June 29, 1937. H. MAUCH ET AL 2,085,265

CONTROL STATION FOR POSTAL PNEUMATIC TUBE PLANTS

Filed Nov. 11, 1932 4 Sheets-Sheet 1

Fig. 1

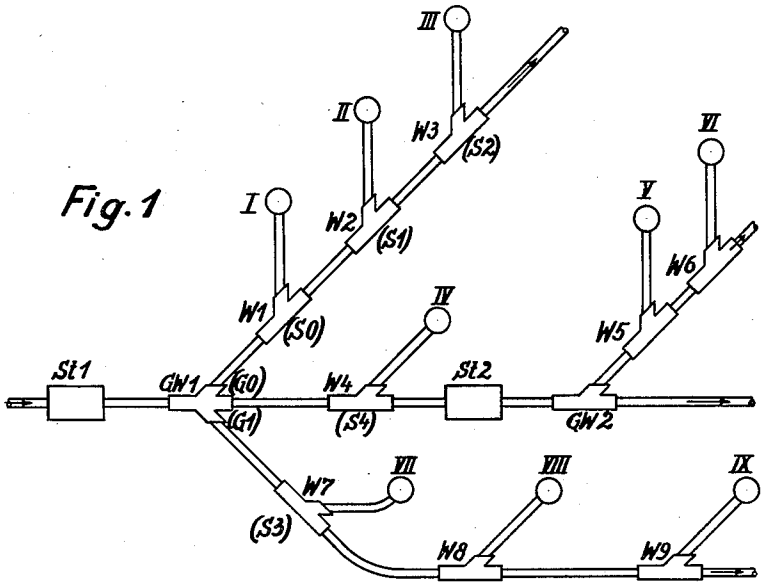


Fig. 2

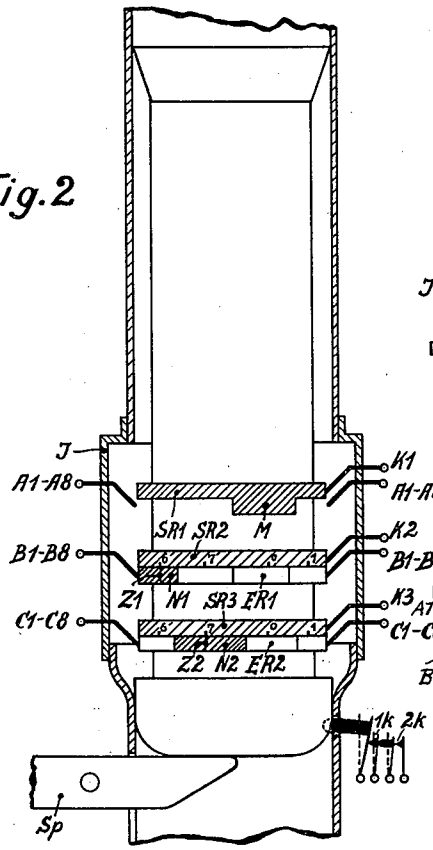
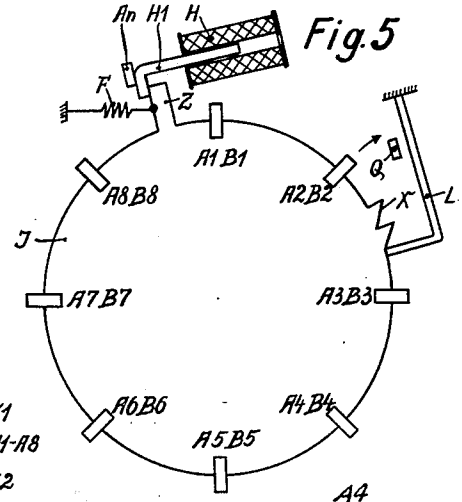


Fig. 5



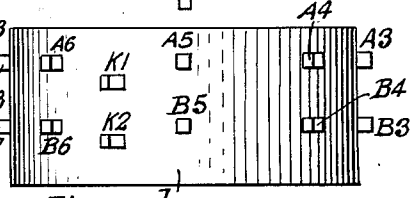


Fig. 5a.

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June 29, 1937. H. MAUCH ET AL 2,085,265

CONTROL STATION FOR POSTAL PNEUMATIC TUBE PLANTS

Filed Nov. 11, 1932 4 Sheets-Sheet 2

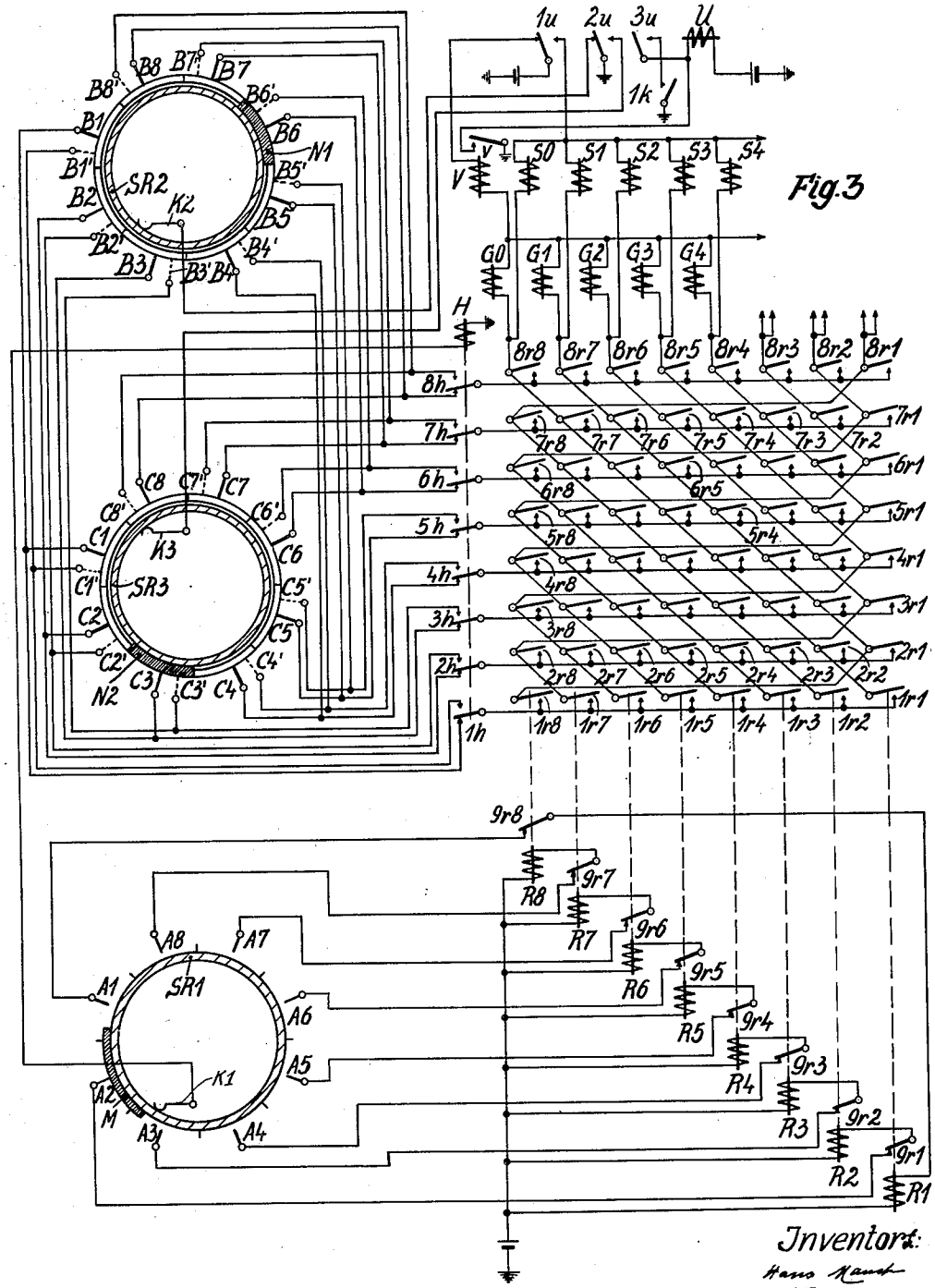


Fig.3

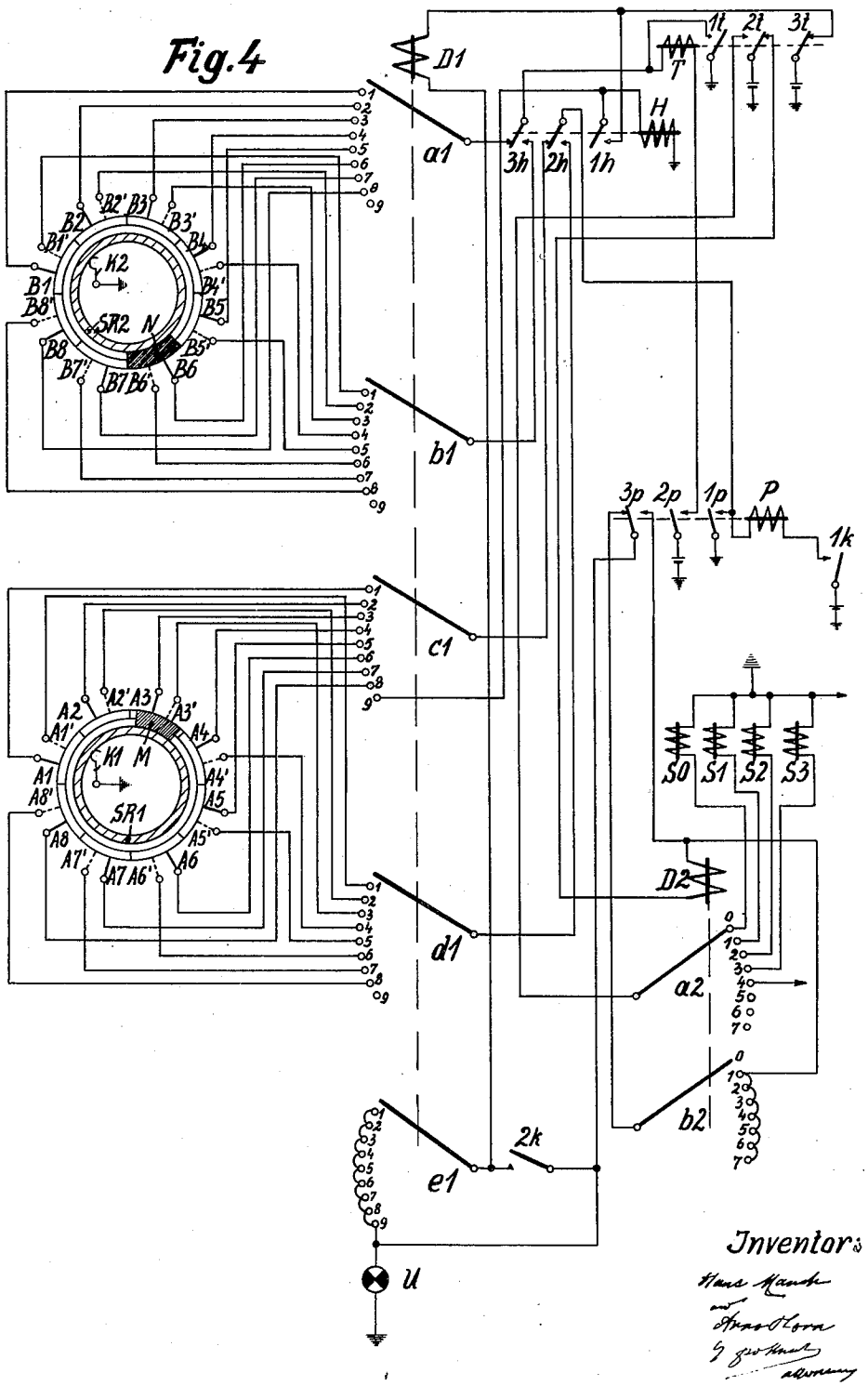
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CONTROL STATION FOR POSTAL PNEUMATIC TUBE PLANTS

Filed Nov. 11, 1932 4 Sheets-Sheet 3

Fig. 4



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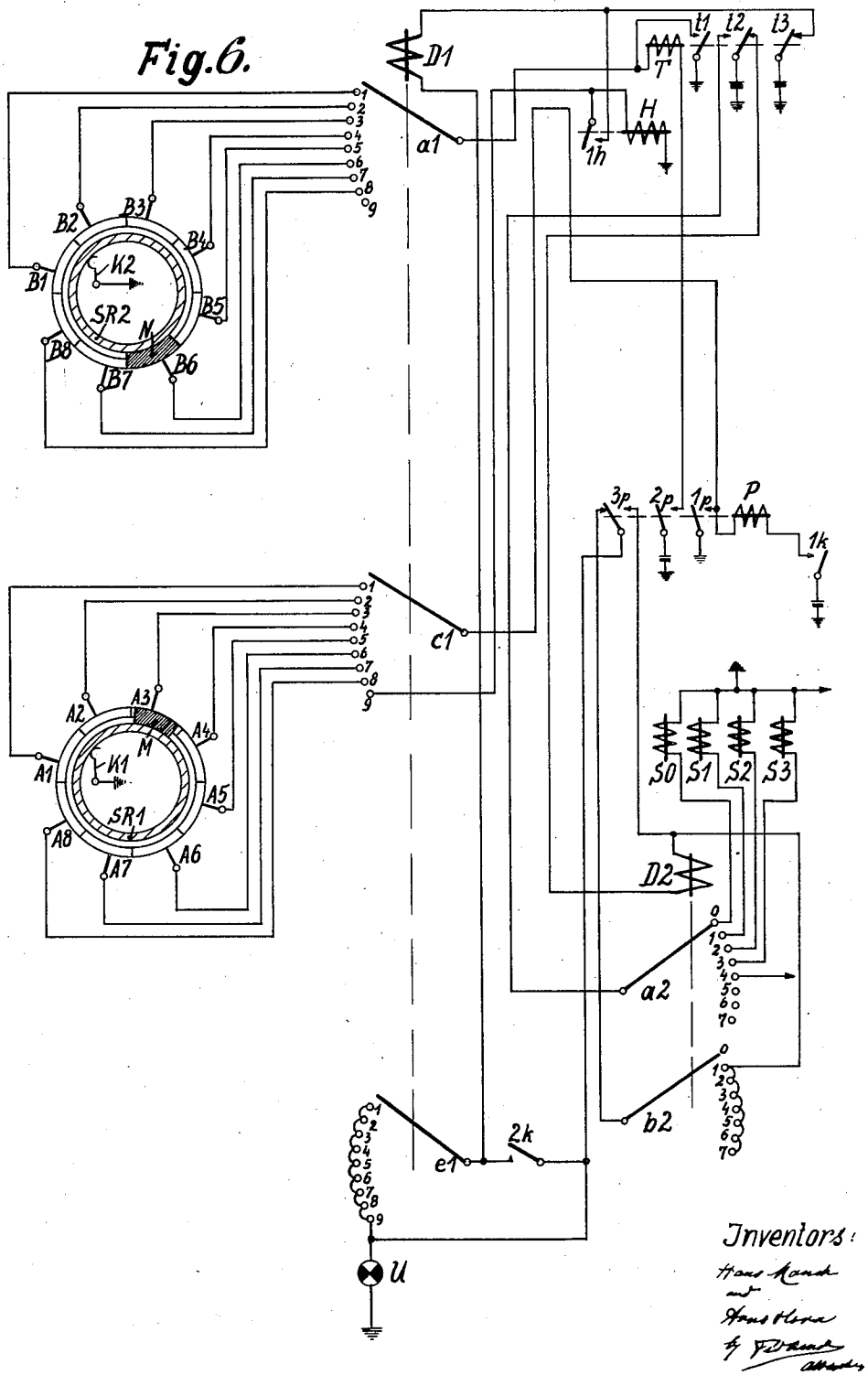
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CONTROL STATION FOR POSTAL PNEUMATIC TUBE PLANTS

Filed Nov. 11, 1932 4 Sheets-Sheet 4

Fig.6.



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CONTROL STATION FOR POSTAL PNEUMATIC TUBE PLANTS

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Application November 11, 1932, Serial No. 642,283
In Germany March 11, 1932

4 Claims. (Cl. 243—16)

It is known to equip the dispatch carriers with adjustable contact segments, by which according to the turning of these rings relative to a fixed contact segment the controlling operations necessary for conducting the carriers to their destination are released. In a control station, which is arranged in front of each carrier deflector or common for several carrier deflectors the position of the adjustable contact segments relative to the fixed contact segment is ascertained, and the controlling operations for setting the carrier deflectors resulting therefrom are released. As the dispatch carrier can turn around its longitudinal axis during its travel through the pneumatic tube it is necessary to either guide the carriers during their travel or provide at the control station a device by which the dispatch carrier is brought into the normal position.

The object of the present invention is to dispense with the arrangements which were necessary in the known plants to bring the dispatch carrier into the normal position at the control station. With the construction of the control station according to the invention it is possible, to ascertain the setting of the adjustable contact segment relative to the fixed contact segment irrespective into which position the dispatch carrier has turned and to utilize this setting for the control of the carrier deflectors.

This advantage is obtained by providing on the control station current feeders and contact pins designed to come into contact, the current feeders with contact pieces fixed on the carrier and the contact pins one with the fixed contact segment and the others with the adjustable contact segments of said contact pieces. For ascertaining the position of the adjustable contact segment relative to the fixed contact segment by difference formation from the result of the feeling. As shown by the constructional examples hereinafter described the ascertaining of the difference between the position of the fixed contact segment and the position of the adjustable contact segments can be effected in various manners by electrical control means. It may be nevertheless mentioned, that this ascertaining might also be effected by purely mechanical means, when methods are employed as known in calculating machines.

It should also be noted, that the position of the carrier in the control station is very unfavourable for ascertaining the destination sign if the fixed contact segment is just situated midway between two contact pins. So as to ensure a reliable working of the control station when a carrier is in this critical position, the fixed contact segment is, according to the invention, constructed so that, when the carrier is in such a critical position, this contact segment either comes into contact with two contact pins or with no contact pins. This criterion is utilized for actuating a controlling operation by which auxiliary contact pins, which are not in a critical position relative to the carrier, are rendered operative for ascertaining the destination mark. It is however possible to allow the contact pin to carry out a rectifying movement instead of employing auxiliary contact pins with unchangeable position.

Several embodiments of the invention are illustrated by way of example in the accompanying drawings in which:

Fig. 1 is a diagrammatic view showing a plan of a pneumatic tube plant.

Fig. 2 is a longitudinal section through a control station.

Fig. 3 shows one form of wiring scheme of the control station.

Fig. 4 shows an alternative form of wiring scheme for the control station.

Fig. 5 shows in cross section another embodiment according to which the contact ring of the control station is turned so that the contact pins carry out a rectifying movement.

Fig. 5*a* is a side elevation of the contact ring shown in Fig. 5.

Fig. 6 shows a suitable wiring scheme for the embodiment shown in Fig. 5.

In Fig. 1 control stations St*1* and St*2* are shown. The dispatch carriers travelling in the direction of the arrow are to be alternatively conducted to the destination stations I to IX. Two group carrier deflectors GW*1* and GW*2* are shown in the diagram, besides which a plurality of single carrier deflectors W*1* to W*9* are shown which lead to the destination stations I to IX. As shown in Fig. 2 adjusting rings ER*1* and ER*2* rotatable around the longitudinal axis of the carrier are provided on the dispatch carriers. The ring ER*1* has a contact segment N*1*, which glides along a slip ring SR*2*. The contact ring ER*2* has also a contact segment N*2*, which slides along a slip ring SR*3*. The size of the contact segments N*1* and N*2* in the example illustrated amounts to one eighth of the circumference of the rings ER*1*, ER*2* respectively. A contact piece M is rigid with the slip ring SR*1*. Eight division lines **0**, **1**, to **7** are engraved in the slip rings SR*2* and SR*3*. In the middle of each of the contact segments N*1* and N*2* a division line Z*1*, Z*2* is en-

graved. Before dispatching the carrier the contact segment N1 is set to one of the division lines 0, 1, 2 and so forth of the slip ring SR2. This setting designates the group carrier deflector GW which must be actuated to enable the carrier to reach its destination. By adjusting the contact segment N2 to a certain division line 0 to 7 of the slip ring SR3 the carrier deflector W1 or W2 and so forth is indicated which has to be actuated. With the two rings SR2 and SR3 each provided with eight division lines 0 to 7 it is possible to determine 64 stations as in each tube section branching off behind a group carrier deflector GW there may be eight station carrier deflectors W1, W2 . . . to W8 which can be selected by adjusting the segment N2 to one of the division lines 0 to 7. Fig. 1 shows only a section of the whole plant. The station points W1, W2 are successively numbered and as the illustration would end with station IX the carrier deflector corresponding to station IX is designated by W9. For example the carrier deflectors W1, W5, W4 and W7 can be selected when the contact segment N2 is set to the division line 1. When the carrier is destined for the station I, the group carrier deflector GW1 must be so set that the carrier runs into the branch designated by GO. This is effected by adjusting the contact segment N1 for example to the division line 0. In the event of the carrier being destined for the station IV the segment N1 must be set to another division line for example to the division line 2. If the carrier is destined for the station VII, the segment N1 must again be set to another division line, for example to the division line 1. Although the segment N2 in the examples described is always adjusted to the division line 1, the carrier travels to the stations I, IV or VII according to the adjustment of the segment N2 by the influence of the group carrier deflector GW1. It must be observed that the station carrier deflectors W1, W2 and so forth situated in the different pipe branches behind the group carrier deflector, can be selected by the same adjustment of the contact segment. A current feeder K1 brushes against the slip ring SR1. Current is supplied to the slip rings SR2 and SR3 by current feeders K2 and K3. Eight contact pins A1 to A8, which are uniformly distributed around the circumference of the ring SR1, brush against the circumference of this ring at the height of the contact piece M. Eight contact brushes B1 to B8, which are uniformly distributed around the circumference of the adjusting ring ER1, brush against the circumference of this adjusting ring ER1. As the size of the contact segment N1 is one eighth of the circumference of the ring ER1, one of the pins B1 to B8 always comes into contact with the contact segment N1. Eight contact pins C1 to C8 brush against the adjusting ring ER2. The pins C1 to C8 are so arranged that one of these pins always comes into contact with the contact segment N2. In each circular row of contact pins A1—A8, B1—B8, C1—C8 the pins are arranged in the same horizontal plane and the corresponding contact pins of all rows are arranged in the same vertical plane. The same applies to the brushes A2, B2, C2 and so forth. At the control station a locking lever Sp is provided by which the oncoming carrier is first arrested to enable the testing of the positions of the contact segments N1 and N2 relative to the fixed contact segment M.

To facilitate the understanding of the diagram shown in Fig. 3 it is assumed that the contact segment N1 is set to the division line 4 and the contact segment N2 to the division line 1. The fixed contact segment M serving as fixed mark is always registering with the division line 0. It is assumed that the dispatch carrier has accidentally arrived at the control station in the position shown diagrammatically in Fig. 3, that is the contact segment M does not come into contact with the contact pin A8 but with the contact pin A2. Also, the contact segment N1 does not come into contact with the contact pin B4 but with the contact pin B6, and the contact segment N2 brushes against the pin C3. When the carrier is in this position the following circuit is closed:—

(1) Earth, relay H, current feeder K1, slip ring SR1, fixed contact segment M, contact pin A2, contact 9r1, relay R2, battery. The attraction of a relay is dependent upon the current flowing through the relay and the construction of the relay, such as number of windings, armature, yoke and load of the armature. By the number of contact springs and suitable choice of the constructional elements it is therefore possible when two relays are connected in series, to attract one relay and not attract another relay with the same current. This is an obvious measure known to every electric control technician and therefore does not need further description.

The resistances of the relays R1 to R8 are so chosen that the relay H in the circuit 1 does not attract, whereas the relay R2 does. The contacts 1r2 to 9r2 are reversed, that is the operating contacts 1r2, 2r2 to 8r2 in the diagram are closed and the contact 9r2 is opened. The operating contacts of the relays R1 to R8 are shown in the wiring scheme. In Figs. 3 and 4 the relays are designated by capital letters, whereas the contacts of the relays are designated by small letters. The individual contacts on each relay are designated by prefixed numbers. For example the relay H in Fig. 3 has eight contacts 1*h*, 2*h*, 3*h*, 4*h*, 5*h*, 6*h*, 7*h* and 8*h*. The contacts of the relays are shown in the position they occupy when the relay is excited. All the contacts of each of the relays R1 to R8 are shown. The contacts 1r1, 2r1 to 8r1 and the contacts 1r2, 2r2, 3r2 and so forth to 8r2 of the relay R2 are operating contacts, that is the two contact springs are closed when the relay is excited. By the operation of the relay R2 the following circuit is closed:—

(2) Earth, contact 2*u*, current feeder K2, slip ring SR2, contact segment N1, contact pin B6, contact 6*h*, contact 6r2, relay G4, relay V, contact 1*u*, battery.

The relay G4 in a circuit not shown in the drawings closes in known manner the circuit for a magnet which reverses the corresponding carrier deflector GW in a suitable manner. The relay U is caused to respond through the contact *v* of relay V, which relay is held through its own contact 3*u* in dependency on the tube contact *k* (Fig. 2). Owing to the responding of the relay U the following circuit is closed through the operative contact 2*u*:—

(3) Earth, 2*u*, K3, SR3, N2, C3, 3*h*, 3r2, relay S1, 1*u*, battery.

In the circuit 3 the relay S1 attracts its contacts (not shown) and the group relay G4 operates the corresponding carrier deflector.

The group point magnet G4 is caused to attract according to the adjustment of the contact segment N1 to the division line 4, and the relay S1 according to the adjustment of the contact segment N2 to the division line 1. The carrier at the control station can now leave same.

Assume that the carrier happens to be in the control station in such a position that the fixed contact segment M comes simultaneously into contact with two pins A2 and A3. The length of the contact segment M must be slightly greater than the distance between two contact pins, whereas the length of the contact segments N1 and N2 is slightly less than the distance between two contact pins. In the example in question the contact segment N1 is therefore midway between the contact pins B5 and B7, without coming into contact with either. The contact segment N2 likewise is midway between the contact pins C3 and C4. As the contact pins A2 and A3 are connected with the contact segment M the relays H, R2 and R3 attract in the following circuit:—

(4) Earth, H, K1, SR1, M, A2, 9r1, R2, battery, and parallel thereto:

A3, 9r2, R3, battery.

In this circuit the relays H, R2 and R3 attract their contacts.

Owing to the parallel connection of the relays R2 and R3 the current for the relay H is increased, so that this relay can attract. After the relay R2 has attracted, the circuit for the relay R3 is interrupted by the contact 9r2. The strength of current of relay H is reduced by cutting out of relay R3 but is still sufficient to prevent this relay from dropping off. The contact pins B1′ to B8′ and C1′ to C8′ are switched onto the contacts of the relays R1 to R8 by the contacts 1h to 9h of the relay H. The circuit (2) is closed through the contact pins B6′, whereas the circuit (3) is closed through the contact pins C3′. As already mentioned above the resistances of the relays R1 to R3 are so chosen that the relay H, when it is connected in series with one of these relays, receives insufficient current, that is it does not attract. When the windings of two of the relays R1 to R8 are connected in parallel, assuming that each winding has the same resistance, only half the resistance is operative in the circuit for the relay H so that the current in the relay H increases correspondingly and causes the relay H to attract. The succeeding control operations are the same as already described.

The second constructional example of the invention is illustrated in Fig. 4. Step-by-step switches are employed instead of the contact arrangement of a series of relays connected by wires in known manner for difference formation. It is assumed for the sake of simplicity that only the station points S0, S1 and so forth have to be influenced from the control station. The ascertaining of this station point is effected also in this instance by shifting the contact segment N relative to the contact piece M.

Assume that the contact segment N is put on the division line 3 in order that the relay S3 be influenced when the pneumatic dispatch carrier is in the control station St1, the relay S3 will then effect the reversing of the carrier deflector W3. The pneumatic dispatch carrier 2 arrives at the control station in the position indicated, that is the contact segment M, which is always opposite the division line 0, does not come into contact with the contact pin A8 but with the contact pin A3. In this position the adjusting segment N does not come into contact with the contact pin B3 but with the contact pin B6. As soon as the carrier is arrested at the control station by the locking lever Sp (see Fig. 2), the contacts 1k, 2k are reversed, that is the contacts 1k and 2k are closed and assume the position indicated in full lines in Fig. 2. By the closing of contact 2k break current is supplied to the rotary magnet D1, so that the contact arms a1, b1, c1, d1, e1 are moved on stepwise in a manner similar to that of the known automatic telephone selector disc mechanism:—

(5) Earth, break contact U, tube contact 2k in the control station, rotary magnet D1, contact 3t of the relay T, battery.

As soon as the contact arm c1 has reached the step 3 the relay P attracts in the following circuit:—

(6) Earth, current feeder K1, slip ring SR1, contact segment M, contact pin A3, contact arm c1, contact 2h of the relay H, testing relay P, tube contact 1k, battery.

The relay P is held by its own contact 1p; therefore the relay P must remain excited when the contact arm c1 is moved on and consequently the exciter circuit for the relay P is interrupted. The retaining circuit for the relay P extends through earth—1p—P—1k—battery; the rotary magnet D2 receives break current through the contact 3p of the relay P, so that the contact arms a2, b2 are moved on in steps. The contact arms a1 to e1 of the one step-by-step switch and the contact arms a2, b2 of the second step-by-step switch now move on in the same rhythm. The contact arms a1 to e1 of the first step-by-step switch move three steps ahead of the contact arms a2, b2 of the second step-by-step switch. As soon as the contact arm a1 reaches the step 6 the relay T attracts in the following circuit:—

(7) Earth, current feeder K2, slip ring SR2, contact segment N, contact pin B6, contact arm a1 on step 6, contact 3h, relay T, contact 2p, battery.

The relay T is held over its own contact 1t. The deflector magnet S3 is now excited in the following circuit through the contact 2t owing to the attraction of the relay T:—

(8) Battery, contact 2t, contact arm a2 on step 3, magnet S3, earth.

By means of the relay S3 a carrier deflector magnet is switched which actuates the carrier deflector leading to station III. By the reversing of the contact 2t the rotary magnet D2 becomes dead and the attracting circuit for the rotary magnet D1 is interrupted by breaking the contact 3t. The contact 3t is not interrupted by the dropping of the rotary magnet D2 but the attraction of the relay T in the circuit 7 causes the reversal of the contacts 1t, 2t, 3t. Contact 2t causes the switching out of the magnet D2 and the contact 3t causes the switching out of the magnet D1. The carrier leaves the control point when the points GW and W (Fig. 1) are set, so that the carrier reaches the stations I, II, III . . . for which it is destined. As soon as the carrier has left the control station, the tube contacts 1k and 2k return into their inoperative positions. The retaining circuit for the relay P is interrupted by the contact 1k. Owing to the dropping of the relay P the relay T becomes dead, its retaining circuit being interrupted by the contact 2p. The contact arm e1 is moved in steps by the rotary magnet in the same manner as the contact arms a1, b1, c1, d1. The contacts 1–9 brushed by the contact arm e1 are interconnected, contrary to the contact steps brushed by the contact arms a1, b1, c1, d1. The contact arm b2 is moved by the rotary magnet D2. The rotary magnet D1 is again excited by the contact arm e1 and the rest contact 3t, the contact arms a1 to e1 being returned into their initial positions.

The rotary magnet D2 likewise receives break current in the following circuit:—

(9) Battery, 2*t*, D2, *b*2, 3*p*, U, earth.

As soon as the contact arms *a*2, *b*2 have reached their initial positions which is step 0, the circuit 9 is broken by the contact arms *b*2. The relay H should only attract when the carrier in the control station is in an unfavorable position relatively to the contact brushes A1, A2 . . . B1, B2 . . . In this instance the determination of the angle between adjustable mark N relatively to the fixed mark M is effected by the auxiliary contact brushes A1′, A2′ . . . A2′, B2′ . . . and B1′, B2′ . . .

In order to ensure a reliable feeling of the mark on the carrier when the adjusting elements on the carrier happen to be in an unfavourable position relative to the feeler elements in the control station, a reversing is caused. For this purpose the length of the contact segment M is chosen slightly shorter than the distance between two contact pins A1, A2 and so forth, so that, when the carrier is in an unfavourable position, the contact segment M will not come into contact with one of the pins A1, A2 and so forth.

Assume, that the contact segment M is situated midway between the contact pins A3 and A4. Consequently, when the contact arm *c*1 checks the position of the contact segment M, the testing potential on the current feeder K1 does not lie on any of the steps 1 to 8. However, the following circuit is made on the step 9:—

(10) Earth, relay H, contact arm *c*1 on step 9, contact 2*h*, relay P, tube contact 1*k*, battery.

In this circuit only the relay H attracts as the winding of this relay must be of such high resistance, that the relay P cannot respond. The contacts 1*h*, 2*h* and 3*h* are actuated when the relay H is excited. Relay H is held in the following circuit:—

(11) Earth, H, 1*h*, 3*t*, battery.

As the attracting circuit 5 for the rotary magnet D1 (earth, break contact U, tube contact 2*k* in the control station, rotary magnet D′, contact 3*t* of the relay T, battery) has not yet been broken by the contact 3*t*, the contact arms *a*1 to *e*1 are shifted a second time over the different contact steps. As soon as the contact arm *d*1 has reached the step 3, the relay P attracts in the following circuit:—

(12) Earth, K1, M, A3′, *d*1 on step 3, 2*h*, P, 1*k*, battery.

By the attraction of the relay P break current is supplied to the rotary magnet D2 over the contact 3*p*, as already explained, so that the contact arms *a*2 and *b*2 move on simultaneously with the contact arms *a*1 to *e*1. As soon as the contact arm *b*1 reaches the step 6, the relay T attracts in the following circuit:—

(13) Earth, K2, SR2, N, B5′, *b*1 on step 6, 3*h*, T, 2*p*, battery. The relay T in the circuit 13 has attracted and actuates the contacts 1*t*, 2*t*, 3*t*. The circuit for the magnet D2 is interrupted by the contact 2*t* and the circuit for the relay S3 closed over the contact 2*t*. The contact arm *a*2 is on the step 3 when the relay T attracts. The contact arm *a*2 moved by the magnet D2 has moved from step 0 to step 3 during the same time as the contact arm *b*1 is moved by D1 from step 3 to step 6.

Owing to the reversal of the contact 2*t* and the contact arm *a*2 on the step 3, the point magnet S3 attracts and the rotary magnet D2 is stopped. By the opening of the contact 3*t* when the relay T attracts the attracting circuit for the rotary magnet D1 is broken and the relay H caused to drop by breaking the contact 3*t* because it was held by the circuit earth, H, 1*h* closed, 3*t* closed and battery. The further control operations and the return movement of the step-by-step switch are the same as already described.

Instead of effecting a switching over onto the auxiliary contact pins by a relay H, the main contact pins themselves might be moved into the position shown in dash lines. In this instance the contact arms *b*1 and *d*1 are not necessary; however for the same a device must be substituted in the control station by which the entire ring of contact pins is rotated through a certain angle. Fig. 5 shows how this can be carried out.

The superposed contact pins A1, B1, A2, B2 and so forth are fixed in a cylindrical insulating element J inserted in the tube, which, as shown in Fig. 2, is rotatable around the tube axis. A projection Z on the cylinder J is acted upon by a spring F. The projection Z is pressed against the plunger core H1 of the magnet H by the spring F. The movement of the core H1 is limited by a fixed abutment A*n*. When the magnet H attracts as described in connection with Fig. 4, the cylinder J is rotated a certain angle by the core H1 in opposition to the action of the spring F, so that the brushes A1, B1 and so forth move out of their critical position for feeling the destination mark. A notch X is provided on the cylinder J in which notch a pawl L engages in order to maintain the brushes in their new position after the magnet H has become dead. As soon as the carrier leaves the control station, an abutment Q rigidly connected to the locking lever *Sp* is moved in the direction of the arrow by the movement of the locking lever Sp and lifts the pawl L out of engagement with the notch X so that the cylinder J is returned into its initial position by the action of the spring F. The above described correcting movement of the contact pins might also be effected by mechanical means, if, for example, the contact pins are not, as is here the case, constructed as contact brushes, but as feeler pins which feel the destination mark composed of projections and depressions on the surface of the carrier.

We claim:—

1. Control station for pneumatic tube plants in which carrier deflectors situated behind the control station in the direction of travel of the carrier are electrically adjusted from the control station by contact segments adapted to be displaced by hand about the axis of the carrier relatively to a fixed contact segment thereon according to the desired destination station before dispatching the carrier, comprising in combination contact pins arranged in sets on the inner wall of the tube, the contact pins of each set uniformly distributed on the wall of the tube and situated in the same horizontal plane, all contact pins consecutively numbered, the contact pins of the same numeral in the different sets situated in the same vertical plane, one current feeder for each set of contact pins, all current feeders being consecutively numbered, a number of contact pieces on a carrier one for each current feeder, a fixed contact segment on one of said contact pieces, an adjustable contact segment on each of the other contact pieces, and a switch arrangement connected with the contact pins and the current feeders for determining the angular displacement between the adjusted contact

segments and the fixed contact segment on the carrier by the difference between the numerals of the contact pins at the control station engaging the adjusted contact segments of the carrier and the numeral of the contact pin at the control station engaging the fixed contact segment of the carrier.

2. A control station as specified in claim 1, comprising in combination with the dispatch carrier and the contact pins, auxiliary contact pins arranged displaced relative to said first mentioned contact pins, the fixed contact segment on said carrier being larger than the interval between two adjacent contact pins, and an auxiliary relay adapted to be actuated by said fixed contact segment in the event of said carrier being in an unfavorable position for the feeling operation by said first mentioned contact pins, said relay adapted to switch the switch arrangement on to said auxiliary contact pins.

3. A control station as specified in claim 1, comprising in combination with the dispatch carrier and the contact pins in the tube, a movable piece of said tube carrying the current feeders and the contact pins, the fixed contact segment of the carrier being longer than the distance between two adjacent contact pins, an outwardly directed spring-controlled projection on said tube piece, and an electric arrangement adapted to be actuated by said fixed contact segment to bring said contact pins into a favorable position for feeling a dispatch carrier arriving at the control station in an unfavorable position.

4. A control station as specified in claim 1, in which the number of contact pins for ascertaining the position of the fixed contact segment is equal to the number of contact pins for ascertaining the position of said adjustable contact segments.

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