April 9, 1946. C. E. BUCHWALD 2,398,205

ARTICLE HANDLING APPARATUS

Filed Aug. 18, 1943

FIG. 1

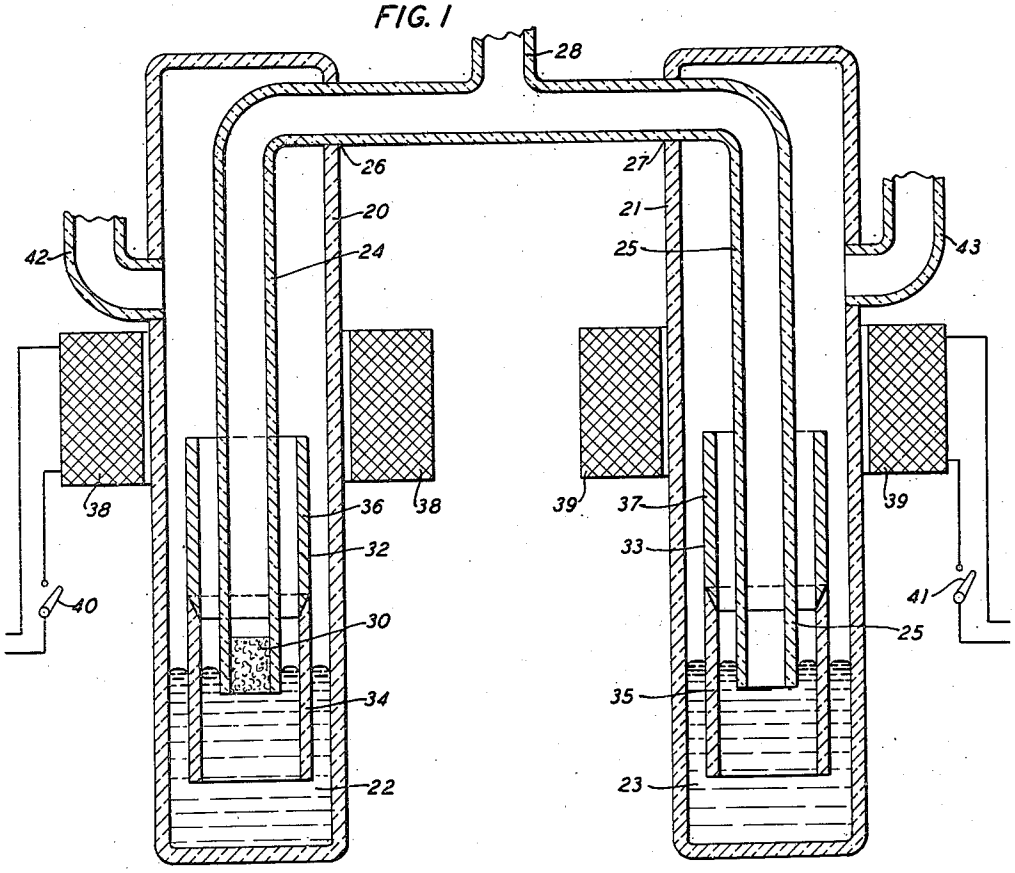


FIG. 2

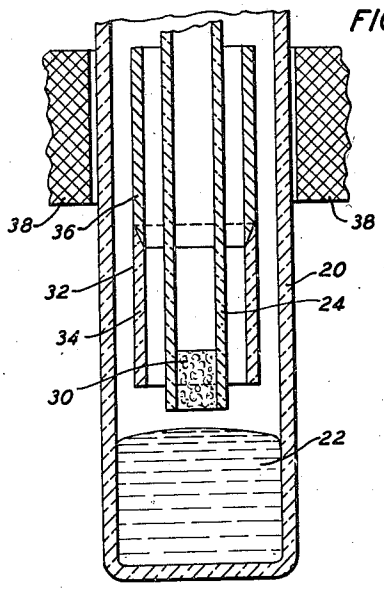
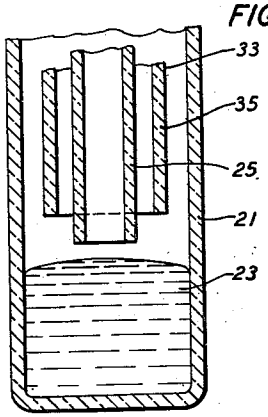


FIG. 3



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ARTICLE HANDLING APPARATUS

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4 Claims. (Cl. 137—144)

This invention relates to article handling apparatus, and more particularly to apparatus for supplying a predetermined quantity of gas to an evacuated hollow body.

In the manufacture of gas filled vacuum tubes such as are used in many ways in the electrical arts, it may be of importance to ensure that the gas pressure or density in the tube shall be of a predetermined value with only small variation allowable from the desired optimum value.

An object of the present invention is to provide a simple, durable and efficient apparatus or device for use in the manufacture of gas filled vacuum tubes to enable the accurate delivery into an evacuated tube of a predetermined amount of gaseous material.

With the above and other objects in view, the invention may be embodied in an apparatus to be connected to an evacuated hollow article to supply gas thereto and comprising a Y shaped hollow member to have the stem thereof connected to an evacuated article, a housing about each arm of the Y, gas flow retarding means in the end of one arm of the Y, gas-tight sealing means in each housing to seal the end of the Y therein, mutually independent means to break and reestablish at will the seal on the end of each arm of the Y, means to connect the housing about the arm of the Y having the gas retarding means therein to a source of gas, and means to connect the other housing to a source of evacuation.

Other objects and features of the invention will appear from the following detailed description of an embodiment thereof taken in connection with the accompanying drawing in which the same reference numerals are applied to identical parts in the several figures and in which

Fig. 1 is a partially diagrammatic view in central vertical section of the essential elements of an apparatus constructed in accordance with the invention;

Fig. 2 is a partial similar view thereof with parts in another position; and

Fig. 3 is another partial view similar to Fig. 2.

The apparatus herein disclosed comprises two closed ended vertical cylindrical glass housings 20 and 21, respectively, supported by any suitable means not shown. Each contains a volume or pool of mercury 22 and 23, respectively, filling the lower portion. In each housing is also a relatively small coaxial glass tube 24 and 25, respectively, extending downwardly to a point above the floor of the housing and extending upwardly and through the wall of the housing as at 26 and 27, being sealed gastight to the wall. The two tubes 24 and 25 are joined as arms of a Y with an upwardly extending stem 28. In the bottom end of the tube 24 is a plug 30, preferably of porous sintered glass powder.

Coaxially between the housing 20 or 21 and the tube 24 or 25 is a cylindrical plunger generally indicated at 32 or 33. The left one 32 consists of a lower part 34 of glass and an upper part 36 of iron, steel or other paramagnetic metal or alloy, joined together as shown. The volumes and masses of the plungers 32 and 33 and the volumes of the mercury pools are so proportioned that normally each of the plungers floats in its mercury pool substantially as shown in Fig. 1 and raises the mercury surfaces sufficiently high to close the end of the tube 24 or 25, while if the plunger 32 or 33 be raised out of the mercury as hereinafter described, the mercury surface will fall sufficiently to uncover the lower end of the corresponding tube 24 or 25 as shown in Figs. 2 and 3.

A solenoid 38 or 39 controlled by a switch 40 or 41 surrounds each housing 20 or 21 coaxially and is supported by means (not shown) to stand with its horizontal central plane above the horizontal central plane of the magnetic tube 36 or 37 of the plunger 32 or 33.

Each housing 20 or 21 is further provided with a tubulation 42 or 43 sealed gas-tight in the wall of the housing.

In operation, the tubulation 42 is connected to a suitable supply (not shown) of the gas to be used, e. g. argon, the tubulation 43 is connected to some evacuating means (not shown), and a hollow evacuated body to be filled with a predetermined amount of gas is connected to the tube 28. The solenoid 39 is then energized from some suitable source of electric current (not shown) by closing the switch 41. The solenoid then lifts the body 33 to allow the mercury 23 to sink and uncover the lower end of the tube 25. The evacuation from the tubulation 43 then acts to clean out of the tubes 24, 28 and 25 and out of the plug 30, any residues of gas therein from previous operation, and also to maintain the vacuum in the evacuated body connected to the tube 28. After a due interval of time, the switch 41 is opened and the tube 25 is again sealed by the mercury 23. The switch 40 is then closed and held closed for a sufficient interval to allow gas to pass through the retarding plug 30 and to fill the body connected to the tube 28 to a predetermined amount. The switch 40 is then opened, thus sealing the tube 24 again with mercury. The filled body is then disconnected from the

tube 28, replaced by another to be filled, and the cycle of operations beginning with closing the switch 41 is repeated.

The plug 30 controls the rate of flow of gas into the evacuated body to be filled. The flow will also depend upon the molecular size of the particular gas in question. In the case of argon at ten (10) cms. of mercury pressure in the tubulation 42 and with substantially no mechanically significant pressure in the tube 24, a satisfactory plug 30 can be provided by reducing lead glass to powder of about four hundred (400) mesh fineness, pressing this powder in a mold at about two thousand (2,000) lbs. per square inch, and sintering the fragile but coherent body thus produced at about 500° C. for about forty (40) minutes. Such a plug 30 suitably sealed into a tube 24 of about one-quarter inch internal diameter, will allow argon to pass under the conditions stated at a rate to require a convenient number of seconds to fill, for example, the argon filled electron tubes of the communications arts to the extent required for proper operation. In the case of another gas of other molecular dimension, the glass powder may need to be finer or coarser, the sintering period longer or shorter, the molding pressure greater or less. The plug is in effect, means to meter the gas flow from the supply to the evacuated space.

While the particular sintered glass powdered plug described is preferred in the case of argon, and while this may be satisfactorily modified for other gases as suggested above, other minutely porous materials may also be employed as the gas flow retarding means in the tube 24. For example, in some instances Lavite or porcelain may be used, or a sponge made by compressing and sintering a suitably fine-grained metal powder, provided the metal or alloy used be chosen with an eye to the chemical nature of the particular gas in question and with an eye also to the mercury seal.

While the Y 24, 25 and 28 and the housings 20 and 21 and the cylinders 34 and 35 are shown and described as of glass, they may well be of any other material, glazed porcelain, molded plastic or the like suitable to the purpose, or even of metal not affected by mercury or by the particular gas in question or not paramagnetic.

What is claimed is:

1. Apparatus to be connected to an evacuated hollow article to supply gas thereto and comprising a Y shaped hollow member having the stem thereof connectible to an evacuated article, a housing about each arm of the Y, gas flow metering means in the end of one arm of the Y, gas-tight sealing means in each housing to seal the end of the Y therein, mutually independent means to break and reestablish at will the seal on the end of each arm of the Y, means to connect the housing about the arm of the Y having the gas metering means therein to a source of gas, and means to connect the other housing to a source of evacuation.

2. Apparatus to be connected to an evacuated hollow article to supply gas thereto and comprising a Y shaped hollow member having the stem thereof connectible to an evacuated article, a housing about each arm of the Y, gas flow metering means in the end of one arm of the Y, a pool of mercury in each housing to seal the end of the Y therein, a magnetic plunger in each pool of mercury, a solenoid outside of each housing to lift the plunger in that housing to break the seal on the end of the Y arm in that housing, and a tubulation on each housing.

3. Apparatus to be connected to an evacuated hollow article to supply gas thereto and comprising a Y shaped tube of glass having the stem thereof connectible to an evacuated article, a housing of glass about each arm of the Y and sealed gas-tight thereto, a minutely porous sponge in the end of one arm of the Y to meter gas flow therethrough, a pool of mercury in each housing to seal the end of the Y therein, a magnetic plunger in each pool of mercury, a solenoid outside of each housing to lift the plunger in that housing to break the seal on the end of the Y arm in that housing, and a tubulation on each housing.

4. Apparatus to be connected to an evacuated hollow article to supply gas thereto and comprising a Y shaped tube of glass having the stem thereof connectible to an evacuated article, a housing of glass about each arm of the Y and sealed gas-tight thereto, a minutely porous sponge of sintered glass powder in the end of one arm of the Y to meter gas flow therethrough, a pool of mercury in each housing to seal the end of the Y therein, a magnetic plunger in each pool of mercury, a solenoid outside of each housing to lift the plunger in that housing to break the seal on the end of the Y arm in that housing, and a tubulation on each housing.

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