

United States Patent

Nagashima

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[54] **APPARATUS FOR SENSING THE
PREDETERMINED LEVEL OF
CONTINUOUSLY FED PARTICLES**

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[52] U.S. Cl. **200/61.2, 200/61.21, 200/153 T**

[51] Int. Cl. **H01h 35/00, H01h 3/00**

[58] Field of Search **200/61.2, 61.21, 61.42, 82.3,
200/83.34, 81.9, 153.19, 82 D, 83 G, 81.9 R, 153 T**

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Primary Examiner—J. R. Scott

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[57] **ABSTRACT**

The apparatus according to this invention is adapted to be fixed within a receptacle into which particles are continuously fed. When the level of the particles reach the apparatus and the particles cover a cone provided with said apparatus, said cone descends and closes the switch of the electrical circuit containing a signalling apparatus and, if desired, apparatus for suspending the feed and discharging the contents of the receptacle. Several forms of the cones are also shown.

2 Claims, 8 Drawing Figures

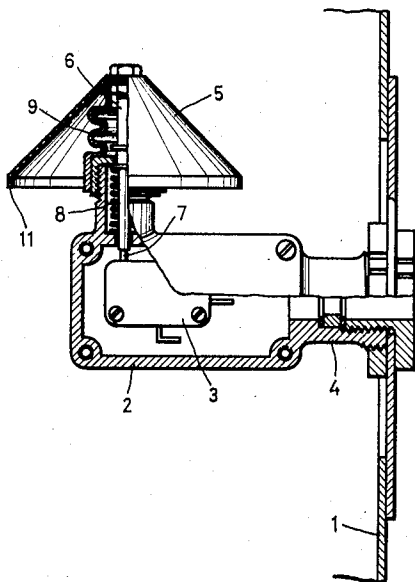


Fig. 1

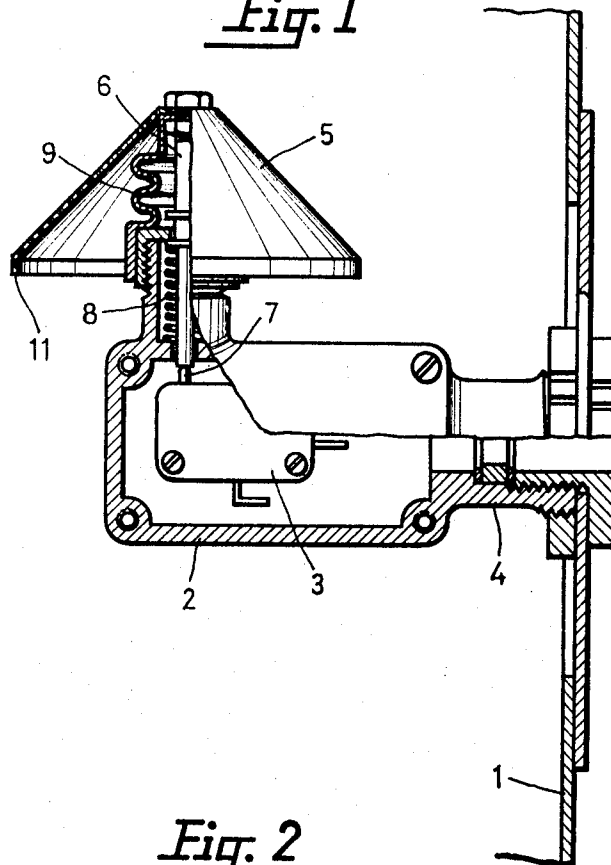
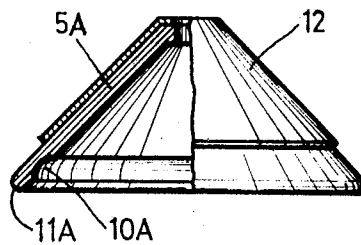


Fig. 2



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Fig. 3

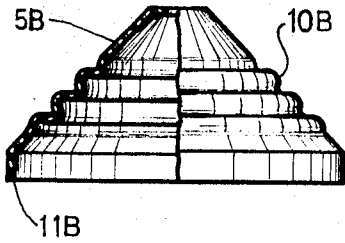


Fig. 4

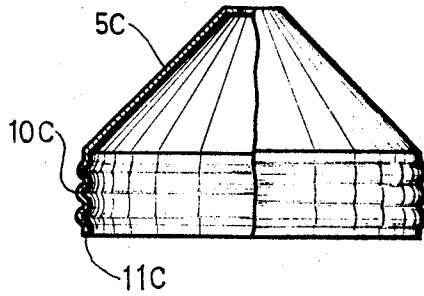


Fig. 5

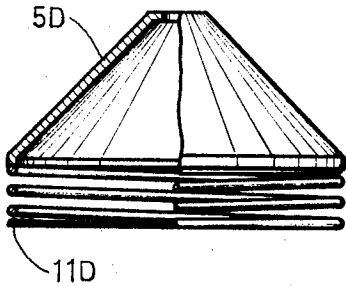


Fig. 6

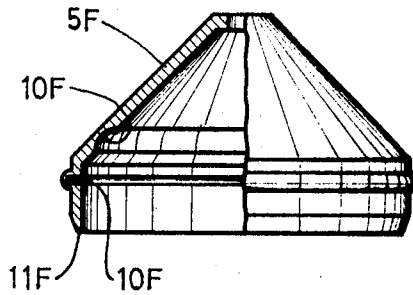


Fig. 7

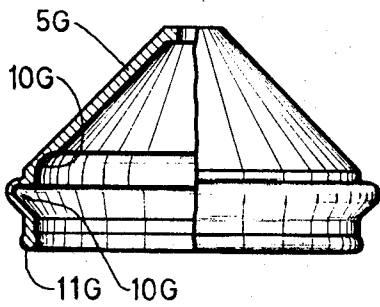
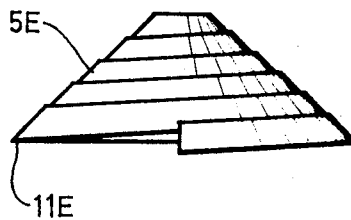


Fig. 8



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APPARATUS FOR SENSING THE PREDETERMINED LEVEL OF CONTINUOUSLY FED PARTICLES

The apparatus according to this invention is arranged at a proper position within a receptacle into which particles are continuously fed. When the level of the particles within said receptacle reaches a predetermined height, the apparatus functions automatically to close an electric circuit containing an apparatus for signalling the reaching of the predetermined level and, if desired, apparatuses for suspending the feeding as well as discharging the contents of the receptacle whereby a definite quantity of the particles may be easily measured and removed from the receptacle.

The apparatus according to this invention comprises a housing, a switching means such as a micro switch or other pressure responsive switching element arranged in said housing, a vertical rod projecting upward from said housing and cooperating with said switching means, a cone attached to the upper end of said rod for receiving the particles thereon and a spring for normally maintaining said cone and rod in the ascending position, but which is yieldable to the weight of the particles gathered on the cone so as to permit the cone and its supporting rod to descend in order to operate the switching means.

During the feeding operation, the level of the particles within the receptacle rises gradually. After the level passes by the housing of the invented apparatus, the particles begin to gather upon the cone and the weight thereof causes the descent of the cone. Since the particles exist below the cone, it is essential that the cone should descend easily without much resistance in order to ensure the high sensitivity of the apparatus. For this purpose, I have devised several appropriate cone forms as later explained.

This invention will be clearly understood with reference with the following description as well as the accompanying drawings in which,

FIG. 1 is a side view of the apparatus according to this invention with partial sectional view and,

FIGS. 2-8 show seven types of the cones.

In FIG. 1, 1 is a receptacle. 2 is the housing of the apparatus according to this invention attached at a proper position by a lateral arm 4 to the side wall of the receptacle 1. 3 is a micro switch arranged in the housing 2. 6 is a vertical rod cooperating with the push button 7 of said micro switch. A part of the rod 6 projects upward from the housing 2 and supports a cone 5. A spring 8 is provided to maintain the cone 5 and the rod 6 at the ascending position. Bellows 9 surround the upper portion of the rod 6 and prevent particles from intruding to the interior of the apparatus.

The function of the apparatus is as follows:

During the feeding operation, the level of the particles within the receptacle 1 rises gradually upward until it reaches and, then, passes by the housing 2 of the apparatus. Finally particles begin to gather upon the cone 5. When a sufficient quantity of particles gathers upon the cone 5, the weight thereof causes the cone 5 together with the rod 6 to descend whereby the rod 6 depresses the button 7 of the micro switch 3

so as to close the circuit containing the signalling apparatus and apparatuses for discontinuing the feeding operation and discharging the contents of the receptacle 1.

When the contents of the receptacle 1 are discharged, the cone 5 will return to the initial raised position by means of the spring 8 and the micro switch 3 will again resume the "off" position. Therefore, by repeating the above operations, substantially equal quantity of particles may be taken away every time from the receptacle 1.

In order to facilitate the descent of the cone, I have devised several types as shown in the drawings.

The cone 5 shown in FIG. 1 is preferably made from plastic material and its lower edge portion 11 is stiff and vertically extending. The cone of this type is adapted to be used for particles of fine size or powder.

However, if the particles be of a larger size (say 4-10 mm. dia.), the particles gathered below the skirt of the cone will greatly hinder the downward movement of the cone and in extreme case the apparatus becomes inoperative.

In order to overcome such a defect, I have improved the cones as shown in FIGS. 2-8.

The cone 5A shown in FIG. 2 is preferably made of soft elastic material such as rubber and is covered with a metal or hard plastic cap 12. The round edge 11A of this cone 5A is made much flexible by means of a circular groove 10A formed around the inner surface of the cone.

The cone 5B shown in FIG. 3 is preferably made of comparatively soft plastic material. The edge 11B is vertically disposed and the cone is provided with rows of inner grooves 10B between the top and the base.

In the cone 5C shown in FIG. 4, the skirt 11C is downwardly disposed and is provided with bellows 10C.

The cone 5D shown in FIG. 5 is provided with a skirt 11D consisting of a coil spring.

The cone 5F shown in FIG. 6 is provided with a vertically downcast edge 11F and inner groove 10F. The cone 5G shown in FIG. 7 is similar to the cone 5F except that it has a round edge 11G. Said cone is provided with inner grooves 10G. The cone 5E shown in FIG. 8 is comprised of a spiral of metal or plastic strip 11E.

If desired, in place of conical forms, pyramidal cones may be employed.

What I claim is:

1. An apparatus for sensing the predetermined level of continuously fed particles comprising a laterally projecting casing attached to a side wall of a receptacle, a micro-switch contained in said housing, a vertically extending rod having a lower end bearing upon a push button of the micro-switch, the upper end of said rod supporting a cone, a spring disposed within the laterally projecting casing about said rod for holding said rod in a raised position, a flexible cover for preventing particles from entering into the housing, the cone being provided with a downwardly directed lower edge.

2. An apparatus according to claim 1, wherein the cone is composed of yieldable material so that the same is yieldable under the weight of the particles gathered upon the cone.

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