United States Patent [19]

Ebert et al.

[11] **3,773,966**

[45] **Nov. 20, 1973**

[54] **LEAD-IN-DEVICE PASSING A CONDUCTOR THROUGH THE COVER OF AN ELECTRICAL PRECIPITATION APPARATUS**

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[22] Filed: **Feb. 26, 1973**

[21] Appl. No.: **335,598**

[30] **Foreign Application Priority Data**

Mar. 2, 1972 Germany ..... P 22 09 999.6

[52] **U.S. Cl.** ..... **174/31.5,** 55/120, 55/146, 174/12 BH

[51] **Int. Cl.** **B03c 3/34,** H01b 17/26

[58] **Field of Search** ..... 174/12 BH, 14 BH, 174/15 BH, 16 BH, 18, 31 R, 31.5; 55/120, 140, 146, 148

[56] **References Cited**

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Primary Examiner—Laramie E. Askin
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[57] **ABSTRACT**

Lead-in-device receiving a conductor which passes through the cover of an electrical precipitation apparatus and down to its electrode system, the electrical precipitation apparatus being used in the production of phosphorus. A middle portion of the conductor is concentrically surrounded by a duct and a sealing cup is disposed above the cover of the electrical precipitation apparatus concentrically with respect to the conductor. Above the sealing cup, the conductor is encircled by an insulator which is radially spaced therefrom and above the insulator, the conductor is concentrically surrounded by a bellows, of which the upper end is fast with the conductor. An annular chamber is disposed between the insulator and the bellows, the lower surface of the said annular chamber being apertured to provide passages, whereby a gaseous medium can be continuously supplied to the annular space between the said insulator and the said conductor. Elastic packing rings provide seals between the insulator and the annular chamber situated above it, and between the insulator and the sealing cup situated below it, and spring pressed elements urge the annular chamber into contact with the insulator, the spring-pressed elements having mountings which bear against cross-members fast with the conductor.

9 Claims, 1 Drawing Figure

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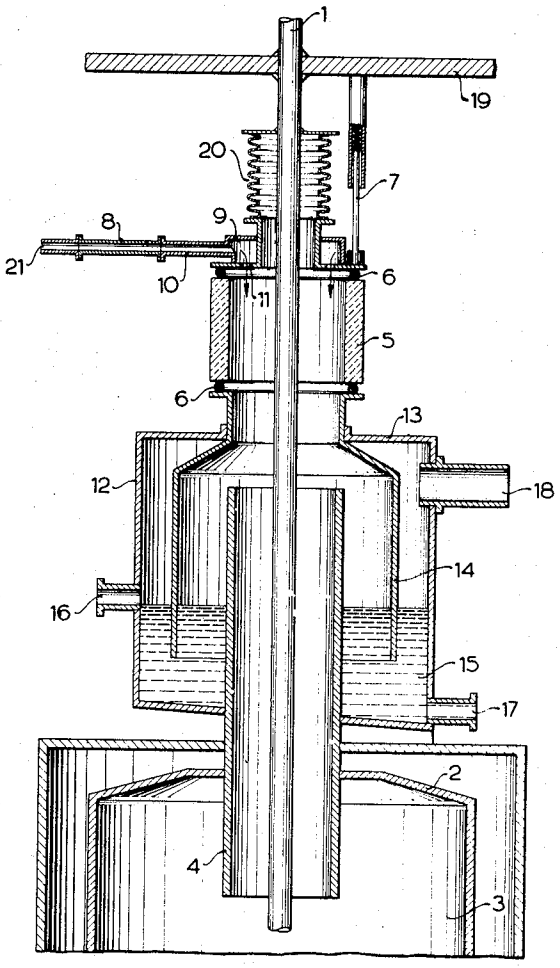

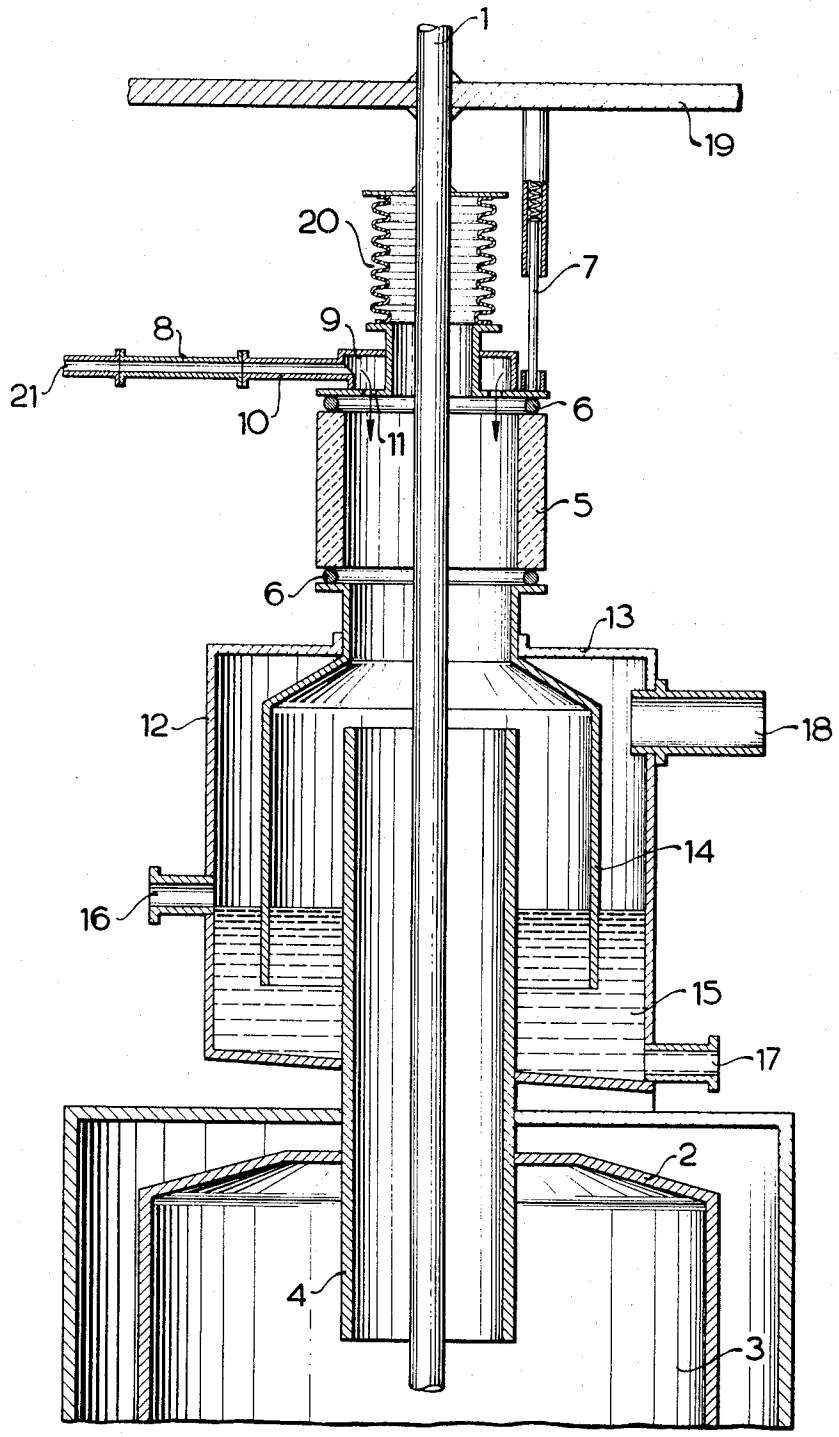
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LEAD-IN-DEVICE PASSING A CONDUCTOR THROUGH THE COVER OF AN ELECTRICAL PRECIPITATION APPARATUS

The present invention provides a lead-in device receiving a conductor which passes through the cover of an electrical precipitation apparatus and down to its electrode system, the precipitation apparatus being used in the production of phosphorus, wherein a middle portion of the conductor is concentrically surrounded by a duct; wherein a sealing cup is disposed above the cover of the electrical precipitation apparatus concentrically with respect to the conductor; wherein, above the sealing cup, the conductor is encircled by an insulator which is radially spaced therefrom; and wherein, above the insulator, the conductor is concentrically surrounded by a bellows, of which the upper end is fast with the conductor.

A lead-in device receiving a conductor which passes through the cover of an electrical precipitation apparatus has already been described, wherein the conductor, housed in a duct arranged concentrically therewith, is surrounded by an insulator, which is positioned above the corner of the electrical precipitation apparatus and is radially spaced from the conductor, and wherein an insulating bush is mounted on the conductor, the insulating bush being surrounded by a barrier disc so as to leave a narrow gap therebetween. In this device, the insulator, the insulating bush and the barrier disc are conveniently of polytetrafluoroethylene. Positioned above the insulator is a bellows, of which the lower and upper ends are fast with the insulator and conductor, respectively. The space between the bellows, the insulator, the barrier disc and the insulating bush is occupied by a sealing gas maintained under overpressure. Arranged concentrically around the conductor and positioned between the duct and the cover of the electrical precipitation apparatus is a sealing cup, of which the lower portion conveniently has water therein and of which the upper portion provides a pipe connection running to a chimney.

A difficulty encountered during the operation of the above lead-in device is that the surfaces of the insulator, the insulating bush and the barrier disc, which as just mentioned are conveniently of polytetrafluoroethylene, are rapidly contaminated, and thereby rendered electrically conductive, by dust particles which are ejected from the electrical precipitation apparatus as a result of pressure variations therein; this difficulty is encountered despite the use of nitrogen, for example, as an incombustible sealing gas. This superficial contamination has even been found to lead in many cases to the destruction of these relatively costly insulating elements, due to continual electric flash-overs.

It is accordingly an object of the present invention to provide a lead-in device receiving a conductor which passes through the cover of an electrical precipitation apparatus, which device is free from the disadvantages referred to above and makes it possible for the high voltage applied to the conductor to produce corona currents in the electrical precipitation apparatus, avoiding wasteful currents leaking over the surfaces of the insulating elements.

According to the present invention, we provide a lead-in device receiving a conductor which passes through the cover of an electrical precipitation apparatus and down to its electrode system, the electrical precipitation apparatus being used in the production of phosphorus; wherein a middle portion of the conductor is concentrically surrounded by a duct and a sealing cup is disposed above the cover of the electrical precipitation apparatus concentrically with respect to the conductor; wherein, above the sealing cup, the conductor is encircled by an insulator which is radially spaced therefrom; and wherein, above the insulator, the conductor is concentrically surrounded by a bellows, of which the upper end is fast with the conductor; the lead-in device comprising: an annular chamber disposed between the insulator and the bellows, the lower surface of the said annular chamber being apertured to provide passages whereby steam or another gas vapour can be continuously supplied to the annular space between the said insulator and the said conductor; elastic packing rings which provide seals between the insulator and the annular chamber situated above it, and between the insulator and the sealing cup situated below it; and spring-pressed elements urging the annular chamber into contact with the insulator, the spring-pressed elements having mountings which bear against cross-members which are fast with the conductor.

Preferred features of the lead-in device of the present invention, which can be used singly or in combination, provide:

a. for the insulator to be of quartz, or

b for the insulator to be of quartz glass, or

c for the insulator to be of polytetrafluoroethylene;

d for the insulator to have a length equal to its internal diameter, or

e for the insulator to have a length larger than its internal diameter;

f for the annular chamber to have a pipe connection connecting the annular chamber to supply means for steam or another gas or vapour, through an insulating joint; and

g for the insulating joint to have a length equal to the internal diameter of the insulator, or

h for the insulating joint to have a length larger than the internal diameter of the insulator.

In the lead-in device of the present invention, the insulator can be a plain cylinder of quartz, quartz glass or polytetrafluoroethylene, with no attachments. As a result, it is possible for the purchase, assembly and maintenance costs to be reduced substantially by 50 percent, compared with the costs of known lead-in devices. To avoid the deposition of, for example, condensed phosphorus and/or impurities containing phosphorus and carbon, on the surface of the insulator, use should preferably be made of a system whereby steam at 100° to 120° C is caused to flow into the interior of the insulator. If contaminating material should ever deposit on the insulator, for example, as a result of a breakdown in the steam supply system, it is possible for the inside of the insulator to be rapidly rinsed, the power to the electrical precipitation apparatus being switched off, using as a rinsing means the condensed water which is at first produced once the supply of steam is resumed. Following this, the rising steam temperatures effect drying of the insulator, and restore its full insulating properties.

In addition to this, the steam flowing through the insulator and the duct into the electrical precipitation apparatus has been found favorably to influence the separation of dust, in the electrical precipitation apparatus.

An embodiment of the device of the present invention is shown diagrammatically (generally in axial section) in the single FIGURE of the accompanying drawing.

As can be seen from the FIGURE, a conductor **1** is arranged to project through a cover **2** down to the electrical system of an electrical precipitation apparatus **3**. The conductor **1** is surrounded by a duct **4** projecting, from a level above the cover **2**, into the interior of the electrical precipitation apparatus **3**. Above the duct **4**, the conductor **1** is surrounded by a cylindrical insulator **5**, which is radially spaced therefrom and of which the lower end is sealed by an elastic packing **6** which is supported by an upper flange provided on a bell-shaped member **14** forming an inner part of a sealing cup **12**. At the upper end of the insulator **5**, which is also sealed by an elastic packing **6**, is an annular chamber **9** of which the lower surface is apertured to provide outlets **11**. The annular chamber **9** is urged towards the insulator **5** by spring-pressed rods **7** mounted in sleeves which bear against cross-members **19** fast with the conductor **1**. The annular chamber **9** is further provided with a pipe connection **10** opening laterally thereinto. The pipe connection **10** and an insulating joint **8** connect the chamber **9** to a conduit **21** supplying steam, for example. Disposed above the annular chamber **9** is a bellows **20** which is secured at its lower end to a flange provided on the chamber **9** and is secured at its upper end to the conductor **1**.

The bell-shaped member **14** is arranged so as to open out into the sealing cup **12**, its upper end passing through the cover **13** of the sealing cup **12**. The lower portion of the sealing cup **12** contains a sealing liquid **15**, for example water, which is supplied thereto through an inlet **17** and removed therefrom through an outlet **16**. The upper portion of the sealing cup **12** has an off-gas connection **18** running to a chimney.

The claims:

1. Lead-in device receiving a conductor which passes through the cover of an electrical precipitation apparatus and down to its electrode system, the electrical precipitation apparatus being used in the production of phosphorus; wherein a middle portion of the conductor

is concentrically surrounded by a duct and a sealing cup is disposed above the cover of the electrical precipitation apparatus concentrically with respect to the conductor; wherein, above the sealing cup, the conductor is encircled by an insulator which is radially spaced therefrom; and wherein, above the insulator, the conductor is concentrically surrounded by a bellows, of which the upper end is fast with the conductor; the lead-in device comprising: an annular chamber disposed between the insulator and the bellows, the lower surface of the said annular chamber being apertured to provide passages whereby steam or another gas or vapour can be continuously supplied to the annular space between the said insulator and the said conductor; elastic packing rings which provide seals between the insulator and the annular chamber situated above it, and between the insulator and the sealing cup situated below it; and spring-pressed elements urging the annular chamber into contact with the insulator, the spring-pressed elements having mountings which bear against cross-members which are fast with the conductor.

2. Lead-in device as claimed in claim **1**, wherein the insulator is of quartz.

3. Lead-in device as claimed in claim **1**, wherein the insulator is of quartz glass.

4. Lead-in device as claimed in claim **1**, wherein the insulator is of polytetrafluoroethylene.

5. Lead-in-device as claimed in claim **1**, wherein the insulator has a length equal to its internal diameter.

6. Lead-in-device as claimed in claim **1**, wherein the insulator has a length larger than its internal diameter.

7. Lead-in-device as claimed in claim **1**, wherein the annular chamber has a pipe connection connecting the annular chamber to supply means for steam or another gas or vapour, through an insulating joint.

8. Lead-in-device as claimed in claim **7**, wherein the insulating joint has a length equal to the internal diameter of the insulator.

9. Lead-in-device as claimed in claim **7**, wherein the insulating joint has a length larger than the internal diameter of the insulator.

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