in operating condition.

All electrical parts of the Sudden Pressure Relay receive a 1500 Volt insulation test for a period of one minute at 60 cycles. The seal-in relay must operate at 80% of rated voltage within 12 milliseconds. The bellows is tested at 15 pounds pressure while positioned in a fixture to limit its travel to a maximum of 1/16" from free length. When the pressure is released the bellows must return to its original free length plus or minus .005 inches. The maximum pressure which is applied to the bellows in the completed Sudden Pressure Relay should be limited to 8 psi.

The following tests are made on all completed Sudden Pressure Relays with the relay mounted on a vertical mounting plate.

1. A 1500 Volt 60 cycle insulation test is made on the electrical circuit of the Sudden Pressure Relay to ground for a period of one minute.

2. An operation test is made to determine the "make" and "break" pressure of the microswitch.

(a) The maximum "make" pressure at which point the normally-open contacts of the micro-switch close is 0.40 psi or 11 inches of water absolute pressure.

(b) The minimum "break" pressure at which point the normally-open contacts of the micro-switch reopens is 0.29 psi or 8 inches of water.

3. An orifice test is made in the same manner as outlined under Field Test Procedure. This gives the operating characteristics of the Sudden Pressure Relay without actually making a rate-of-rise pressure test.

4. A 20 pound pressure test is made to ensure that the relay is pressure tight. During this test it is necessary to apply pressure to both the tank side and the relay case itself so as not to damage the bellows.

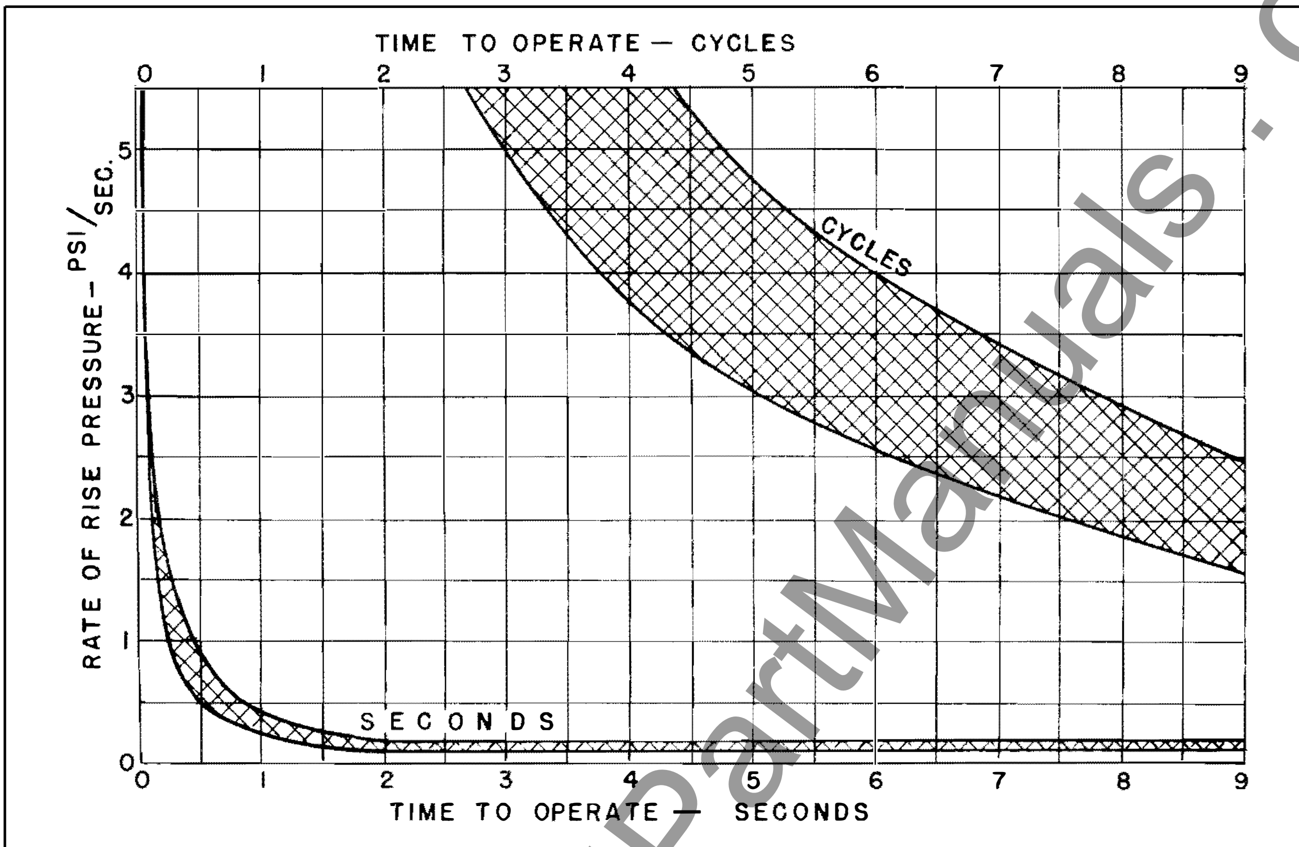

Fig. 3 Operating Characteristics of Sudden Pressure Relay

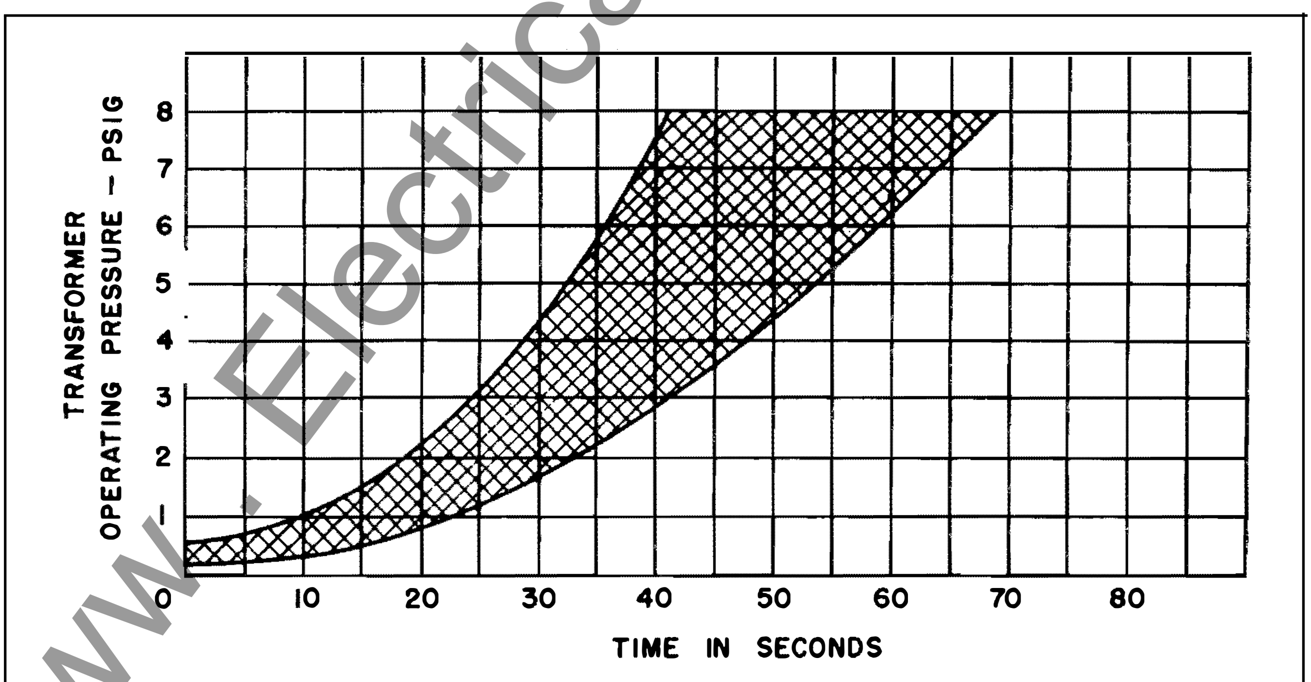

Fig. 4 Time and Pressure Curves

When an operation occurs, the seal-in relay will keep the alarm and trip circuits closed until the reset switch is opened. The reset switch is manually operated. It is necessary to open this switch for a fraction of a second only to interrupt the circuit and release the seal-in relay. Opening and closing the reset switch will restore the alarm and trip circuits to their original condition, ready for detection of further sudden pressure rises in the transformer.

IMPORTANT: Relays, solenoids and motors are inductive loads. When an inductive circuit is opened, a voltage is induced which tends to maintain current flow. The resultant arcing causes severe contact duty and may result in failure of the contacts to interrupt current.

TABLE NO. 2
BZ-2RD Micro-Switch Rating

VOLTAGE	RATED CAPACITY OF CONTACTS (AMPS)				
	Carry (All Loads)	Break Type of Load for N.O. and N.C. Contacts		Lamp Load for Max. Heated Filament	
		Resistive	*Inductive	N.O. Contact	N.C. Contact
115 V.A.C.	15	15	15	1.5	3.0
230 V.A.C.	15	15	15	1.25	2.5
24 V.D.C.	15	2	1	1.5	2.0
48 V.D.C.	15	.8	.05	0.8	0.8
125 V.D.C.	15	.3	.03	0.3	0.3
250 V.D.C.	15	.2	.02	0.2	0.2

*L/R EQUAL OR LESS THAN 0.026. WHERE L = INDUCTANCE IN HENRYS AND R = RESISTANCE IN OHMS.

MAINTENANCE

It is desirable to check the operation of the relay when it is installed and every six months or a year afterwards. There is a definite relationship between the transformer gas pressure and the time required to equalize the pressures between the transformer and the relay. This relationship is shown graphically in Figure 4 and is the basis for checking the operation of the relay. The following test may be made on the relay while the transformer is in service, providing the transformer is operating at a positive tank pressure in excess of 3/4 pound per square inch.

FIELD TEST PROCEDURE

1. Disconnect the relay supply voltage.

2. Record the transformer operating pressure. (Note: The pressure must be greater than 3/4 p.s.i. for the following tests.)

3. Connect a circuit tester across terminals 12 and B (reset switch terminal).

4. Remove the test plug from the Sudden Pressure Relay case. The microswitch will operate and the circuit tester will indicate an open contact between 12 and B.

5. Close the test plug and record the time in seconds required for these same contacts to close.

6. Using the time recorded in (5) and the pressure recorded in (2) as coordinates on Figure 4, Time and Pressure Curve,

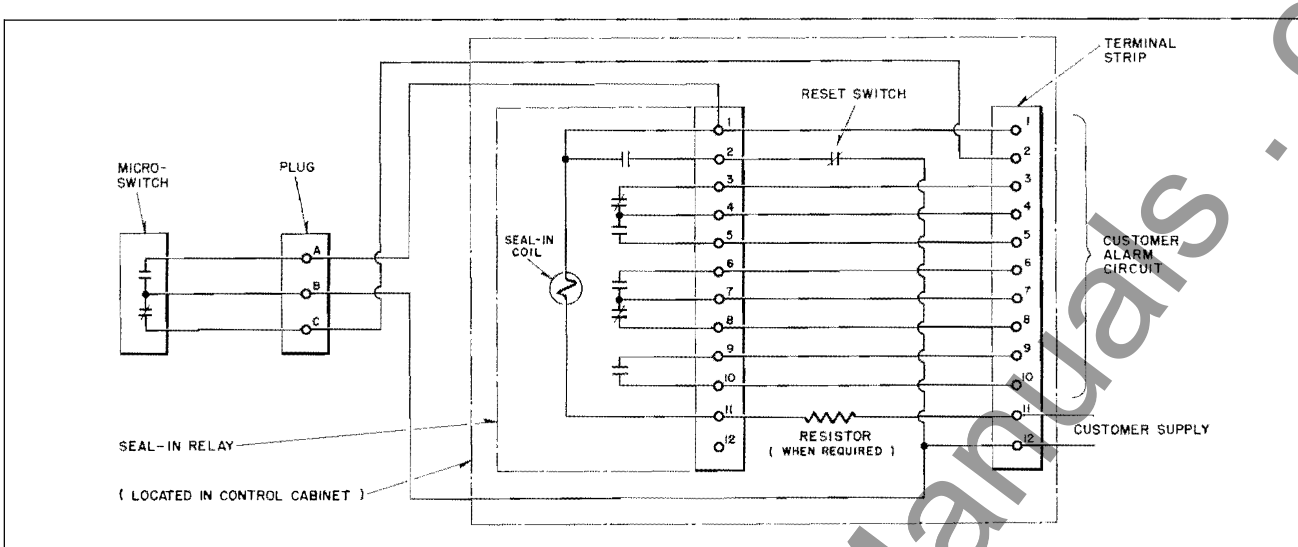

Fig. 2 Sudden Pressure Relay Wiring Diagram

OPERATION

The Sudden Pressure Relay will accomplish the following: (See Figure 3).

1. It will operate on changes in gas pressure regardless of the operating pressure on the transformer.

2. A rate of rise of pressure of 5.5 pounds per square inch per second will operate the relay in three cycles on a 60 cycle circuit.

3. At high rates of rise, 30 to 40 pounds per square inch per second, it will operate in a half cycle.

4. It will not operate on changes in pressure common to normal transformer operation.

5. It will detect abnormal disturbances which are insufficient to operate the conventional pressure relief device.

6. Disturbances, such as short circuits, in-rush currents and impulse voltages, will not operate the relay unless the transformer is damaged internally.

7. Mechanical shock will not operate the relay.

TABLE NO. 1
Seal-In Relay Characteristics

SEAL-IN RELAY COIL			
Style Number	Coil Current (MA)		Coil Voltage
	In-Rush	Cont.	
590A807H01	120	62	115 AC
590A807H02	62	27	230 AC
590A807H03	...	96	48 DC
590A807H04	...	39	125 DC(1)
590A807H05	...	170	24 DC

SEAL-IN RELAY CONTACT RATINGS				
Make (All Loads) Amps	Carry (All Loads) Amps	Break Type of Load For N.O. and N.C. Contacts (Amps)		Contact Voltage
		Resistive	*Inductive	
20	10	10	5	115 AC
20	10	5	2.5	230 AC
20	10	5	3.0	24 DC
20	10	2	1	48 DC
20	10	.5	.25	125 DC
20	10	.1	.05	250 DC

*L/R equal or less than 0.026, where L = inductance in henrys and R = resistance in ohms.

(1) To be used with resistor Style No. 56[illegible]6468H04 for 250 V.D.C.

Instructions for Sudden Pressure Relay

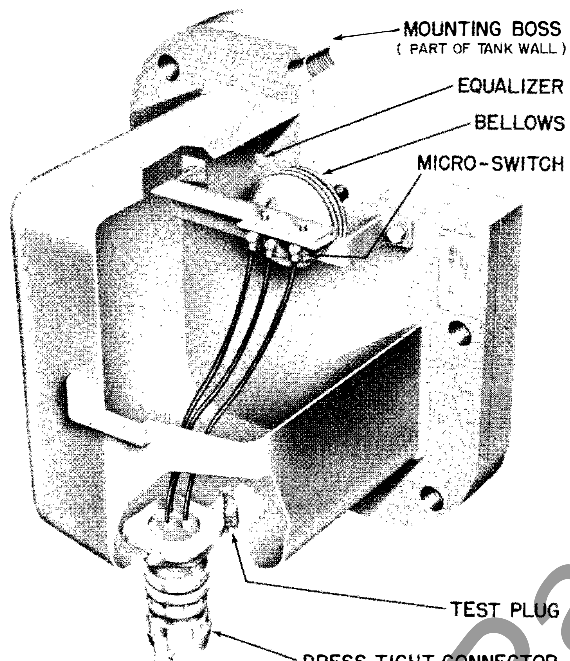

Fig. 1 Sudden Pressure Relay

GENERAL DESCRIPTION

The Westinghouse Sudden Pressure Relay is made-up of three main parts: The Pressure Sensing Element and Micro-Switch, the Seal-In-Relay and the Reset Switch. The complete relay is designed to have a relay circuit that closes on occurrence of a fault in the transformer which produces an abnormal rise of pressure. The signal is actuated by means of a pressure-actuated switch housed in the hermetically sealed case. This case is isolated from the transformer gas space except for a pressure equalizer. The pressure equalizer consists of a non-corrosive plug with a very small orifice which will permit normal transformer operation over its entire pressure range without giving an alarm. It will, however, act to throttle any pressure change of greater magnitude than that experienced in normal operation, which would cause a pressure differential between the relay case and the transformer case, causing the pressure-switch to be actuated.

The pressure sensing element consists of a pressure tight case in which is mounted a bellows operated micro-switch, equalizer and a test plug. The pressure operated micro-switch will close at a small pressure differential and allow the externally mounted seal-in-relay to be energized. The seal-in-relay being externally mounted makes it possible for the customer to use his own relay if he so desires.

The seal-in-relay, located in the transformer control cabinet, will operate on the first half cycle of positive or negative increasing current. This relay has two single pole single-throw contacts and two single pole double-throw contacts. (See Table 1 for current ratings of these contacts.) One single pole single-throw-contact is used to lock the coil of the seal-in-relay into the power circuit. The coil remains in the circuit until released by operating the reset switch. The remaining contacts may be used for alarm and/or trip circuits.

INSTALLATION

The Sudden Pressure Relay is mounted above the maximum oil level in the gas space when applied on transformers. This is the preferred mounting. However, the relay can be satisfactorily mounted on the transformer cover for application to transformers in the field.

When vacuum filling a transformer on which a Sudden Pressure Relay is mounted, care must be taken that the relay is not filled with oil. The normal procedure is to ship all new transformers with a dummy plate mounted in place of the Sudden Pressure Relay. Whenever possible the transformer should be filled with oil before the dummy plate is removed.

Effective December, 1962 Supersedes I.L. 48-065-1, June, 1962

Westinghouse Electric Corporation
Power Transformer Division, Sharon, Pa.

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tions. Operation of the Relief Device occurs only under excess pressure. Diaphragm travel, which is limited by compression springs in the protective cover, serves to lift the semaphore and operate the alarm device if one is attached.

After operation it is unnecessary to reset the Relief Device but the semaphore and alarm device should be reset as soon as convenient.

Resetting is accomplished by pushing the semaphore flush with the top of the cover. The alarm switch is reset by pulling out the reset lever to its limit and releasing it. (Fig. 2)

IMPORTANT

Replace the Relief Device with a blind flange before testing the transformer tank for leaks with pressure greater than 8 psi. The Relief Device will withstand full vacuum and need not be removed from the transformer tank during any vacuum treatment.

Relays, solenoids, and motors are inductive loads. When an inductive circuit is opened, a voltage is inducted in the circuit tending to maintain current flow. The resultant arcing causes severe contact duty and may result in failure of the contacts to interrupt current.

When checking circuits through this device, it is necessary to follow Table No. 1.

VOLTAGE	NON-INDUCTIVE LOAD-AMPS.	INDUCTIVE LOAD-AMPS. L/R = .026*
125 A-C	10	10
250 A-C	5	5
125 D-C	0.5	0.005
250 D-C	0.25	0.025

* Equal to or less than .026. If greater, refer to factory for adjusted rating.

Table No. 1 *Switch Interrupting Ratings*

This means that a low voltage bell ringer cannot be used unless switched through a high impedance relay. An indicating light type device is generally recognized as best for checking circuits through instruments containing microswitches or similar switches.

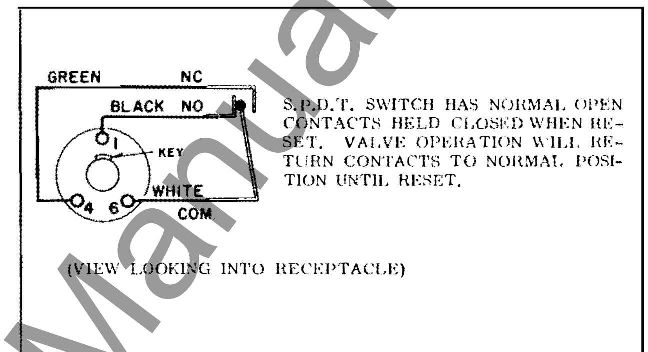

Fig. 3 *Alarm Device Wiring Diagram*

MAINTENANCE

Necessary maintenance is the resetting of the semaphore and alarm switch (if supplied) after each operation. If the gasket between the transformer boss and flange has to be replaced, coat all over with cement #7486. After applying first coat of cement let dry for 15 minutes, apply a light second coat of cement to the same surfaces, wiping excess cement off edges of the gasket.

Keep spare gaskets and cement on hand. A limited supply is furnished with the transformer. For additional parts, order from the nearest Westinghouse Office, giving the serial and stock order number of the complete transformer as stamped on the nameplate.

CAUTION

Should disassembly of the Relief Device be necessary, caution must be exercised when removing the protective cover because the springs are under compression.

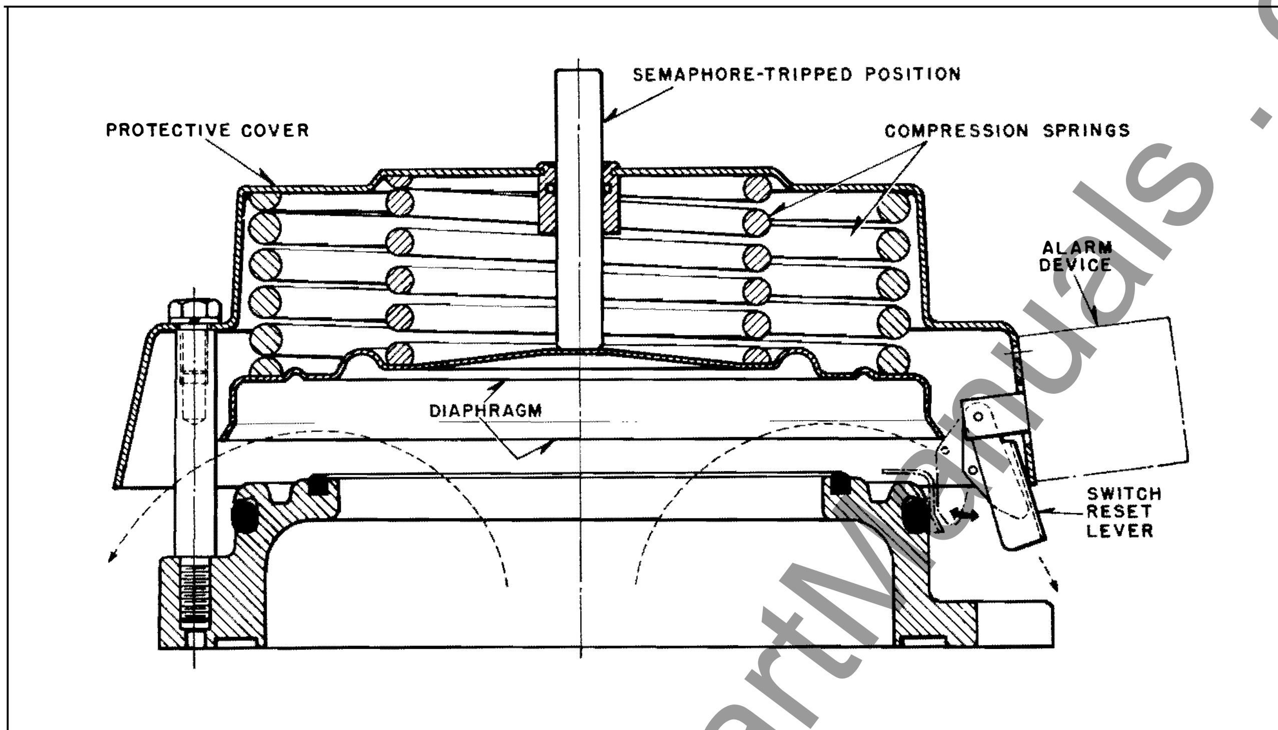

Fig. 2 *Relief Device in Maximum Venting Position*

The sturdy parts allow the Relief Device to operate numerous times without damage.

SIGNALS

The Relief Device is equipped with a lightweight, plastic semaphore which rests upon the diaphragm before operation. (Fig. 1) When the diaphragm rises during operation, it lifts the semaphore into view and indicates the Relief Device has operated. Alarm contacts can also be supplied to indicate the unit has operated.

When electrical alarm contacts are ordered, the alarm device is mounted on the side of the cover. The alarm device incorporates a double throw microswitch. The button of this switch is depressed to open a normally closed circuit for the untripped position of the Relief Device. When the Relief Device operates, the movement of the diaphragm releases the button on the switch and the switch transfers back to the normally closed circuit. (Fig. 2) Closing this circuit actuates the alarm. (Fig. 3) The switch ratings appear in Table No. 1.

OPERATION

The mechanism is shown in the sealed position in Fig. 1. Figure 2 shows maximum venting position.

When the pressure in the tank rises above normal to tripping pressure of 10 ± 1 psi, the diaphragm lifts slightly, exhausting into the space between the outer ring and the body of the Relief Device. The tank pressure thus spreads over the entire diaphragm area, which is twice the area of the center section, causing the device to open rapidly and remain open until the pressure within the tank falls well below the tripping pressure. This differential between tripping and closing pressures assures positive sealing upon closure.

The Relief Device resets itself and reseals when the pressure in the gas space has fallen to approximately one-half the tripping pressure.

The Relief Device hasn't any moving parts during normal transformer condi-

Instructions for Automatic Resetting Relief Device

I.L. 48-065-4A

The Automatic Resetting Relief Device, mounted on the transformer cover, is designed to relieve dangerous pressures which may build up within the transformer tank. When a predetermined pressure is exceeded, a pressure reaction lifts the diaphragm and vents the transformer tank.

Occasionally a fault under oil may result in a primary explosion. The wave front of pressure created is not as steep as that of a secondary explosion of hydrogen or acetylene and air above the oil, nor the results as violent. The abnormal pressure following an arc is often great enough to rupture the tank if a Relief Device has not been provided.

DESCRIPTION

The construction of the Automatic Resetting Relief Device is shown in Figures 1 and 2. Its operating parts consist of a dome-shaped diaphragm, compression springs, gaskets, and protective cover.

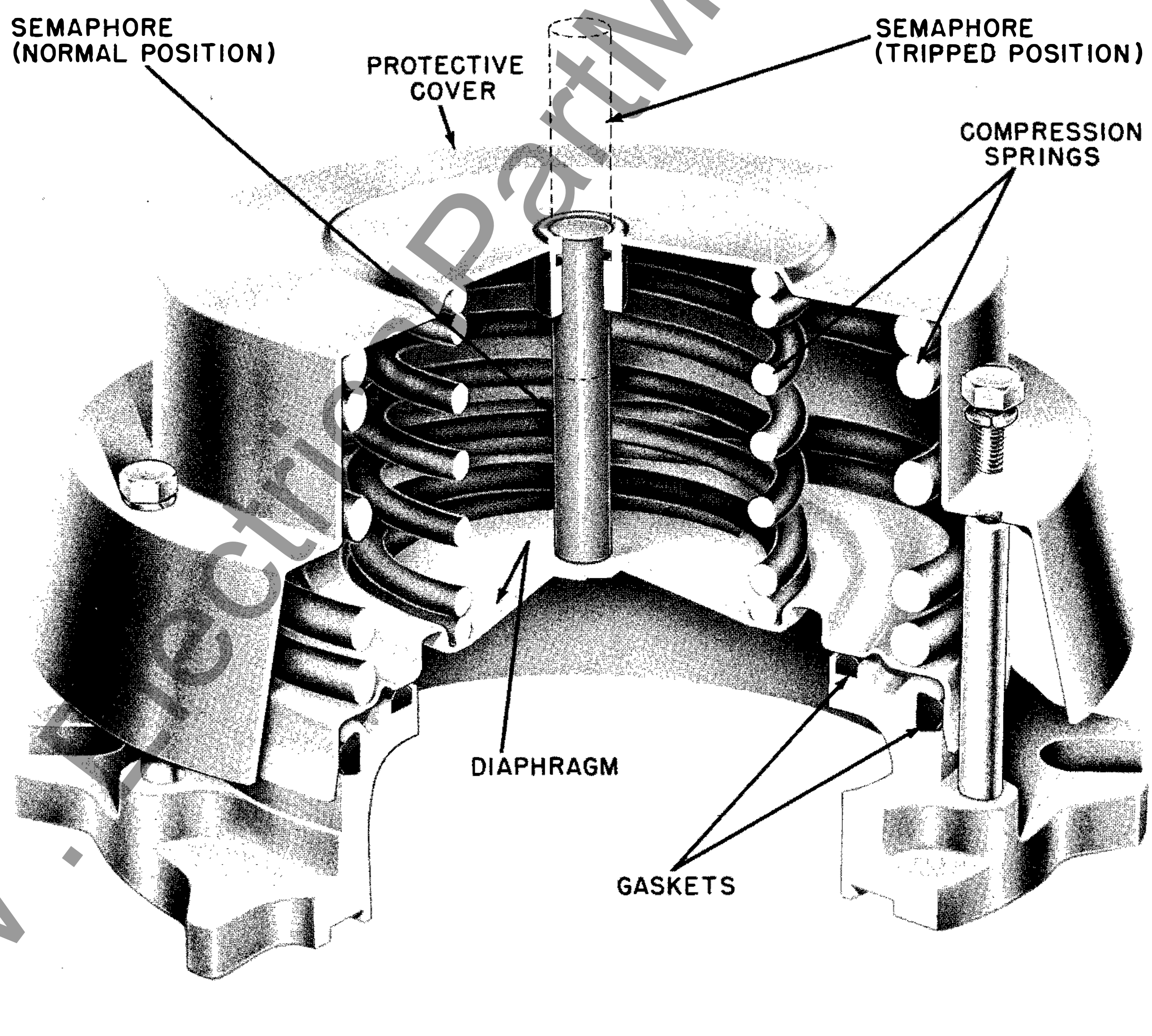

Fig. 1 *Relief Device in Sealed Position*

Effective May, 1963
Supersedes I.L. 48-065-4, February, 1962