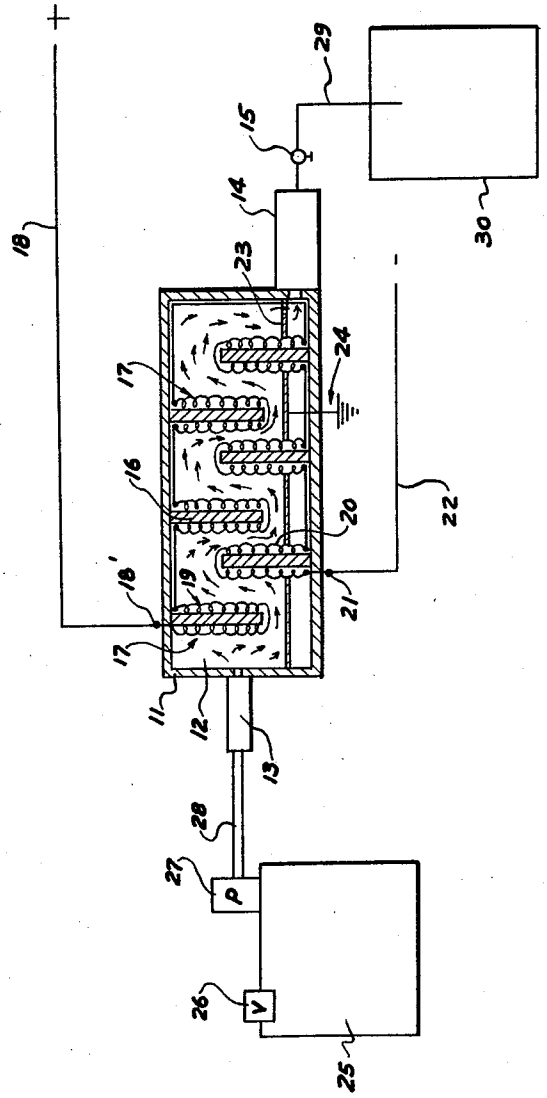
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APPARATUS FOR TREATING INERT GAS

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APPARATUS FOR TREATING INERT GAS

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1 Claim. (Cl. 250—48)

This invention relates to a process for changing inert gases to non-inert gases for immediate use, preferably such as in a nitriding furnace.

This invention further relates to apparatus for this purpose. It is the object of the present invention to provide a novel method and apparatus for changing inert gases to non-inert gases.

Heretofore, certain gases such as nitrogen, helium, argon, neon, xenon, krypton, and others, known to be normally inert, have been incapable of chemical combination with other elements or compounds. It has been found as a result of the present invention that the inert characteristic of these gases will be lost once the molecules thereof have been subjected to an electrostatic or magnetic field in such a way that the molecules of a particular gas have apparently acquired an extra charge of electricity. So charged, these gases are rendered sufficiently active as to permit the formation of new chemical combinations.

In the manufacture of a protective shield against radioactive emission, it is recognized that such a shield will be effective for its intended purpose if it has the characteristic of not absorbing neutrons. Accordingly, if such a shield can be constructed of a substance which will not absorb neutrons, an effective shield may be provided. This is believed to be true of the inert gases wherein it is believed that, as the molecules will not combine with molecules of other substances to form compounds, in effect, these inert gases will not absorb neutrons.

For example, nitrogen as inert gas, will normally not react with steel unless the nitrogen is a nitrogen which is disassociated from a chemical compound such as ammonia as NH^3. If the ammonia is broken down such as

$$N\text{—}\overset{H}{\underset{H}{H}}$$

the nitrogen molecule apparently has an extra charge of electricity and is an active gas, which has been used to form nitrides such as have been employed in the case hardening of steel, for example. It is assumed that the nitrogen molecules as disassociated and separated from the hydrogen molecules have acquired an extra electrical charge, or some other characteristic which now renders this nitrogen molecule active and capable of chemical combination.

Following this, it is believed that inactive or inert nitrogen might be given this extra charge of electricity in a more simplified manner than in the electrolysis or the breaking down of ammonia such as by directly applying to the inert nitrogen or other inert gas an extra charge of electricity.

It is, therefore, the primary object of the present invention to provide a method and apparatus whereby inert gases such as nitrogen or any of the others above listed, or other inert gases not listed, may be passed through an electrostatic field which carries a high potential and whereby the molecules of the gas will pick up an extra electrical charge or other characteristic which renders

the molecule an active molecule capable of chemical combination.

It is the further object of the present invention to provide a mechanism in the nature of an envelope such as in an electron tube wherein there are provided a plurality of electrical coils which will discharge electrons and at the same time passing the inert gas through the said tube and collecting it at the other end in a separate container for immediate use, such as a nitriding furnace.

It is the further object of the present invention to employ the present process for rendering more useful the presently noninert gases such as the gases above set forth. It is the further object to thereby provide for the formation of many new compounds which heretofore were not possible by utilizing nitrogen or other inert gas in active form having the proposed extra charge and combining with other elements or compounds.

It is the further object of utilizing the compound so obtained for the case hardening of steel or other metals for use in the construction of a shield against radioactivity.

These and other objects will be seen from the following specification and claim in conjunction with the appended drawing in which:

The figure is a diagrammatic illustration of an electron tube to be used in the present process.

It will be understood that the above drawing is illustrative only of one preferred form of apparatus for accomplishing the present method, and that other apparatus may be employed for this purpose without departing from the scope of the present invention.

Referring to the drawing, the electron tube consists of a sealed envelope **11** of any desired shape and which has an interior chamber **12** with communication thereinto provided by inlet **13**. The opposite end of the envelope is provided with a suitable outlet **14** which includes a control valve **15** for regulating the flow of gas therethrough.

Within the envelope there are provided a series of alternately arranged spaced baffle plates **16** which extend from opposite side walls of envelope **11** in overlapping relation to thereby provide a circuitous pathway for the passage of gases through the envelope.

Adjacent each of the said baffles there are provided in the preferred embodiment of the present apparatus a series of electrical coils or filaments **17** of such material which will have electron emitting characteristics when rendered incandescent, such as platinum, vanadium, tungsten, or any other compound which is well known for this purpose, such as are used in the construction of radio or electron tubes. The lead wire **18** from a source of electricity is joined to the envelope **11** as at **18'** and continues to the first coil **19** as indicated by the arrow. In the present embodiment all of the coils are connected in series and accordingly the electrical current will then pass through each of the coils with the last coil thereof, such as coil **20** being connected as at **21** with a return lead wire **22** for completing the electrical circuit to the source of electrical energy employed. The potential at which the current is supplied may be regulated in a conventional manner, it being understood that the potential is such that the coils will be rendered incandescent and will emit electrons which will flow in the general direction towards the grid **23** which is grounded as at **24**.

A tank of inert gas is indicated at **25** with a relief valve **26** thereon and having a compressor or pump **27** which will withdraw the gas and deliver the same through conduit **28** to inlet **13**. Conduit **29** connects the outlet **14** with a receiver **30** within which is stored the gas to which has been applied an extra electrical charge. Receiver **30** may be a nitriding furnace.

In operation, the inert gas is passed through the circuitous passageway within the electron tube around the

baffles 16 and with respect to the electrically charged area which is otherwise evacuated of air to thereby be exposed to and pick up an electrical charge.

In other words, an inert gas had been introduced into the apparatus and there is stored within receiver 30 an active gas which is capable of chemical combination.

These inert gases are thus available for the formation of new compounds or useful compounds and are produced by an electronic method which is believed more satisfactory than the separation of a nitrogen compound such as ammonia which would produce molecules of nitrogen which appear to have active characteristics.

As one specific use to which the present process may be applied, it is assumed that the inert gas delivered through the envelope is nitrogen and which is stored under compression in receiver 30, and which nitrogen has the characteristic of being able to make chemical combination.

With nitrogen, nitrides may be formed by which steel plate or other metallic substances may be case hardened and thereby have an exterior layer which may under certain conditions partially penetrate the skin of the metal and which case hardened layer has different characteristics than the remainder of noncase hardened material.

For example, this case hardened metal may be employed in a construction of a shield against radioactivity. It is believed that the nitrogen molecules in the nitride employed in the case hardening process have somehow lost their charge of electricity, and are again given an inert characteristic, such that they will no longer transmit therethrough neutrons.

Whether the nitrogen molecule has lost its positive charge in the case hardening process, or whether it has acquired some new characteristic, it is believed that the case hardened layer so produced will have the characteristic of resisting the passage therethrough of neutrons,

and will not absorb neutrons such as the possibly harmful neutrons from radioactive material. At least, the nitrogen molecules having the original extra charge or other characteristic acquired in the above process have again become neutron resisting. While nitrogen has been set forth as one specific use, it is contemplated that others of the normally inert group of gases may also be employed in obtaining a case which will resist passage of neutrons.

Having described my invention, reference should now be had to the claim which follows for determining the scope thereof.

I claim:

An electron tube comprising a sealed envelope having a closable inlet and outlet, a plurality of electron discharge coils within the envelope adapted for connection to a source of electrical energy, means for delivering an inert gas through said envelope past and adjacent said coils and out from said envelope, and a series of staggered baffle plates within said envelope and joined thereto providing a circuitous passage for said gas through said envelope, said coils being wound around the baffle plates.

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