

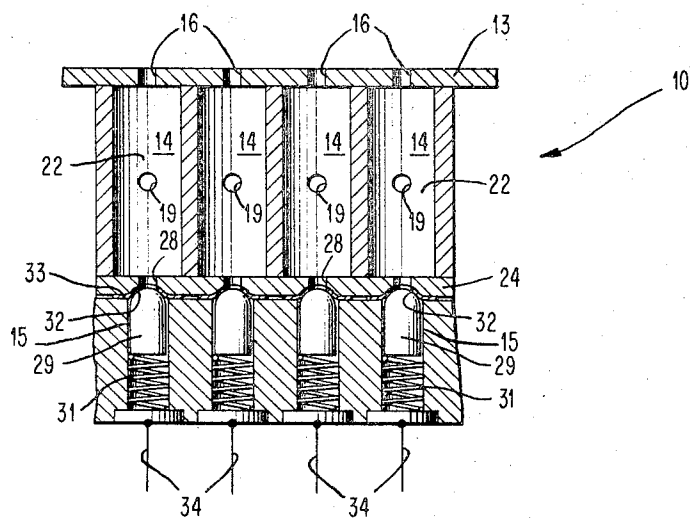
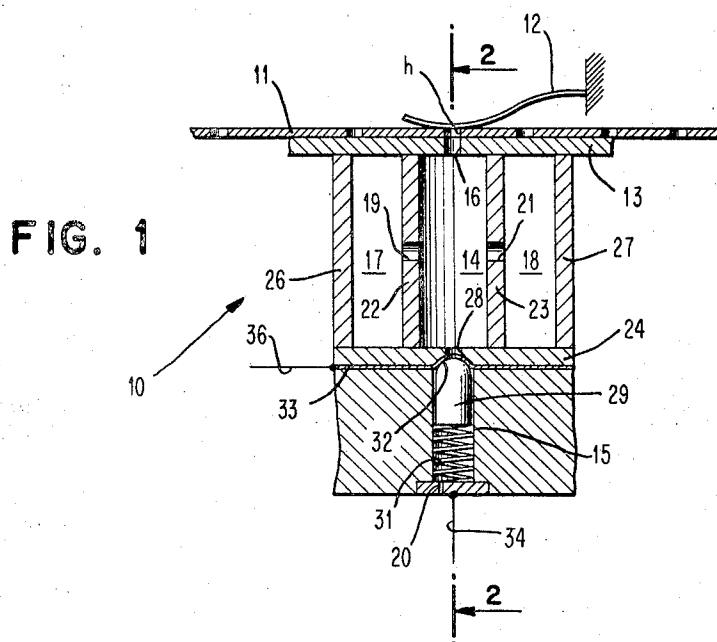
Oct. 8, 1968

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3,405,254

PNEUMATIC SENSING DEVICE

Filed April 6, 1964



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1

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PNEUMATIC SENSING DEVICE

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Filed Apr. 6, 1964, Ser. No. 357,459

3 Claims. (Cl. 235-61.11)

ABSTRACT OF THE DISCLOSURE

An electro-pneumatic device for sensing holes in cards and the like is provided, wherein fluid under pressure is directed into a chamber having openings toward its top and bottom. A spring loaded valve element normally closes the opening toward the bottom of the chamber to close an electrical circuit. The card to be sensed is passed over the top opening. When a hole is detected in the card the valve stays in place. When no hole in the card is present pressure builds up in the chamber to unseat the valve and thereby open an electrical circuit.

This invention relates to a pneumatic sensing device and more particularly to a pneumatic sensing device for sensing perforations in punched record cards or tapes.

There are various arrangements presently in use for sensing perforations in cards or tape. Probably the most common arrangement for detecting perforations is an apparatus which includes a plurality of pins which upon the perforated cards passing under them protrude through the perforation. In this way the pins make contact with a conductive plate or pin on the other side of the card to close a switch. Alternately, instead of using pins, brushes may be used which operate in essentially the same manner. The disadvantages with the above arrangements are that they are slow acting, mechanically complicated and therefore prone in many instances to mechanical failure.

It is an object of the present invention to provide a pneumatic sensing device for sensing holes or perforations in data bearing cards or tape which is capable of operating at high speeds without undue mechanical failures or wear.

Another object of the present invention is to provide a pneumatic sensing device for sensing perforations of punched cards which is simple in construction and inexpensive to make and wherein the parts are self-adjusting, easy to service, and readily interchangeable and which is capable of operating at the high speeds demanded by present day equipment without appreciable lost time due to mechanical failure or wear in parts.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanied drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIGURE 1 illustrates partly in section a preferred embodiment of the present invention;

FIGURE 2 shows a view of FIGURE 1 taken along the lines 2-2 of FIGURE 1.

Referring now more particularly to FIGURE 1 there is shown one sensing element 10 of the present invention of which there may be several in alignment as shown in FIGURE 2. A perforated card or tape 11 adapted to be moved to the left by drive means not shown is disposed between an appropriately biased spring 12 and platform 13 over which card 11 is passed. One end of spring 12 may be rigidly fixed in any convenient manner while the other end holds card 11 down on platform 13.

2

Each of the sensing elements of the present invention comprises a central chamber 14. Central chamber 14 is vented by means of vent 16 through platform 13. Central chamber 14 communicates with air supply manifolds 17 and 18 by means of openings 19 and 21 through walls 22 and 23, respectively. Air supply manifolds 17 and 18 are formed by platform 13, bottom plate 24, and walls 22, 23, 26 and 27, respectively. Air supply manifolds 17 and 18 which are supplied with air at some desired pressure are used to supply air to all of the chambers 14 of each of the sensing elements 10 used.

Another opening 28 passes through bottom plate 24 connecting central chamber 14 to cylinder 15. A spherical ended plunger 29 is biased by spring element 31 against opening 28. Opening 28 has formed around it a spherical seating 32 for receiving the spherical end of plunger 29.

Plate 24 may be composed of a conductive material or alternately may have a layer of conductive material 33 painted or otherwise placed on the bottom thereof. Plunger 29 which is made of a light material such as cork may be plated with an electrically conductive material or have an electrical wire conductor going there-through so that when plunger 29 is in the position shown, it is making electrical contact with conductive element material 33. Alternatively, the plunger may take the form of a hollow metal thimble. Spring 31 which is made of conductive material has connected to it a lead 34 while conductive material 33 has a lead 36 connected to it. When the sensing vent 16 is closed by the unpunched portion of a card, the pressure in central chamber 14 builds up and overcomes bias of spring 31 which holds plunger 29 in its seated condition closing opening 28. When the bias of spring 31 is overcome, plunger 29 is caused to lift off from seat 32 breaking electrical contact between leads 34 and 36. However, when one of the holes in card 11, for example, hole *h* passes over vent 16, the air pressure within central opening 14 is released therethrough and plunger 29 reassume its position within the seat 32 thereby making an electrical contact between leads 34 and 36. It should be noted that plunger 29 should have a smaller diameter than cylinder 15 so as to permit excess pressure to bleed off through opening 20 when plunger 29 is off seat 32.

Lead 34 may connect with a source of power such as a D.C. power source and lead 36 may be connected to some type of storage element. The actual lifting of plunger 29 from its seat 32 causes an otherwise continuous circuit to be broken signifying that the card or tape has no perforations. The device may be made high speed in operation since the breaking or making of the contact between plunger 29 and seating 32 may be made to occur vary rapidly after the sensing vent 16 becomes covered or uncovered. In the construction of the device, for example, by choice of a suitably biased spring 31 and by keeping the mass of plunger 29 to a minimum the speed of operation can be made very fast.

As may be seen from FIGURE 2 the pneumatic sensing device of the present invention would normally comprise a plurality of sensing elements like element 10 with each consisting of a central chamber 14, sensing vent 16, plunger 29, etc., and with each having its separate electrical circuit. As aforesaid, the air supply manifolds 17 and 18 may supply all of the central chambers 14 with pressurized air. The actual number of sensing elements arrayed in one unit depends on the number of rows in a card or tape having punched data therein to be sensed or read.

The present invention may be constructed so as to use vacuum instead of pressurized air by reversing the spring, plunger and seat portions to act within the chamber instead of without. This alternate method of construction

3

would provide an automatic card-hold-down feature thus eliminating the spring.

Obviously many modifications and variations of the present invention are possible in light of the above teaching. Therefore, the particular modification disclosed should not be construed as limiting the invention which is set forth in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A pneumatic sensing device for sensing perforations in cards or tape, comprising in combination: first chamber means having an opening to the atmosphere, second chamber means, port means connecting said first chamber means to said second chamber means, plunger means disposed within said second chamber means, means normally biasing said plunger means against said port means, means for providing said first chamber means with fluid so that when said opening is closed said plunger means is moved away from said port means, conductor means connected to said port means and said plunger means forming a continuous electrical circuit only when said plunger means is against said port means.

2. A pneumatic sensing device for sensing perforations in cards or tape, comprising in combination: first chamber means having a flat surface, said first chamber means communicating with the atmosphere through an opening in its flat surface, means for providing said first chamber means with fluid second chamber means, port means connecting said first chamber means to said second chamber means, plunger means disposed within said second cham-

4

ber means, means biasing said plunger means against said port means, data card means adapted to move over said flat surface and to thereby normally close said opening causing said plunger means to move away from said port means, said plunger means moving back against said port means when a perforation in said data card means coincides with said opening, conductor means connected to said port means and said plunger means forming a continuous electrical circuit only when said plunger means is against said port means.

3. A pneumatic sensing device for sensing perforations in cards or tape, comprising in combination: chamber means having an opening to the atmosphere and a port means, a valve means adapted to be seated into said port means when in a first position and to be withdrawn from said port means when in a second position, means normally biasing said valve means to one of its positions, means for providing said first chamber means with fluid at a predetermined pressure so that when said opening is closed said valve means is moved away from its biased position to its other position, and conductor means connected to said port means and said valve means forming a continuous electrical circuit only when said valve means is held against said port means.

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