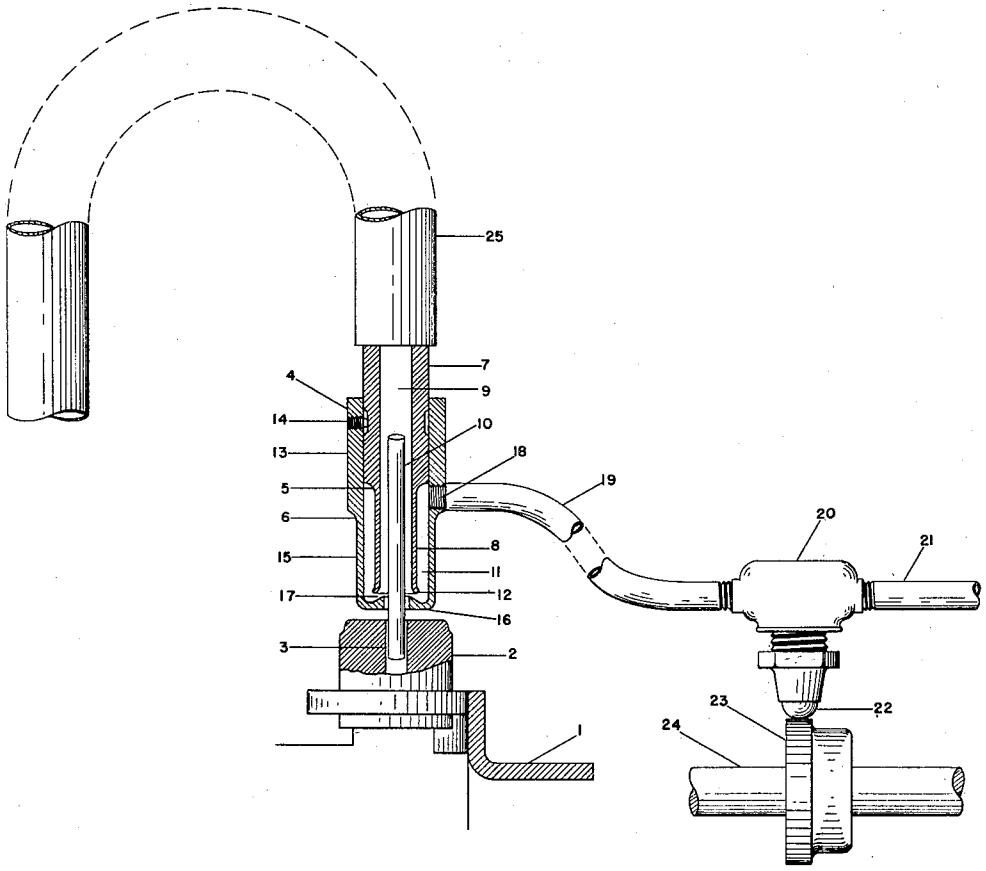
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TUBE REMOVING MECHANISM

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TUBE REMOVING MECHANISM

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15 Claims. (Cl. 254—1)

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In the manufacture of radio electron tubes, it is necessary with certain tubes, before the tube is finished, to exhaust the gases therefrom. For this purpose, a hollow glass rod, commonly called an exhaust tube is formed integral with the base of the electron tube and communicates with the interior thereof. Through the exhaust tube the gases are withdrawn from the electron tube to create a vacuum therein. After the gases are withdrawn or exhausted, the exhaust tube is sealed and severed adjacent the base of the vacuum tube. These operations are performed mechanically on machines, designed for the purpose, that are common and well known in the art. During these operations, the exhaust tube extends into a compression chuck and upon severance from the vacuum tube, the exhaust tube must be removed from the chuck. It is to the removal of the severed exhaust tube that this invention relates.

Heretofore, and prior to the invention herein disclosed, mechanical tube pullers have been used for removing the severed exhaust tube. These include mechanical grippers which grip the exhaust tube and raise it out of the chuck. It has been found to be difficult to control the tension and slippage of such mechanical grippers with the result that at times the exhaust tube is not removed from the chuck or is broken in the process. In the latter case, the broken glass over the exhaust port of the chuck clogs the port and oil traps and increases the dead or non-productive time of the machine.

An object of this invention is to provide an exhaust tube removing mechanism which does not depend upon mechanical grippers for removing the tube. Another object of the invention is to provide a mechanism of this kind that removes the exhaust tube by the application of air under pressure. A further object of the invention is to provide a mechanism of this kind that removes, in addition to the exhaust tube, any particles of glass that may have fallen in the chuck when the exhaust tube is severed.

The foregoing objects and certain advantages that will hereinafter appear are realized in the embodiment of the invention illustrated in the drawing, as an example of the best method of applying the invention, and described in detail below, from which description a clearer understanding of the invention may be had.

The drawing consists of a single figure which constitutes an end elevation, partly in section, of the mechanism embodying the invention.

The mechanism embodying the invention that

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is illustrated in the drawing is particularly adapted for removing the severed exhaust tube from the chuck of a machine for exhausting electron tubes, such as the machines known in the art as "RCA Sealex" and "Hofmann Exhaust" machines. This is the use to which the invention has heretofore been successfully applied. It will, however, be apparent from the following description of the mechanism, so applied, that the invention may well be applied to other uses.

In the "RCA Sealex" and "Hofmann Exhaust" machines there is a horizontal dial 1 which is rotatable about a vertical axis. These dials carry a plurality of compression chucks 2, sixteen on one and twenty-four on the other. The dials are actuated step by step to index the chucks successfully from loading position through several positions to the position (shown in the drawing) in which the exhaust tube is removed from the chuck. Each chuck, such as the chuck 2 is provided with a vertical opening 3 in which the exhaust tube is received. This opening connects with an exhaust port which is connected, during certain indexed positions of the dial 1 to a suction pump. The machine is loaded by placing the exhaust tube in a chuck and as the dial moves from position to position the electron tube is exhausted, through the exhaust tube, and the exhaust tube is severed adjacent the electron tube. The chuck is then carried by the dial to the position for removing the severed exhaust tube from the chuck from which position a chuck again moves to the loading position.

In the accompanying drawing, the chuck 2 is in the position in which the exhaust tube is removed. The mechanism of this invention is appropriately attached to the machine such that as a chuck is brought into this position it may be moved manually or automatically, preferably the latter, to operative position, the position shown in the drawing. The connection of the mechanism to such a machine and its actuation from inoperative to operative position are considered to be within the skill of one skilled in the art and, therefore, need not be here described.

The exhaust tube removing mechanism illustrated in the drawing includes a fixture designated generally by the numeral 4. In the practical art, this fixture has been called an air chuck. The fixture consists of two elements 5 and 6, one extending into the other. The inner element 5 consists of two aligned portions 7 and 8, circular in cross section and axially aligned. An opening 9 is formed axially through the inner element of a diameter slightly greater than the

external diameter of the exhaust tube to be removed, such as the tube 10. The portion 8 of the inner element constitutes an extension from the portion 7 of substantially smaller external diameter and forms the inner wall of an annular air passage 11. The free end of the portion 8 is flared outwardly as at 12.

The outer element 6 of the fixture includes a portion 13 that surrounds the portion 7 of the inner element, making a substantially air tight fit therewith. The two elements are adjustable, longitudinally, and are secured together in adjusted position by a set screw 14. The portion 13 of the element 6 extends slightly beyond the lower end of the portion 7 of the inner element 5. A thin walled portion 15 of the element 6 extends from the portion 13 and is provided with an inwardly extending end wall 16. This thin walled portion constitutes the outer wall of the air passage 11. The inner surface of the end wall 16 is somewhat frustro-conical, as shown, and forms with the flared end 12 of the portion 8 of the inner element 5, a circular air blast passage 17 inclined to the axis of the fixture and directed into the axial opening therethrough in a direction such that upon the flow of air under pressure a force is created on the tube 10 in a direction to lift the tube out of the chuck 2. In addition, the air blast through the passage 7 creates a suction below the fixture which removes any particles within the chuck. The velocity, for a given air pressure, of the air through the passage 17 may be regulated by varying the passage. This is accomplished by relative longitudinal adjustment of the inner and outer elements 5 and 6.

The wall of the portion 13 of the outer element is drilled and tapped at 18 to provide a connection for an air pipe 19. This pipe is connected through a control valve 20 to a source of air under pressure represented by a pipe 21. The valve 20 is of the type that is spring pressed to the closed position and is opened by axial movement, against the spring, of the valve stem 22. When the mechanism is applied to one of the aforementioned machines, the end of the valve stem 22, engages a cam 23 mounted on a shaft 24 that is rotated in timed relation with respect to the operation of the machine. In this way, the valve is periodically opened when the air chuck or fixture 4 is in operative position over an exhaust tube. Air thus passes through the air passage 11, the blast passage 17 and axially through the fixture in a direction away from the chuck 2. The suction created below the blast passage removes any particles in the chuck 2 and they are carried into the air stream in the fixture and through the fixture.

The upper end of the fixture 4 extends into the end of a curved duct or conduit 25 through which the tube and particles are delivered to a waste receptacle (not shown). The radius of curvature of the duct is such, in accordance with its inner diameter and the dimensions of the exhaust tubes to be removed, that the removed exhaust tube may readily be carried around the curve. The duct is curved through one hundred and eighty degrees. The air blast carries the removed exhaust tube beyond the crest of the curve in the duct from where it drops by gravity into the waste receptacle.

From the foregoing description of the embodiment of the invention illustrated in the drawings and described in detail above, it will be apparent to those skilled in the art that by the invention

there is provided a mechanism for conveying rods and particles, a mechanism which effectively removes a rod from a holder and cleans the holder of any particles, and that is especially suitable for removing fragile rods such as the exhaust tubes severed from electron tubes.

It will be obvious that various changes may be made by those skilled in the art in the details of the mechanism illustrated in the drawing and described above within the principle and scope of the invention as expressed in the appended claims.

This application is a substitute for abandoned application Serial No. 578,484, filed February 17, 1945.

What is claimed is:

1. A mechanism for withdrawing a rod from a holder which mechanism comprises in combination a source of air under pressure, an air fixture having a jet for acting upon the rod, and a connection between said source of air under pressure and said fixture including means for controlling the supply of air to said fixture.

2. A mechanism for withdrawing a rod from a holder which mechanism comprises in combination a source of air under pressure, an air fixture having a jet for acting upon the rod, a connection between the source of air under pressure and said fixture including means for controlling the supply of air to said fixture, and means for directing the course of a rod removed from the holder.

3. A mechanism for withdrawing a rod from a holder, which mechanism comprises in combination a fixture adapted to receive the rod, the fixture having air passages therein directed to effect a stream of air along the rod and in a direction to remove the rod from the holder.

4. A mechanism for withdrawing a rod from a holder, which mechanism comprises in combination a fixture adapted to receive a portion of the rod, the fixture having air passages arranged to direct a stream of air along the surface of the rod to exert a force on the rod in a direction to withdraw the rod from the holder.

5. A mechanism for withdrawing a rod from a holder, which mechanism comprises in combination a fixture adapted to receive a portion of the rod, the fixture having air passages arranged to direct a stream of air along the surface of the rod to exert a force on the rod in a direction to withdraw the rod from a holder, and means associated with said fixture for directing the course of a rod removed from the holder.

6. A mechanism for withdrawing a rod from a holder, which mechanism comprises in combination a fixture adapted to receive a portion of the rod, the fixture having air passages arranged to direct a stream of air along the rod and create a suction below the fixture, and means associated with the fixture for directing the course of a rod and any particles removed from the holder.

7. In a machine for exhausting glass containers through an exhaust tube, mechanism for removing the exhaust tube from a holder which mechanism comprises in combination a fixture adapted to receive a portion of the exhaust tube, the fixture having air passages therein directed to effect a stream of air along the exhaust tube and in a direction to remove the exhaust tube from the holder.

8. In a machine for exhausting glass containers

through an exhaust tube, mechanism for removing the exhaust tube from a holder which mechanism comprises in combination a fixture adapted to receive a portion of the exhaust tube, the fixture having air passages arranged to direct a stream of air along the surface of the exhaust tube to exert a force on the rod in a direction to withdraw the exhaust tube from the holder.

9. In a machine for exhausting glass containers through an exhaust tube, mechanism for removing the exhaust tube which mechanism comprises in combination a fixture adapted to receive a portion of the exhaust tube, the fixture having air passages arranged to direct a stream of air along the surface of the rod to exert a force on the exhaust tube in a direction to withdraw the exhaust tube from a holder, and means associated with said fixture for directing the course of an exhaust tube removed from the holder.

10. In a machine for exhausting glass containers through an exhaust tube, mechanism for removing the exhaust tube which mechanism comprises in combination a fixture adapted to receive a portion of the exhaust tube, the fixture having air passages arranged to direct a stream of air along the exhaust tube and create a suction below the fixture, and means associated with the fixture for directing the course of an exhaust tube and any particles removed from the holder.

11. In a machine for exhausting electron tubes through an exhaust tube held in a chuck, mechanism for removing a severed exhaust tube comprising in combination a fixture having a central opening therethrough adapted to receive a portion of the severed exhaust tube, air passages directed into the central opening and in a direction to exert a force on the tube to remove the tube from the chuck, and means for directing the course of an exhaust tube removed from the chuck.

12. In a machine for exhausting electron tubes through an exhaust tube held in a chuck, mechanism for removing a severed exhaust tube from the chuck, which mechanism comprises in combination a fixture having a central passage therethrough adapted to receive a portion of a tube held by a chuck, air passages directed into the central passage in a direction to exert a force on the tube to remove the tube from the chuck, a source of air under pressure connected to said air passages, and means intermediate said source of air under pressure and said air passages of said fixture for controlling communication therebetween.

13. In a machine for exhausting electron tubes through an exhaust tube held in a chuck, mechanism for removing a severed exhaust tube from

the chuck, which mechanism comprises in combination a fixture having a central passage therethrough adapted to receive a portion of a tube held by a chuck, air passages directed into the central passage in a direction to exert a force on the tube to remove the tube from the chuck, a source of air under pressure connected to said air passages, and means intermediate said source of air under pressure and the air passages of said fixture for controlling communication therebetween, and means for directing the course of an exhaust tube removed from the chuck.

14. In a machine for exhausting electron tubes through an exhaust tube held in a chuck, mechanism for removing a severed exhaust tube from the chuck, which mechanism comprises in combination a fixture having a central passage therethrough adapted to receive a portion of a tube held by a chuck, air passages directed into the central passage in a direction to exert a force on the tube to remove the tube from the chuck, a source of air under pressure connected to said air passages, and means intermediate said source of air under pressure and the air passages of said fixture for controlling communication therebetween, and means for directing the course of an exhaust tube removed from the chuck consisiting of a conduit having one end thereof arranged to communicate with the central passage through said fixture.

15. In a machine for exhausting electron tubes having a chuck for receiving the end of an exhaust tube on an electron tube, mechanism for removing a severed exhaust tube from the chuck and particles thereof within the chuck which mechanism includes a fixture having a central passage therethrough adapted to receive a portion of the severed exhaust tube and adapted to be positioned adjacent the chuck, air passages in the fixture including passages directed into the central passage in a direction away from the chuck, whereby upon the delivery of air under pressure to the fixture the exhaust tube is removed from the chuck and a suction is created in the chuck which removes any particles therein, and means for directing the course of an exhaust tube and the particles removed from the chuck.

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