July 29, 1958 A. R. STAHL 2,845,164

ELEMENT FEEDING ARRANGEMENT

Filed Nov. 18, 1953 3 Sheets-Sheet 1

Fig. 1.

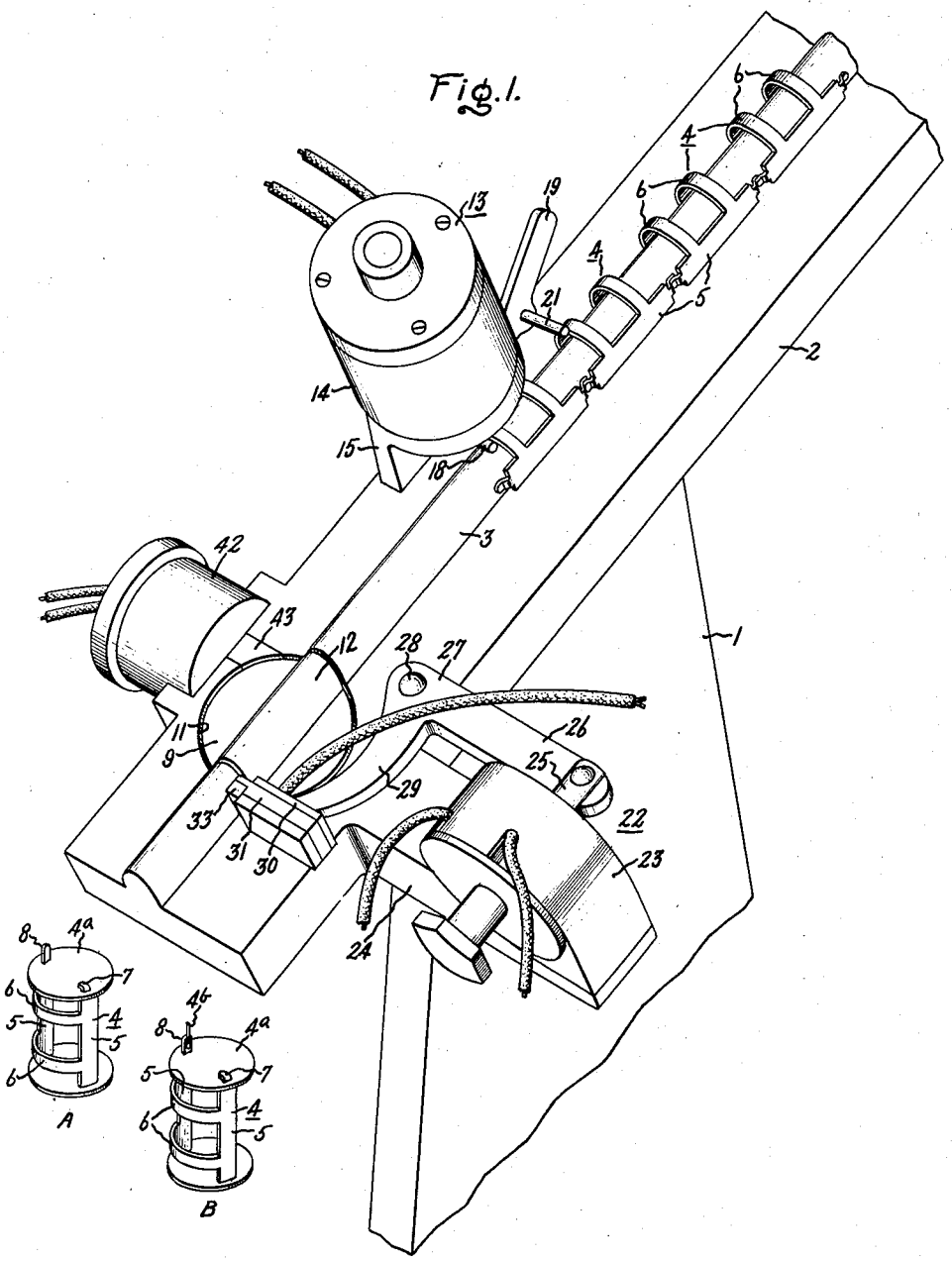

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Fig. 2.

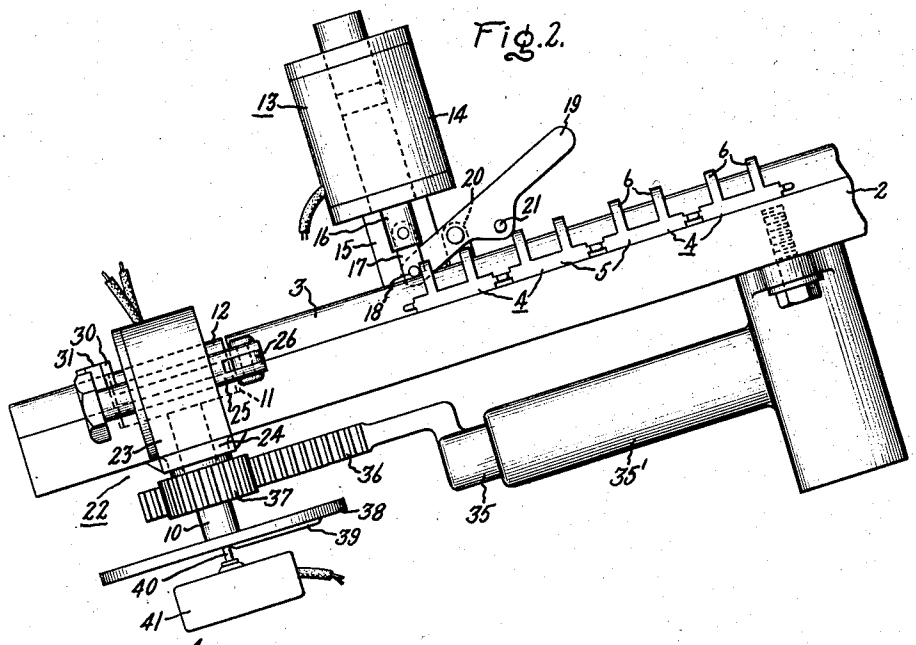


Fig. 3.

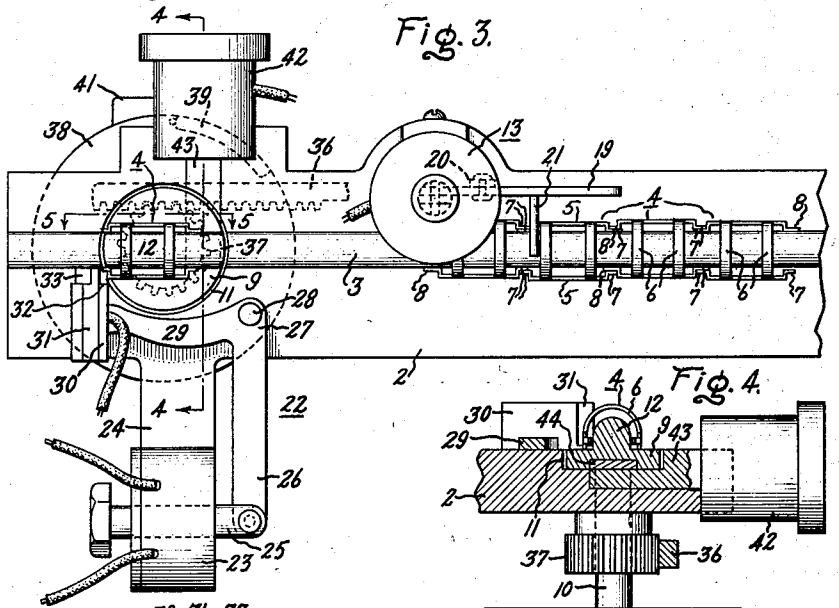


Fig. 4.

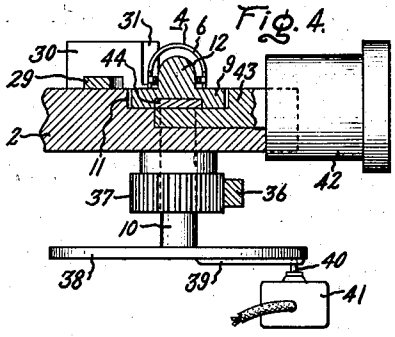
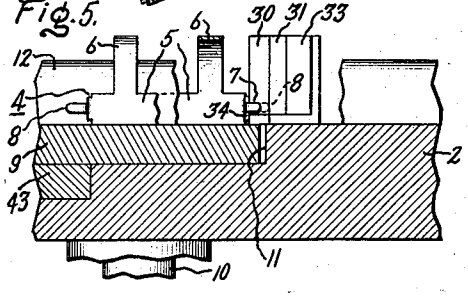


Fig. 5.



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ELEMENT FEEDING ARRANGEMENT

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Fig. 7.

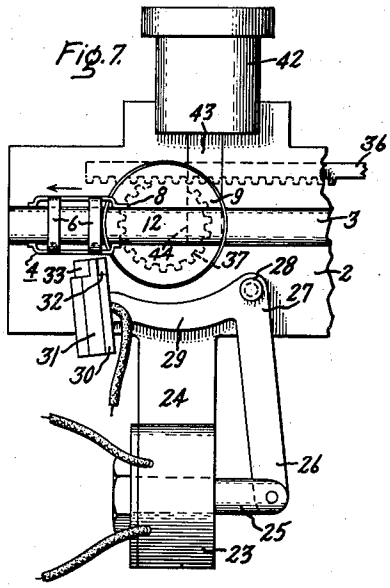


Fig. 8.

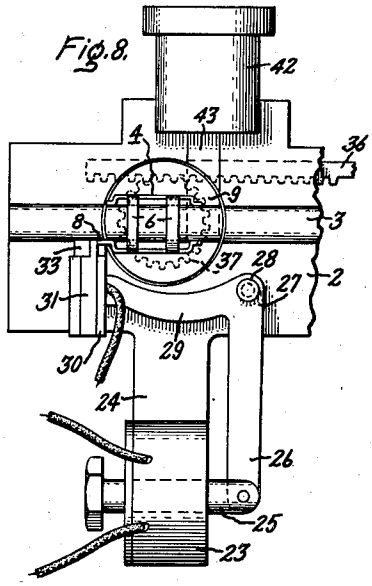


Fig. 9.

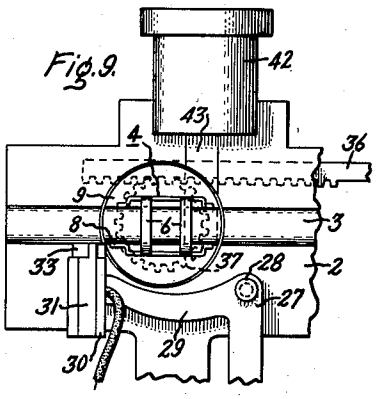
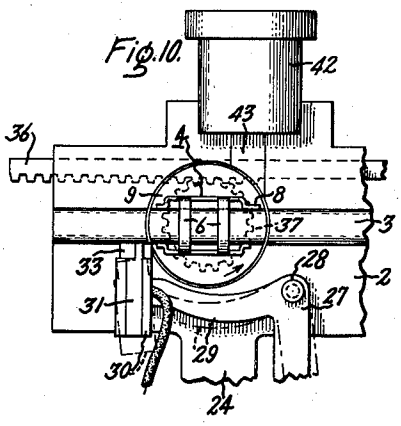


Fig. 10.



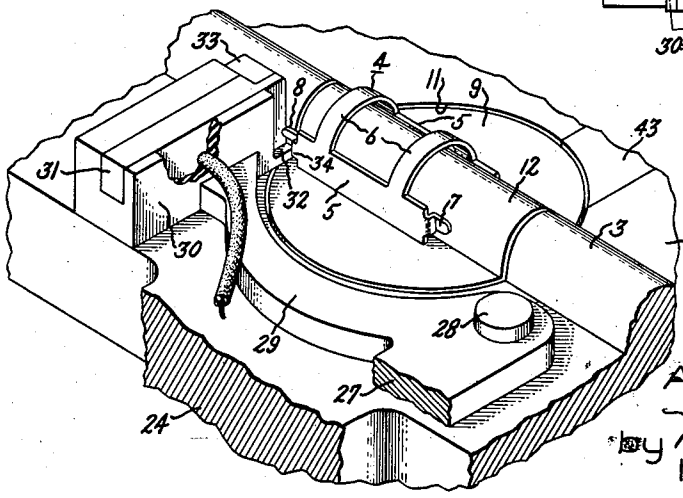


Fig. 6.

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2,845,164

ELEMENT FEEDING ARRANGEMENT

Alfred R. Stahl, Garnet Lake, N. Y., assignor to General Electric Company, a corporation of New York

Application November 18, 1953, Serial No. 392,902

15 Claims. (Cl. 198—33)

My invention relates to the manufacture of electron discharge tubes and pertains more particularly to automatic machinery for assembling electron discharge tube devices.

Many electron discharge tubes include devices comprising elements such as anodes which are formed at their ends to include tabs. The tabs are provided for being inserted into suitable apertures in insulators on either ends of the anodes and bent over for fastening the anodes and insulators together. This operation can be formed at one assembly station of a tube manufacturing machine. Often one of the tabs on each anode is formed longer than the rest to serve as contact lugs for having other elements of the tubes subsequently electrically connected thereto at another assembly station of the machine. When this is the case the anodes must be predeterminedly positioned or orientated when arriving at the second assembly station to insure satisfactory positioning of the longer tabs relative to the elements to be connected thereto.

The present invention contemplates the provision of automatic means for feeding and directing the anodes to an assembly station of a machine, at which station the anodes and insulators are to be fastened together, in such a manner that the long tabs or contact lugs will be so predeterminedly positioned that when moved in the same position to the next assembly station the contact lugs will be satisfactorily positioned relative to the elements to be connected thereto.

A primary object of my invention is to provide, in an electron discharge tube device assembling machine, a new and improved automatic arrangement for feeding elements to an assembly station of the machine in a particular manner.

Another object of my invention is to provide, in an electron discharge tube device assembling machine, a new and improved arrangement for feeding and directing elements to one assembly station in such a predetermined position that when moved in the same position to another assembly station the elements will be satisfactorily positioned relative to other elements to be connected thereto at the other station.

Another object of my invention is to provide, in electron discharge tube device manufacturing machines, a new and improved automatic arrangement which will aid in increasing production.

Still another object of my invention is to provide, in electron discharge tube device manufacturing machines, a new and improved automatic arrangement which is adaptable for use with other automatic devices in arriving at complete automation of electron tube manufacture.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

In carrying out the objects of my invention I provide a chute arranged for feeding and directing anodes or similar elements along a path to an assembly station.

By cyclically operative means, individual anodes are permitted to slide down the chute seriatim and in spaced apart relationship. Provided in the chute is a turntable. By means of a cyclically operative stop member each anode is stopped on the chute and subsequently released for continuing its travel down the chute. If, when stopped, the end of the anode having short tabs, engages the stop member the turntable remains stationary and when the stop member releases the anode it continues down the chute. If the end of the anode having the long tab engages the stop member the long tab engages a contact member carried by the stop member and an electrical control circuit is completed through the turntable, the anode and the contact member. Good contact between the contact member and the long tab is insured by a magnet carried by the stop member which attracts the anode thereto. The completed control circuit operates means for rotating the table 180° to rotate the anode and thereby direct the shorter tabs downward and to energize magnetic means for centering the anode on the turntable during rotation. During rotation of the turntable the stop member retracts whereby the anode is thereafter permitted to continue down the chute the longer tab last.

For a better understanding of my invention, reference may be had to the accompanying drawing in which:

Fig. 1 is a perspective view illustrating a preferred embodiment of my device;

Fig. 2 is a side elevational view of the device;

Fig. 3 is a plan view of the device;

Fig. 4 is a fragmentary sectional view taken along the lines 4—4 in Fig. 3;

Fig. 5 is an enlarged fragmentary sectional view taken along the lines 5—5 in Fig. 3;

Fig. 6 is an enlarged fragmentary perspective view illustrating in detail the turntable and stop member;

Fig. 7 is a fragmentary plan view illustrating retraction of the stop member and release of the anode for movement off the turntable;

Fig. 8 is a similar view illustrating the contact lug of the anode in engagement with the contact member;

Fig. 9 is another similar view illustrating the anode centered on the turntable; and

Fig. 10 is still another similar view illustrating the manner in which the anode is redirected when the turntable is rotated.

Referring to Fig. 1 there is shown a vertically extending frame piece **1** having secured thereto an inclined member or chute **2** including a single guide rail **3**. By means not shown the chute **2** is adapted for having anodes **4** supply thereto and placed on the guide rail **3**. As seen in Figs. 1 through 3 the anodes **4** are each formed to comprise a pair of parallel spaced apart elongated portions **5** connected by a transverse pair of spaced apart arcuate portions **6**. Additionally, the anodes **4** are each formed to have a tab on each of the four end portions of the elongated portions **5**. Three of the tabs are short tabs designated **7**. The fourth tab is relatively long and is designated **8**.

The chute **2** is adapted for guiding the anodes to an assembly station A. At the assembly station A, and by means not shown, the anodes are fastened to other elements such as mica insulators **4***a* by having tabs thereon first inserted through suitable apertures in the insulators and thereafter bent over. As brought out above the tabs **8** are longer than the other tabs **7**. The tabs **8** are not bent over and are made longer in order to serve as contact lugs and be electrically connected at a subsequent assembly station B to other elements of the electron tubes such as wires **4***b*.

Now since the long tabs **8** are to be connected to other elements in the tubes it is essential that the long tabs be predeterminedly positioned or oriented relative to the

other elements at assembly station B where the connecting operation is performed. To accomplish this the anodes and insulators are fastened together at station A with such a predetermined positioning or orientation of parts that when moved to the next station B in the same position satisfactory positioning of the contact lugs relative to the wires 4*b* will be obtained.

The predetermined positioning of the anodes at station A is obtained by feeding and directing the anodes thereto in a particular manner and more specifically by feeding and directing the anodes to this station with the end of the anodes having the long tabs **8** extending upward.

The means above-referred to and not shown which places the anodes **4** on the rail **3** does so indiscriminately. That is, when placed on the rail, some of the anodes have the long tabs extending downward and others have them extending upward. Therefore the anodes will be normally fed down the chute indiscriminately in a desired orientation and in an undesired orientation. In order to enable the device to feed and direct all anodes to station A with the long tab **8** last or extending upward, which is the desired orientation, a turntable **9** is provided in the chute **2**. The turntable **9** is fixed on the end of a shaft **10** rotatably fitted in the chute and is so set in a circular recess **11** in the chute that the tops of the chute and the turntable are coplanar, in the manner shown in Figs. 4 and 5. Additionally, the turntable **9** is formed to include a rail portion **12** for connecting the portions of the chute rail **3** on either side of the turntable.

The anodes **4** are fed individually down the chute to the turntable **9** seriatim and in spaced apart relationship by time operated releasing means generally designated **13**. The releasing means **13** includes a solenoid **14** mounted on a bracket **15** secured to the chute **2**. The solenoid **14** is adapted for being energized cyclically or at predetermined time intervals. As best seen in Fig. 2 the solenoid **14** includes a plunger **16** pivotally connected through a link **17** and a pin **18** to a release lever **19**. Intermediate its ends the release lever **19** is pivotally mounted on another member **20** secured to the chute **2**. Carried on the side of the lever **19** opposite the pin **18** is another pin **21**. Both the pins **18** and **21** extend over the rail **3** for cooperating with the anodes **4** thereon. When the solenoid **14** is deenergized the plunger is down and the pin **18** engages the forward one of the arcuate portions **6** of the first anode on the chute to prevent it from sliding down the chute. When the solenoid is energized the plunger **16** is lifted for thereby rotating the lever **19** clockwise in Fig. 2. This raises the pin **18** out of the path of the first anode for permitting it to slide down the chute. Additionally, it moves the other pin **21** into the path of the succeeding anode for blocking its descent down the chute. Subsequently when the solenoid **14** is again deenergized the pin **18** is lowered and the pin **21** is raised and what was the succeeding anode becomes the one blocked by the pin **18** and the one next to be released when the solenoid is again energized. Thus the individual anodes are released and fed seriatim and in spaced apart relationship for sliding down the chute **2** onto the turntable **9**.

Each anode is stopped on the turntable by a stopping mechanism generally designated **22**. The stop mechanism **22** includes a solenoid **23** mounted securely on a lateral extension **24** of the chute **2**. The solenoid **23** is adapted for being energized cyclically and in timed relationship with respect to the feeding mechanism **13**. The solenoid **23** includes a plunger **25** to which is pivotally connected one arm **26** of a bell crank **27** pivotally mounted at **28** on the chute adjacent the turntable. The other arm **29** of the bell crank carries a stop member **30**.

As perhaps best seen in Fig. 6 the stop member **30** is formed of an insulative material and is channel-like in construction for carrying an electrical contact member **31**. Additionally the stop member **30** is formed to include a step **32** for exposing a portion of the contact member **31** to anodes on the turntable **9**. A permanent magnet **33** is also carried by the stop member and secured thereto on the side of the contact member opposite the step **32**. The permanent magnet attracts anodes on the turntable toward the contact surface and insures good electrical contact if a portion of an anode engages the contact member.

The operation of the stop mechanism is such that when an anode slides down the chute and onto the turntable it is attracted by the magnet **33** toward the stop member and the shoulder **32** of the stop member is engaged by a portion **34** on the anode beneath each tab whereby the anode is stopped on the turntable in the manner shown in Figs. 3–6. If the anode when stopped is desirably oriented on the turntable or so directed that the long tab **8** is extending upward a short tab **7** will overlie the shoulder **32** in the manner shown in solid lines in Fig. 5 and no electrical contact will be made between the anode and the contact member **31**. Thereafter the solenoid **23** of the stopping mechanism **22** is deenergized and the stop member **30** is retracted in the manner shown in Fig. 7. This permits the anode to continue down the chute to the assembly station A at which it will be satisfactorily positioned for being fastened to the insulators 4*a* and moved to a succeeding work station B at which it will be satisfactorily positioned relative to the wire 4*b* to be connected thereto.

Following retraction of the stop member and movement of the anode off the turntable the feeding means **13** permits the succeeding anode to slide down the chute and onto the turntable **9**. If this anode should be incorrectly directed or undesirably orientated on the rail **3** or, in other words, have the long tab **8** extending downward instead of upward the magnet **33** will draw the long tab into good electrical contact with the contact member **31** when the anode is stopped on the turntable by engagement with the shoulder **32** of a stopping member. Thus, a control circuit will be completed through the contact member **31**, the anode **4** on the turntable and the turntable. The control circuit when completed effects actuation to the left in Fig. 2 of a piston **35** arranged for operating pneumatically in a cylinder **35'** suitably supported on the under side of the chute **2**. Carried by the piston **35** is a rack **36** meshing with a gear **37** secured on the turntable shaft **10** on the underside of the chute **2**. When the piston **35** is fully actuated the turntable is revolved 180° counterclockwise in the manner shown in Fig. 10 whereby the anode which was formerly directed with the long tab extending downward is rotated or redirected for having the long tab extend upward.

Carried on the shaft **10** below the gear **37** is a face cam **38** shown in Figs. 2–4. The face cam **38** includes a lobe **39** for cooperating with a plunger **40** of a microswitch **41**. As seen in Figs. 2 and 3 this cooperation is such that for a period commencing substantially immediately after the turntable begins rotating counterclockwise and continuing for approximately 45° of rotation thereof the microswitch **41** will be closed. When closed the microswitch energizes an electromagnet **42** suitably mounted laterally on the chute opposite the stop mechanism **22**. The electromagnet **42** includes a soft iron core **43** which, as best seen in Figs. 1, 3 and 4, is set in a recess in the top of the chute. The core **43** includes a portion which underlies the turntable **9** and cooperates with a soft iron armature **44**, suitably set in the underside of the turntable **9** in the manner clearly shown in Fig. 4. When the microswitch **41** is closed and the electromagnet **42** is energized, the armature **44** becomes magnetized and attracts the anode on the turntable which completed the control circuit. This attraction moves the anode away from the contact member and onto the center of the turntable, in the manner shown in Fig. 9. This disposes the anode for unobstructed movement with the turntable and opens the control circuit which effected actuation of the piston **35**. During turning of the anode in the just

described manner the stop mechanism operates so that upon completion of the turn the anode is permitted to slide off the turntable and down the chute to assembly station A. Thereafter the piston **35** is spring returned to the position of Fig. 2 whereby the rack **36** thereon is effective for cooperating with the gear **37** for rotating the turntable 180° clockwise to return it to its initial rotative position and thereby reset the mechanism for redirecting the succeeding anode if it is not disposed on the rail **3** with the long tab extending upward.

It will be seen that while I have shown and described my device as an arrangement for feeding anodes to an electron discharge tube device assembly station in a desired orientation it can be employed for insuring the feeding of other elements of electron discharge tube devices or similar devices in a desired orientation.

While I have shown and described a specific embodiment of my invention I do not desire my invention to be limited to the particular form shown and described and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, and automatically operating means located along the path of said feeding means including means responsive to the arrival at said automatic operating means of an element in an undesired orientation to operate said automatic operating means in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation, and means for further securing said element along the path of said feeding means during reorientation of said element by said automatically operating means.

2. In a machine for assembling elements of electron discharge tube devices, including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, and automatically operating means responsive only to arrival on said turntable of an element in an undesired orientation to rotate said turntable in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation.

3. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination including; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, and contact means which is unaffected by the arrival of an element on said turntable in a desired endwise orientation but which is engageable by a predetermined portion of an element upon arrival of said element on said turntable in an undesired endwise orientation to effect rotation of said turntable in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation.

4. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, contact means engageable by a predetermined portion of an element upon arrival of said element on said turntable in an undesired orientation to effect rotation of said turntable in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation, and means for insuring good contact between said contact means and said element.

5. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, contact means engageable by a predetermined portion of an element upon arrival of said element on said turntable in an undesired orientation to effect rotation of said turntable in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation, and means effective for centering said element on said turntable during rotation of said turntable.

6. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, means for stopping each element on said turntable, and contact means which is unaffected by the arrival of an element on said turntable in a desired endwise orientation, but which is engageable by a predetermined portion of an element stopped on said turntable in an undesired endwise orientation to effect rotation of said turntable in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation.

7. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, means for stopping each element on said turntable, and contact means engageable by a predetermined portion of an element stopped on said turntable in an undesired orientation to effect rotation of said turntable in said path of said feeding means and thereby alter the orientation of said element in said path to said desired orientation, and magnetic means associated with said contact means for insuring good contact between said contact means and said element on said turntable.

8. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station, said feeding means normally feeding said elements indiscriminately in a desired orientation and in an undesired orientation, a turntable located along the path of said feeding means, means for stopping each element on said turntable, contact means engageable by a predetermined portion of an element stopped on said turntable in an undesired orientation to effect rotation of said turntable and thereby alter the orientation of said element to said desired orientation, and magnetic means effective for centering said element on said turntable during rotation of said turntable.

9. In a machine for assembling elements of electron discharge tube devices including an assembly station, the combination comprising; means for feeding individual ones of said elements to said assembly station including a chute and a turntable disposed in said chute, means for stopping each element on said turntable, contact means engageable by a predetermined portion of an element stopped on said turntable in an undesired orien-

tation to effect rotation of said turntable and thereby alter the orientation of said element to said desired orientation, a magnet carried by said stopping means for attracting said element toward said contact means to insure good contact between said contact means and said element, and electromagnetic means arranged to be energized during rotation of said turntable, said electromagnetic means including a core underlying said turntable, and an armature carried by said turntable for attracting and centering said element on said turntable during rotation thereof.

10. In an electron discharge tube device assembling machine, means for feeding and directing anodes having a contact lug formed thereon in a predetermined manner to a work station comprising; a turntable, a chute for having anodes slide theredown onto said turntable, means for feeding individual anodes down said chute seriatim in spaced apart relationship, means for stopping each anode on said turntable, contact means associated with said last-mentioned means, said contact means being engageable only by said contact lugs, and means for rotating said turntable 180° to redirect an anode thereon, said last-mentioned means being adapted for being actuated when the contact lug on an anode on said turntable engages said contact means.

11. In an electron discharge tube device assembling machine, means for feeding and directing anodes having a contact lug formed thereon in a predetermined manner to an assembly station comprising; a turntable, a chute for having anodes slide theredown onto said turntable, means for feeding individual anodes down said chute seriatim in spaced apart relationship, means operative in timed relationship with said anode feeding means for stopping and then releasing each anode on said turntable, contact means carried by said stopping means, said contact means being engageable only by said contact lugs, and means for rotating said turntable 180° to redirect an anode thereon, said last-mentioned means being adapted for being actuated when the contact lug on an anode on said turntable engages said contact means.

12. In an electron discharge tube device assembling machine, means for feeding and directing anodes having a contact lug formed thereon in a predetermined manner to an assembly station comprising; a turntable, a chute for having anodes slide theredown onto said turntable, means for feeding individual anodes down said chute seriatim in spaced apart relationship, means operative in timed relationship with said anode feeding means for stopping and then releasing each anode on said turntable, contact means carried by said stopping means, said contact means being engageable only by said contact lugs, means for rotating said turntable to redirect an anode thereon, said last-mentioned means being actuated when the contact lug on an anode on said turntable engages said contact means, and a magnet carried by said stopping means for attracting said anode toward said contact means to insure good contact between said contact means and said contact lug.

13. In an electron discharge tube device assembling machine, means for feeding and directing anodes having a contact lug formed thereon in a predetermined manner to an assembly station comprising; a turntable, a chute for having anodes slide theredown onto said turntable, means for feeding individual anodes down said chute seriatim in spaced apart relationship, means operative in timed relationship with said anode feeding means for stopping and then releasing each anode on said turntable, contact means carried by said stopping means, said contact means being engageable only by said contact lugs, means for rotating said turntable to redirect an anode thereon, said last mentioned means being actuated when the contact lug on an anode on said turntable engages said contact means, and magnetic means effective for centering said anodes on said turntable during rotation thereof.

14. In an electron discharge tube device assembling machine, means for feeding and directing anodes having a contact lug formed thereon in a predetermined manner to an assembly station comprising; a turntable, a chute for having anodes slide theredown onto said turntable, means for feeding individual anodes down said chute seriatim in spaced apart relationship, means operative in timed relationship with said anode feeding means for stopping and then releasing each anode on said turntable, contact means carried by said stopping means, said contact means being engageable only by said contact lugs, means for rotating said turntable 180° to redirect an anode thereon, said last-mentioned means being actuated when the contact lug on an anode on said turntable engages said contact means, a magnet carried by said stopping means for attracting said anode toward said contact means to insure good contact between said contact means and said contact lug, an electromagnet arranged to be energized during rotation of said turntable, said electromagnet including a core underlying said turntable, and an armature carried by said turntable for attracting and centering said anode on said turntable during rotation thereof.

15. In element feeding apparatus, feeding means normally effective for feeding individual ones of said elements along a path in a predetermined angular position about an axis substantially parallel to said path and indiscriminately in a desired and in an undesired endwise orientation, a turntable located along said path and adapted for receiving said elements in said predetermined angular position, and automatically operating means responsive only to the arrival on said turntable of an element in an undesired endwise orientation to rotate said turntable and thereby alter the endwise orientation of said element to said desired endwise orientation.

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