Westinghouse

Type CN-S Network Relay

Construction

The relay, Fig. 1, consists of a standard single-phase induction disc directional element, and positive and negative phase sequence current elements which control operation of the directional element. Current and voltage filters serve to energize the directional element with currents proportional to the positive phase sequence power flowing through the protector. The resulting operation is equivalent to that of a sensitive three-phase directional relay, the operation of which may be initiated by small magnitudes of negative phase sequence current or large magnitudes of positive phase sequence current.

A complete phasing feature is also built into the relay circuit to prevent closing the protector when feeder voltages which would cause "pumping" are encountered. A schematic diagram of these circuits is shown in Figure 2.

Application

The type CN-S relay is designed to control the operation of a low voltage network protector. It will operate to close the protector only when correct feeder voltages are encountered, and will "trip" the protector only when abnormal feeder conditions exist.

These tripping conditions may be indicated by the reversal of small magnitudes of negative phase sequence current and transformer magnetizing watts, or by the reverse flow of comparatively large magnitudes of power. The ability of the relay to "trip" when energized with small magnitudes of negative phase sequence current and transformer magnetizing watts provides a means of de-energizing a feeder cable by switching operations at the power station, without resorting to the use of load back methods which may cause system disturbances; while many useless protector

WESTINGHOUSE TYPE CN-S NETWORK RELAY

SCHEMATIC DIAGRAM OF TYPE CN-S RELAY

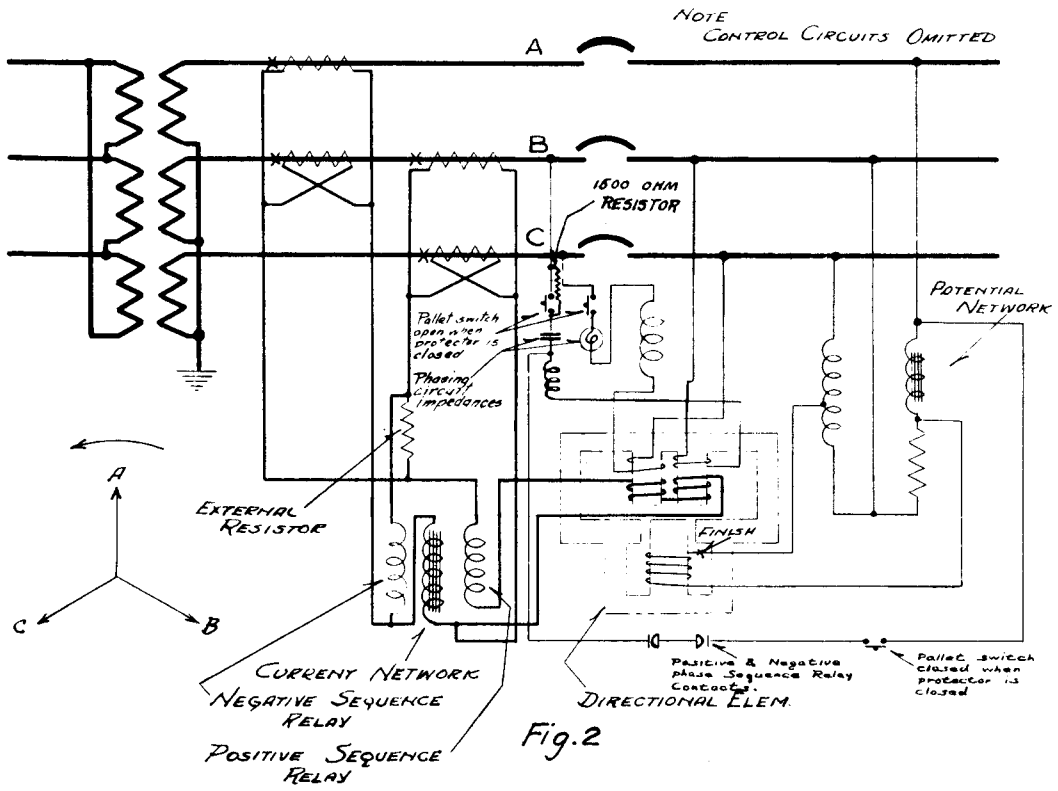
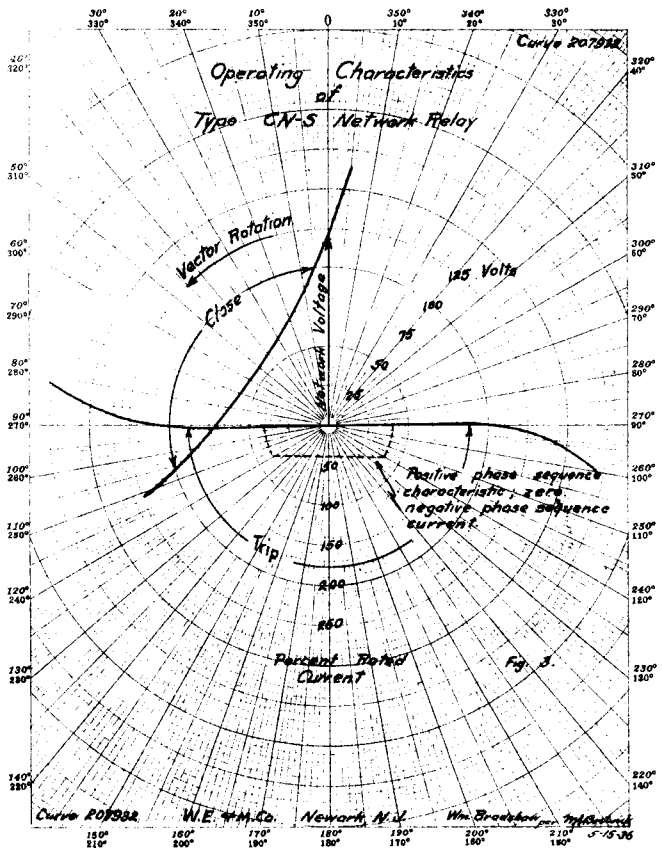
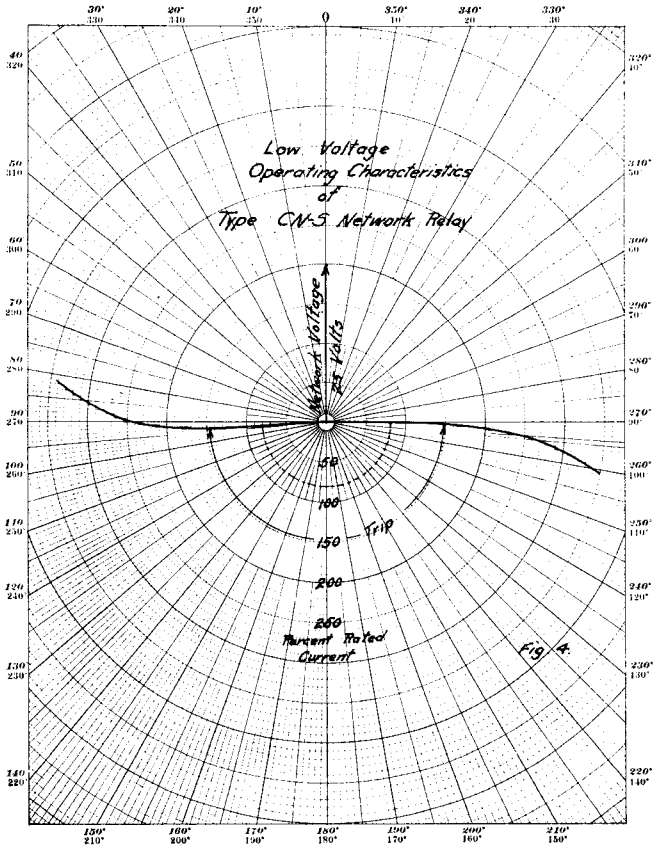


Fig. 2





operations are prevented by its insensitive positive phase sequence characteristic.

Operating characteristics of the relay are illustrated in Figures 3 and 4.

Inspection and Test

There are only three principal adjustments to be made on the relay:

(1) The positive phase sequence current setting.
(2) The negative phase sequence current setting.
(3) The directional element closing adjustment.

Positive Phase Sequence Setting

Pass increasing magnitudes of current through the terminals 2 to 3, Fig. 5, and adjust the contact springs so that the contacts open positively when the chosen current value is reached. The range of adjustment is approximately 4 to 8 amperes.

Negative Phase Sequence Setting

Pass current through terminals 4 and 5 and adjust the contacts to open at the chosen value; between 0.5 and 2.0 amperes. A setting of 0.7 amperes is recommended.

Both current elements are adjusted to have an initial air gap, between the moving armature and iron core, of approximately .020", and a permanent gap at the base of the coil of .045". The armatures of the phase sequence elements must not be bent when making adjustments in alignment, as they are specially heat treated to reduce residual magnetism effects and any mechanical strains caused by bending will spoil that feature.

Closing Adjustment

The end play of the disc shaft should be limited to approximately .002" by adjustment of the upper bearing screw. With the stationary closing contact screw extending approximately 1/4" from its support, set the reverse current stop screw to limit the free travel of the contacts to 1/8", then adjust the spiral spring so that the contacts close from that point in 25 plus or minus 2 seconds.

Connect the relay as indicated in Figure 6, close switches A and B. Adjust the sliders of both potentiometers to obtain a 1.2 volt 100% P.F. difference. Then screw the adjustable lag loop, over the potential coil of the directional element, to a position where the moving contacts will slowly close. With the sliders set at 0 volts difference, and the potential filter energized at rated voltage the moving contacts will slowly move till the reverse current spring touches the stop. Open switches A and B, then adjust the trip contact so that it just fails to close the trip circuit when the moving contacts are allowed to open, the potential circuit being energized at rated voltage.

Check polarity of the phasing circuits by setting the sliders of the two potentiometers at approximately 75 volts. The contacts must "close".

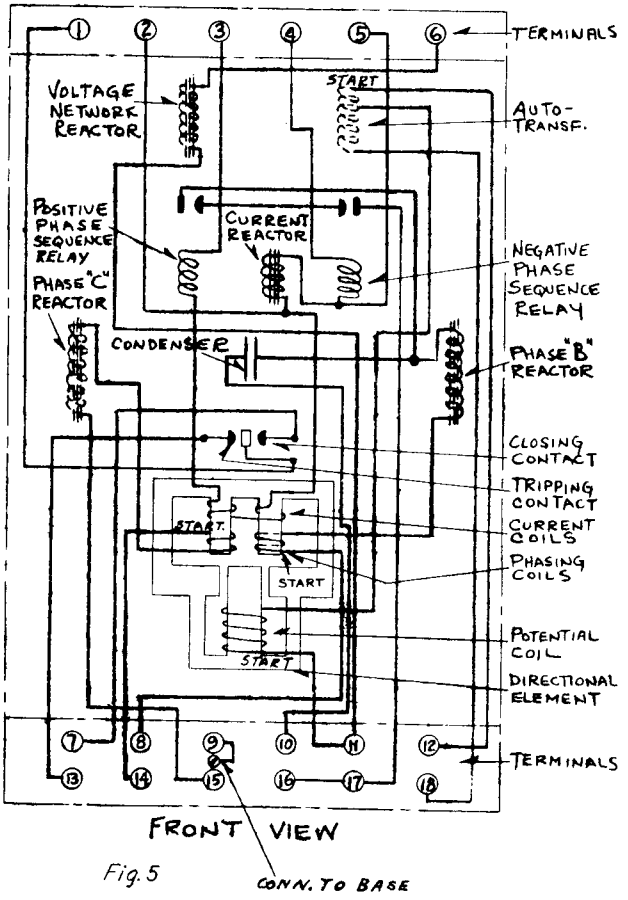


Fig. 5

This completes the relay calibration.

Sensitive relay operation, that is, tripping by reversal of transformer magnetizing watts in the absence of negative phase sequence current reversals can be obtained by adjusting the stationary contacts of the sequence elements so that they open the restraining circuit at all times.

Circuit Checks

A proper balance of the various potential filter parts may be checked by measuring the open circuit voltage of the potential filter. First disconnect the potential coil at terminal #11, then energize the potential filter at 208 volts with switches A and B open (Figure 6). The potential from the potential coil to terminal #11 should be 150 volts plus or minus 5%. When the leads to terminals 6 and 12 are interchanged, this voltage should not exceed 7.0 volts when measured with a voltmeter which has an impedance of 5000 ohms or more.

A suitable balance of the current filter may be checked by passing 4 amperes (60 cycle frequency) through a .432 ohm resistor in series with terminals 3 or 4 of the relay and measuring the voltage drop across the various elements of the current filter. The voltage

Test Diagram for Type CN-S Relay

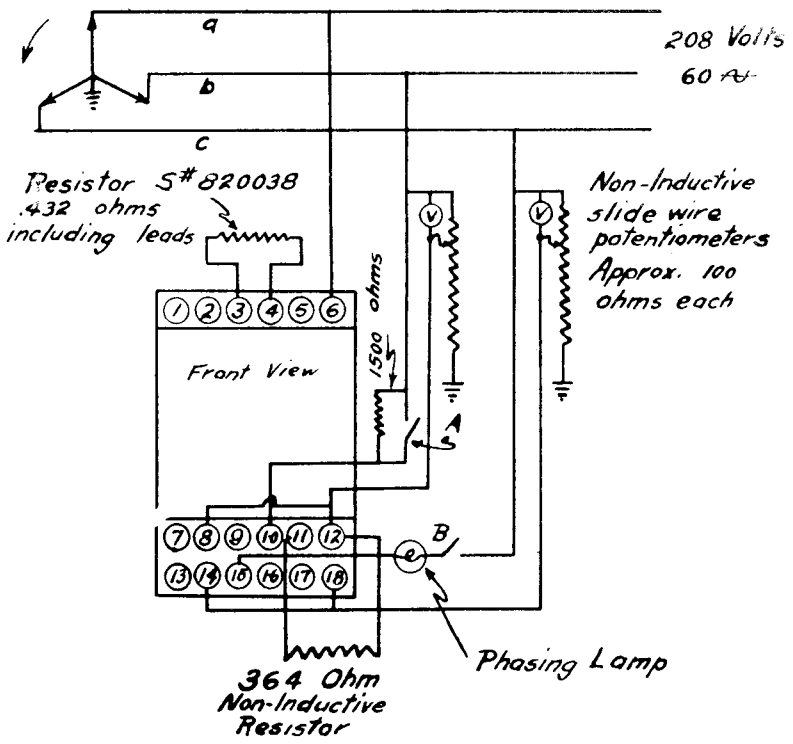


Fig. 6

limits expressed in terms of the drop across the resistor are given below:

Terminals	%
Resistor	100
2 - 3	35 - 45
2 - 5	79.0 - 83.9
4 - 5	35 - 45

Maintenance

Very little maintenance work will be required to keep the relay in good condition, as the number of relay operations normally encountered is greatly reduced by use of its sensitive-insensitive operating characteristic. It is recommended that special attention be given to the contacts on the negative phase sequence current element to insure that a good contact surface is maintained, as this element operates more frequently than any other part of the relay.

When important repairs are required, it will be generally found advantageous to return the relays to the Newark factory where an efficient repair department is maintained. Before returning apparatus for this or any other reason, please communicate with our nearest Sales Office for shipping instructions and an identification tag.

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