BELLOWS RELAY
PER D-81211
FOR PNEUMATIC TUBE SYSTEM BLOCKADE ALARM
REQUIREMENTS AND ADJUSTING PROCEDURES

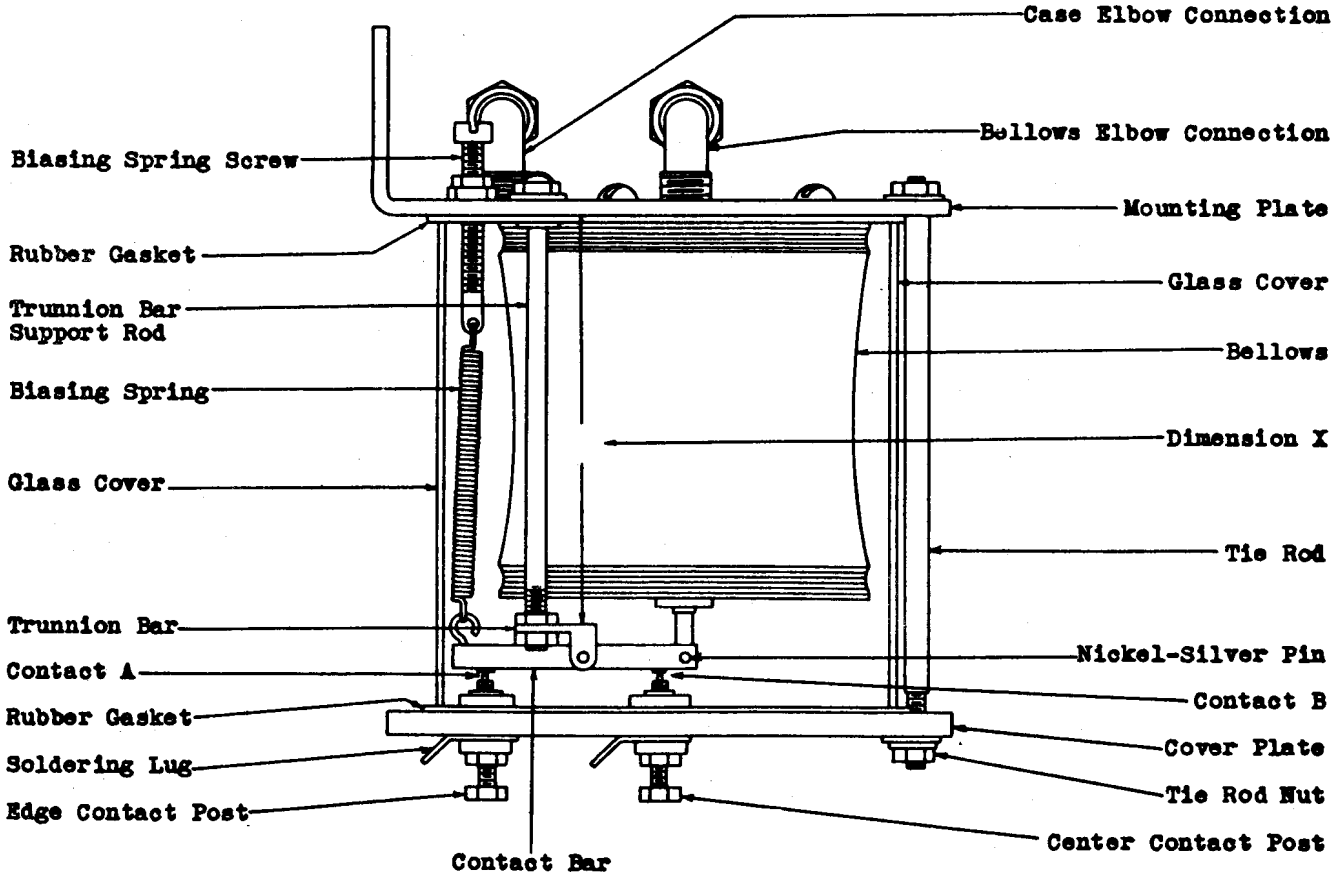

Fig. 1 - Assembly of Relay

1. GENERAL

1.01 This section covers the bellows relay per D-81211.

1.02 Reference shall be made to Section 020-010-711 covering General Requirements and Definitions, for additional information necessary for the proper application of the requirements listed herein.

1.03 The requirements contained in this practice assume that the following points have been checked and that corrective measures have been taken where necessary.

1. Leaks in the common return tubes to which the relay is connected.
2. Faulty seating of edge sections and sending valves.
3. Leaks in the copper tube runs which connect the relay to the ticket tubes.
4. The correct degree of vacuum at the roller valve.

1.04 Operated Position - The relay is in an operated position when either set of contacts A or B is closed.

1.05 Requirements are marked with an asterisk (*) when to check for them would necessitate the dismantling or dismounting of apparatus or would affect the adjustment involved or other adjustments.

1.05 (Continued)

No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

2. REQUIREMENTS

*2.01 Cleaning: The contacts shall be cleaned when necessary.

2.02 Mounting: The relay shall be fastened securely to its mounting plate. Gauge by feel.

2.03 Tightness of Locknuts: The locknuts shall be sufficiently tight to hold the screws in the adjusted position. Gauge by feel.

2.04 Contact Alignment: The contacts shall line up so that the point of contact falls wholly within the boundary of the opposing contact. Gauge by eye.

2.05 Contact Separation: No requirement. See 3.07.

2.06 Bellows: During normal conditions, i.e. when the ticket tubes associated with the relay are not blocked, the bellows shall be slightly collapsed. Gauge by eye.

2.07 Blockade Operation: The relay shall operate when an artificial blockade is caused in either of the ticket tubes with which it is associated. Check operation in both directions. Operation of the relay is indicated by the associated circuit.

*2.08 Bellows Leakage: A difference in pressure of .2 inches of mercury between the inside of the bellows and the outside shall not change more than .08 inch in 90 seconds. Use the KS-5459 gauge or the portable water gauge.

*2.09 Case Leakage: A difference in pressure of .2 inches of mercury between the inside of the case and the outside shall not change more than .08 inch in 90 seconds. Use the KS-5459 gauge or the portable water gauge.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials and Test Apparatus

Code No.	Description
Tools	
45	Wrench 5/16" Hex. Socket
245	Wrench 3/8" and 7/16" Hexagon Open Double-End Flat
418A	Wrench 5/16" and 7/32" Hexagon Open Double-End Flat
R-1770	Wrench 1/2" and 9/16" Hexagon Open Double-End Flat
-	Bell System Cabinet Screwdriver 3-1/2" per A.T.& T. Co. Drawing 46-X-40
-	Tube Cleaner per ED-60599-01
-	Brush 1/2 inch, Flat, or Equivalent
-	Long Nose Pliers
-	Mohr Pinch Cock, Fisher Scientific Co. No. 5-850B or Equivalent
-	Connecting Tube, Brass, "T" Shape, 3/8" Outside Diameter Eimer & Amend No. 32720 or Equivalent
	Connecting Tube, Brass, "Y" Shape, 3/8" Outside Diameter Eimer & Amend No. 32722 or Equivalent
Gauges	
KS-5459	Vacuum Gauge
Materials	
R-1313	Fish Line
-	Shellac
-	Rubber Tubing 5/16 inch inside diameter. (Four lengths of 5 inches each and one length of 24 inches are required)

3.002 General

(1) If the cover plate has been removed care should be exercised when putting it back in place to see that both sets of contacts are in correct alignment before tightening the tie rod nuts.

(2) If the glass cover and the cover plate have been removed it is important that a perfect seal be obtained when they are put back in place.

(3) A difference exists between the earlier relays manufactured and the latest type, in that dimension X on Fig. 1 on the latest type is 2-7/8 inches but on the earlier relays is

sometimes as great as 3 inches. While it is possible to secure satisfactory operation of a relay having the greater value for dimension X, it entails adjusting the contact bar to an inclined position as described in 3.07, and as a result greater difficulty may be experienced in properly aligning the contacts. Consequently, if for any reason it is necessary to dismantle one of these earlier type relays, advantage should be taken of this opportunity to change this dimension to the 2 7/8 inch value now used. The method of doing this once the relay is dismantled is as follows:- By means of the No. 418A wrench loosen the locknuts on top of the trunnion bar and turn them upward on their posts as far as they can go. Then turn the locknuts beneath the trunnion bar equal amounts so as to raise the bar evenly. When the trunnion bar has been raised to the correct height tighten the upper set of locknuts so as to hold the bar firmly in place. Replace the regular contact posts with a set of longer ones per detail 15 ESO-274068, Issue 8 to compensate for the higher elevation of the contact bar. After this change in dimension X has been made and the relay reassembled certain tests and adjustments on it should be made as follows:

a. Bellows leakage per 3.08.
b. Case leakage per 3.09.
c. The biasing spring screw locknut should be loosened with the No. 418A wrench and the screw turned so that the contact bar is horizontal for normal conditions of the relay.
d. The contact separation should be adjusted as described under 3.07.

(4) In certain of the procedures the use of shellac for securing an air-tight seal is mentioned. Attention is called to the fact that when applying shellac to the various parts on the relay where air-leakage might occur, certain of these parts such as the contact posts and the biasing screw permit of adjustment, and such adjustment should be made before the shellac at these points has entirely dried as otherwise it will be difficult to turn these screws and the shellac may become cracked and therefore ineffective in sealing against leakage. At other points where no adjustment or movement of the part is involved the coating of shellac should be permitted to dry before attempting to complete adjustment of the relay.

(5) If the relay meets all the requirements contained in this practice and yet does not operate properly this may be due to the points of connection to the pneumatic tube system being in an unfavorable location in regard to the roller valve.

3.01 Cleaning (Rq.2.01)

(1) Clean the contacts in accordance with the section covering cleaning of relay contacts and parts. The cover plate will have to be removed to make the contacts accessible.

3.02 Mounting (Rq.2.02)

(1) If the relay is loose on the mounting plate tighten the mounting screws securely with the 3-1/2" cabinet screw-driver.

3.03 Tightness of Locknuts (Rq.2.03)

(1) Tighten loose locknuts with the No. 418A wrench (for 5/16" nuts) or the No. 245 wrench (for 7/16" nut).

3.04 Contact Alignment (Rq.2.04)

(1) If the contacts do not line up properly loosen the bottom tie rod nuts by means of the No. 418A wrench. It is necessary to loosen these nuts only sufficiently to permit movement of the cover plate. Line up the contacts carefully by shifting the cover plate as required and then tighten the tie rod nuts. Care should be exercised so as not to break the glass cover.

3.05 Contact Separation (Rq.2.05)
See 3.07.

3.06 Bellows (Rq.2.06)

(1) If the bellows is not slightly collapsed during normal conditions, proceed as follows:

(a) Check dimension X Fig.1 to see if this dimension is too long. If it is too long this may be corrected as described in 3.002.

(b) Determine if the vacuum has failed.

(c) Check the bellows leakage as covered in 3.08. Such leakage would destroy the vacuum and thus permit the biasing spring to exert a pull on the lower part of the bellows causing it to be fully extended continuously. If the bellows leakage requirement is met, then the trouble may be due to the biasing spring having too great a tension. This tension is adequate if it maintains the contact bar horizontal under normal conditions, an exception to this being the inclined contact bar adjustment for relays having dimension X greater than 2-7/8 inches as covered under 3.07.

3.07 Blockade Operation (Rq.2.07)

(1) The blockade operation of the relay may be brought about as follows: Attach a tube cleaner per ED-60599-01

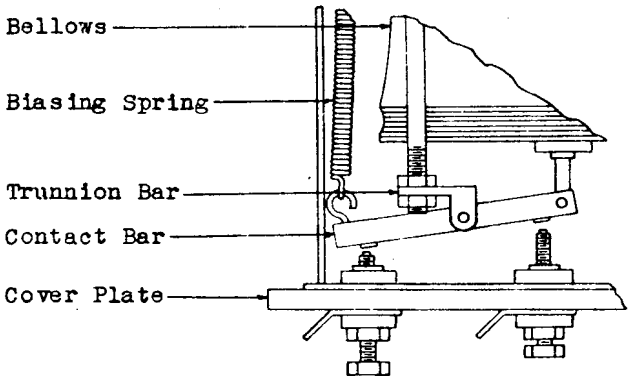

Fig. 2 - Inclined Contact Bar Adjustment

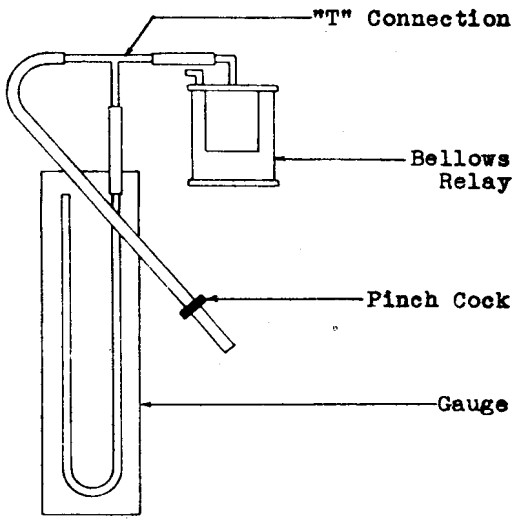

Fig. 3 - Connections for Making Bellows Leakage Test

to the end of an R-1313 fish-line and introduces this cleaner into one of the ticket tubes associated with the relay through the door of the sending valve closest to the roller valve, permitting the air to draw the cleaner about 4 or 5 feet into the tube. Close the door of the sending valve on the fish-line as tightly as possible reducing leakage at this point to a minimum. Repeat for the other tube.

(2) If the relay does not operate proceed as follows:

(a) Check whether the bellows leakage and case leakage requirements are met. They are covered under 3.08 and 3.09 respectively.

(b) Adjust the contact separation. With the No. 418A wrench loosen the contact screw locknuts and with the No. 45 wrench back off the contact screws approximately 1/8 inch. Tighten the lock nuts sufficiently to cause an appreciable resistance to adjustment of the screws but not sufficiently to prevent of adjustment. When the tubes are free, air-gaps should appear at both contacts. The intention is to have the contact separation as great as possible and still have the relay respond to the artificial blockade described above. Experience indicates that where the common return tubes are long, 200 feet or more, the contact separation will be of the order of .005" or less. When the common return tubes are shorter, 100 feet or less, the contact separation will be of the order of .010" or greater. Unreliable operation of the relay from causes such as vibration may be the result of too small contact separation.

(c) The earlier type of relay, due to the fact that dimension X on it is greater than that on the latest type of relay, should be adjusted as follows if it does not operate. Loosen the lock nut on the biasing spring adjusting screw with the No. 418A wrench and turn the screw so as to decrease the pull of the spring on the contact bar. This will cause the contact bar to take an inclined position such that the bellows end of the contact bar will be at the higher elevation. This inclination shall be made a maximum consistent with proper closure of the contacts when the relay operates. If an early type relay has been modified

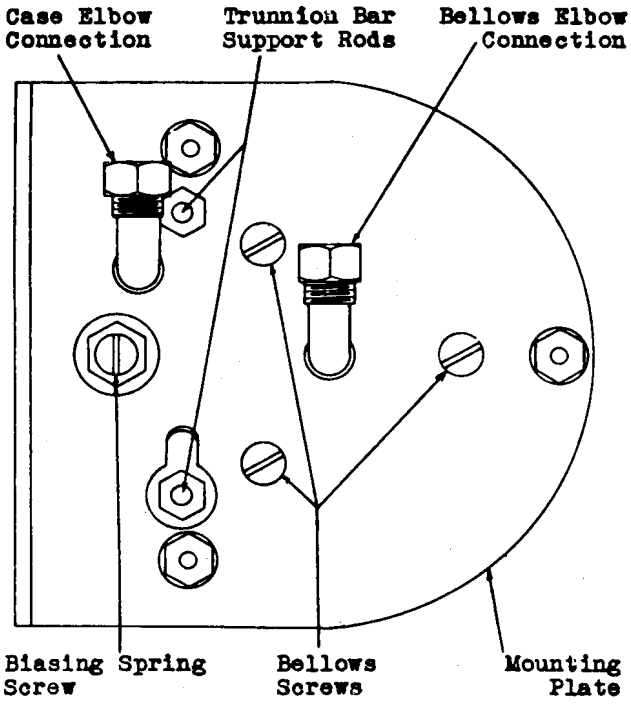

Fig. 4 - Top View of Relay

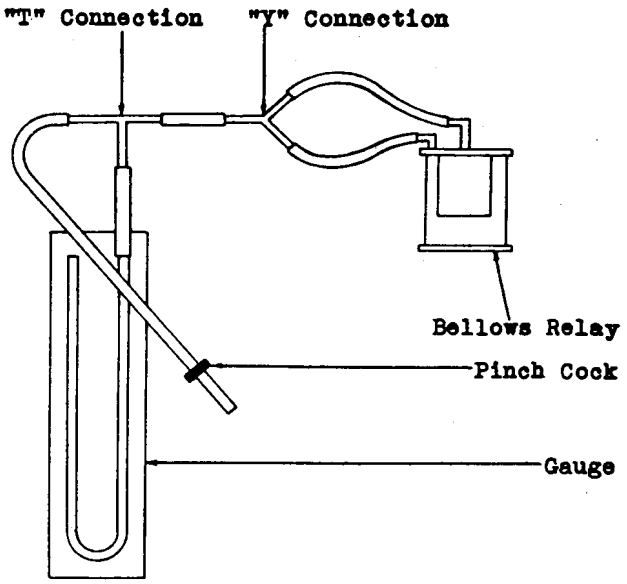

Fig. 5 - Connections for Making Case Leakage Test

in respect to dimension X as described in 3.002 this inclined adjustment for the contact bar is of course not applicable since the standard adjustment described in the preceding paragraph will apply.

3.08 Bellows Leakage (Rq.2.08)

(1) The bellows leakage test should be made as follows: Disconnect the relay from the pneumatic tube system, using the R-1770 wrench to loosen the nuts on the elbow connections. By means of the "T" connection attach the vacuum gauge to the elbow entering the bellows chamber as shown in Fig. 3. To the remaining free end of the "T" connection attach a rubber tube equipped with a pinch cock. If the pneumatic tube system is in operation a difference in pressure between the inside and outside of the bellows may be established by momentarily holding this rubber tube against the end of the copper tube which was disconnected from the elbow connection of the bellows. Close the pinch cock on the rubber tube to seal off the bellows chamber. The rate of change in pressure due to bellows leakage can be observed on the vacuum gauge.

(2) If the bellows leakage is greater than specified under the requirements the bellows is defective and should be replaced. Remove the bottom tie rod nuts using the No. 418A wrench. Remove the bottom cover plate and the glass cover. Using a pair of long nose pliers squeeze one of the flattened ends of the nickel silver pin (see Fig. 1) to a more or less rounded shape so that it may be withdrawn. This will disconnect the bellows from the contact bar. Using the 3-1/2 inch screw-driver remove the three bellows screws from the top of the relay. (See Fig. 4). If the bellows cannot be easily separated from the mounting plate it may be necessary to use a putty knife or some similar tool to pry it loose.

(3) Whenever the bellows is removed advantage should be taken of this

opportunity to replace the upper rubber gasket with a new one if necessary. The lower gasket is easily replaced whenever the bottom cover plate has to be taken off. No shellac or adhesive is to be used on the gaskets. The case leakage test should be made whenever the bellows has been replaced.

3.09 Case Leakage (Rq.2.09)

(1) The case leakage test should be made as follows: By means of the "T" connection and the "Y" connection attach the vacuum gauge to the relay as shown in Fig. 5. To the remaining free end of the "T" connection attach a rubber tube equipped with a pinch cock. By momentarily holding this rubber tube against the end of the copper tube which was disconnected from the bellows elbow a difference in pressure between the inside of the case and the air outside is established. Close the pinch cock on the rubber tube and observe the change in pressure on the vacuum gauge.

(2) If the case leakage is greater than specified under the requirements coat all joints which might cause leakage with shellac without dismantling the relay. The three screws through the top plate which support the bellows and the two screws through the top plate which support the trunnion bar require careful shellac coating and the shellac should be permitted to dry before attempting to complete the adjustment of the relay. The contact post screws and biasing spring screw and the locknuts associated therewith should be freely coated with shellac but, of course, adjustment of the relay should proceed before the shellac at these points has entirely dried as otherwise it will be difficult to turn the screws and the shellac may be cracked and may not be effective in sealing against leakage. The joints between the glass case and the rubber gasket should not have shellac applied to them. If leakage occurs here new gaskets should be put in place.