Sept. 23, 1952 R. B. HARTMAN 2,611,876

INSPECTION DEVICE

Filed Jan. 17, 1951

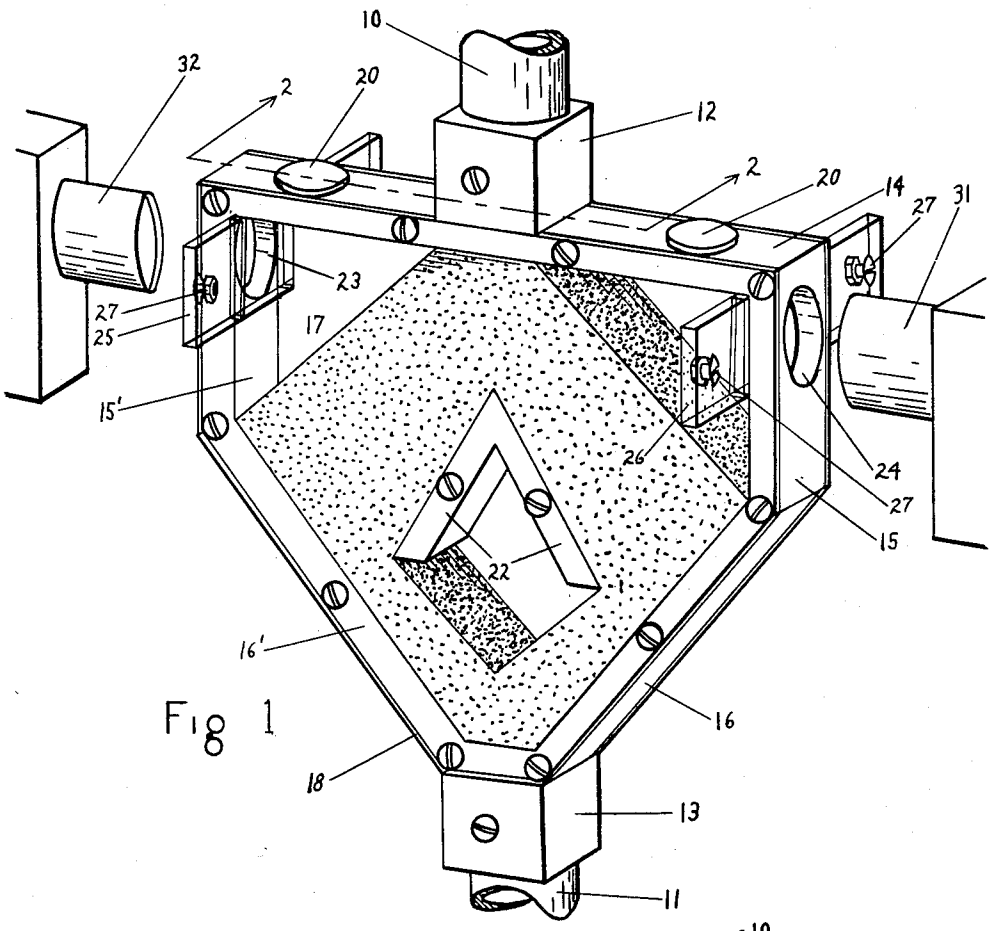


Fig 1

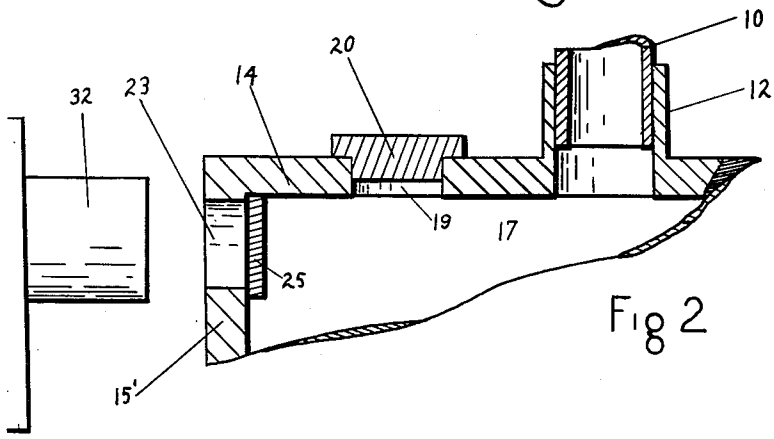


Fig 2

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INSPECTION DEVICE

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This invention relates to a detector or inspection device for ascertaining the presence of a pulverulent material in a line through which such material is being delivered, and to devices activated in the absence of an adequate quantity of material in the delivery line to perfom any desired function.

The invention is particularly useful in conjunction with pulverulent materials which tend to dust and to deposit a dust-coating on surfaces with which they come in contact. The specific embodiment to be described is designed for use in conjunction with the delivery of propellent powder to a machine for loading small arms ammunition, such as shot shells. For this purpose, ordinary visual inspection devices, such as transparent sections in the powder feed line, are unsatisfactory for the reason that, being constantly in contact with the powder moving past them, they very quickly become coated with an opaque dust, and are thus rendered useless.

The present invention contemplates a construction in which transparent members are so positioned with respect to the flowing pulverulent material that they are not contacted by the material, and thus retain indefinitely their transparency and their usefulness for the purpose of either visual or photoelectric inspection.

In the drawings:

Fig. 1 is a perspective view of an inspection cell made in accordance with a preferred embodiment of the invention. The figure includes a diagrammatic showing of photoelectric devices working in conjunction with the cell.

Fig. 2 is a fragmentary sectional elevation, substantially on the line 2—2 of Fig. 1.

Pulverulent material is delivered to the inspection cell through an inlet tube 10, and escapes therefrom through an outlet tube 11, said tubes being joined to the cell through suitable connector blocks 12 and 13 which may be integral with the cell body. The particular cell which is illustrated is of flat rectilinear configuration, comprising a horizontally disposed top plate 14 and vertically disposed side walls 15, 15' joined to or integral with inclined and converging bottom walls 16, 16', the outlet 11 being at the point of convergence. The frame formed by the top, side and bottom walls is closed at the back with a plate 17. Side walls and back plate may be made of any desired material; for the purpose of handling propellent powder, a non-sparking metal, such as brass, is preferred. The front of the cell is closed by a plate 18 which is of a transparent material, such as glass or Lucite. Plates 17 and

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18 are secured to the frame in any suitable manner. For the handling of propellent powder, preferably one or more apertures 19 are formed in the top plate 14 and are closed by loosely fitting blow-out plugs 20. Within the cell and extending between the front and back plates 18 and 17 is a wedge- or cone-shaped flow-controlling baffle 22, the apex or ridge of which is preferably located directly below the center of the inlet tube 10. The surfaces of the baffle extend outwardly and downwardly from said apex, and their lower margins together with the sloping walls 16, 16' and the front and back plates form two restricted passages through which the material flows. The inclination of the baffle surfaces is determined by the character of the particular material being handled. For propellent powder, an inclination of about 45° has been found desirable.

Near the top of the vertically disposed end walls 15, 15' are apertures 23, 24 which are closed by sheets of transparent material 25, 26, such as glass or Lucite. In the embodiment illustrated, these transparent sheets or windows have been shown in juxtaposition to the inner surfaces of walls 15, 15' and extend through slots in the transparent front wall 18 and opaque back wall 17 respectively. The windows are capable of sliding movement through such slots, their movement being limited by suitable stops 27, and are of such length as to enable manual cleaning of the entire window from outside the cell.

Fig. 1 shows the configuration assumed by a pulverulent material in its normal flow through the inspection cell. Bodies of such material of a depth not materially exceeding the width of the passages between the margins of the baffle and the inclined walls lie and flow along such walls. Above the baffle the material is arranged in two diverging masses with free upper surfaces extending downwardly and away from inlet 10 at an angle determined by the angle of repose of the material. These free surfaces terminate near the bottom of the vertical end walls 15, 15' and some distance below the lower margin of the windows 25, 26. The windows are thus completely out of contact with the material, and do not become obscured by a coating of adherent dust which inevitably accumulates on a surface with which a pulverulent material susceptible to dusting is in sliding contact. Experience has shown that even the adjacent corners of the transparent front plate 18 and the mid-portion thereof beneath baffle 22 which are out of contact with the material remain transparent for long periods,

whereas the surfaces of this plate along which the material flows very quickly acquires a dust coating which destroys their transparency.

The baffle is, even under normal operating conditions, a material aid in securing a flow of material through the cell while keeping the upper and outer corners of the cell empty and dust-free. Its importance is increased in the event that withdrawal of the material from the cell is temporarily diminished or stopped. Vibration incident to the motion of contiguous machinery materially reduces the angle of repose of the material, tending to fill the normally empty upper corners of the cell. Under extreme conditions, these corners may be completely filled; but, when withdrawal of material from the cell is resumed, such material must necessarily move through the passages defined by the lower ends of the baffle. The upper corners of the cell are thus very quickly emptied and the material returned to the condition shown in Fig. 1; whereas, in the absence of the baffle, the cell once filled would tend to remain full, with the material in dust-depositing contact with the windows and the upper corners of the front plate. The invention contemplates the automatic performance of a function such as stopping the loading machine or supplying a visual or audible signal in the event that material ceases to flow into the cell. For this purpose, a source of light illustrated diagrammatically at **31** is placed adjacent window **26** and a photoelectric cell diagrammatically shown at **32** is placed adjacent window **25**. As long as material is flowing through the cell, as illustrated in Fig. 1, the light from light source **31** is cut off by such material, but when the cell begins to empty a light path is established between the windows and to photoelectric cell **32** which is thereby activated. The activation of the photoelectric cell may, by conventional means, stop the machine to which the material is being fed, or perform any other desired function.

It will be understood that the embodiment of the invention above described and illustrated in the drawings is merely illustrative and typical, and that the device may assume other configurations and is otherwise susceptible to many modifications, all falling within the scope of the appended claims.

What is claimed is:

1. Apparatus for the delivery of a pulverulent material comprising a vertically disposed tubular passage, an inspection cell in said passage having intake and outlet openings, said cell comprising parallel planar vertically disposed walls spaced by a distance substantially greater than the diameter of said tubular passage and inwardly and downwardly inclined walls below said vertical walls, a flow-controlling baffle in said cell, said baffle comprising end margins defining passages and upwardly converging surfaces meeting in a ridge disposed in alignment with said intake opening, an aperture in and adjacent the top of each of said vertically disposed walls, and photoelectric means mounted adjacent said vertical walls to transmit a beam of light through one of said apertures in the direction of the other of said apertures.

2. Apparatus according to claim 1, in which each of said apertures is covered by a sheet of transparent material extending outside said cell and supported for translational movement in said cell in a plane parallel to the plane of the apertured wall.

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