

- [54] SENSING SWITCH HAVING RESILIENT FINGER SENSOR FOR DETECTING A DOCUMENT**

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Edell, Welter & Schmidt

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- [51] **Int. Cl.²** **H01H 3/16**; G06M 7/00
- [58] **Field of Search**..... 200/61.13, 61.18, 61.41,
200/61.42, 153 T, 330, 332, 336, 337, 46;
235/61.11 R, 61.11 C, 98 B

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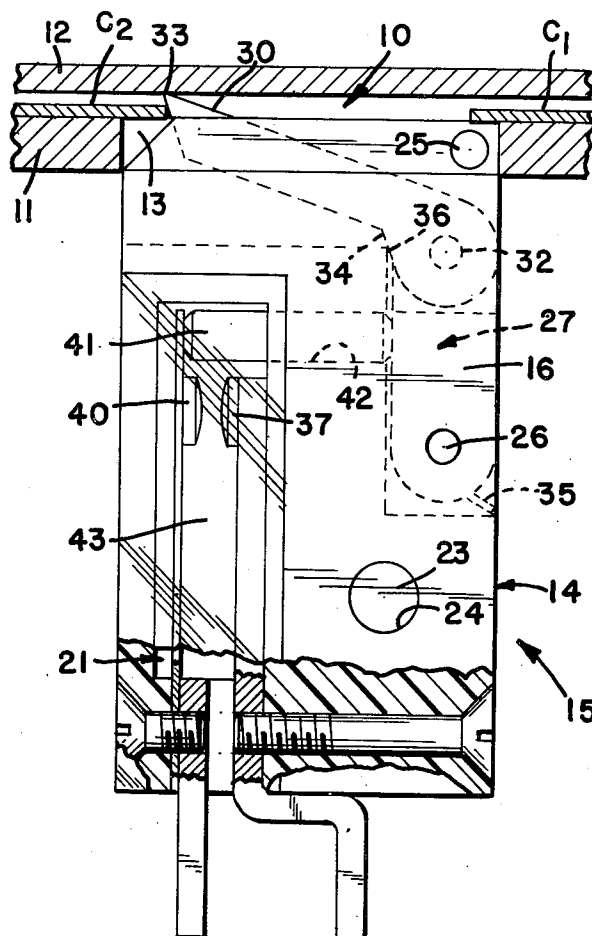
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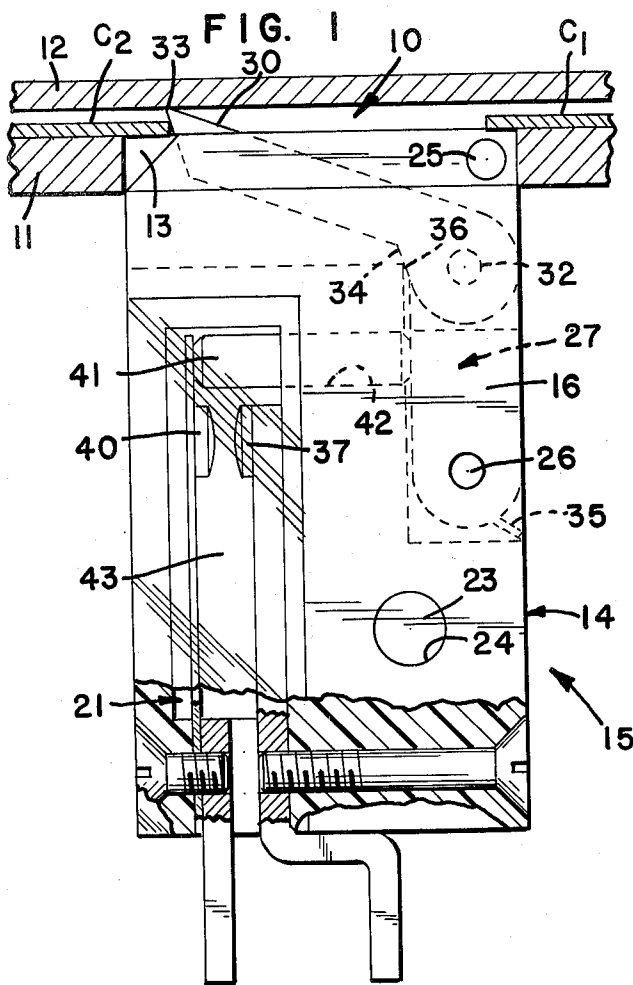
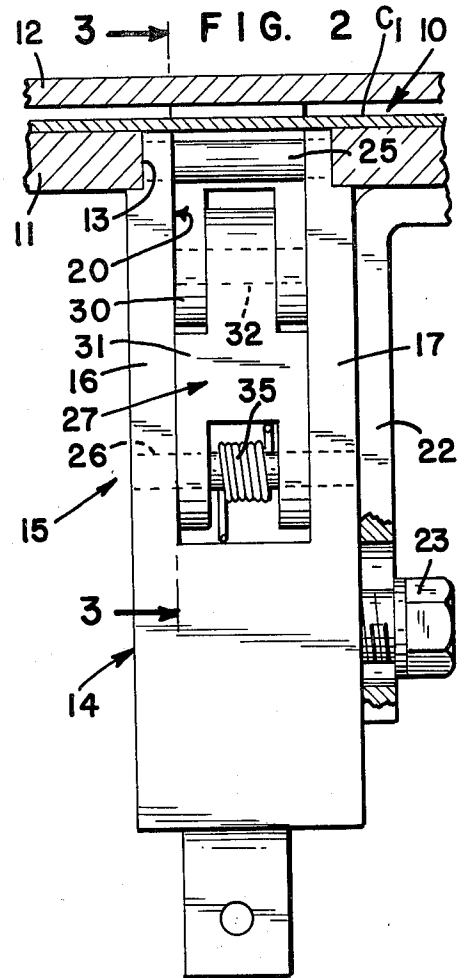
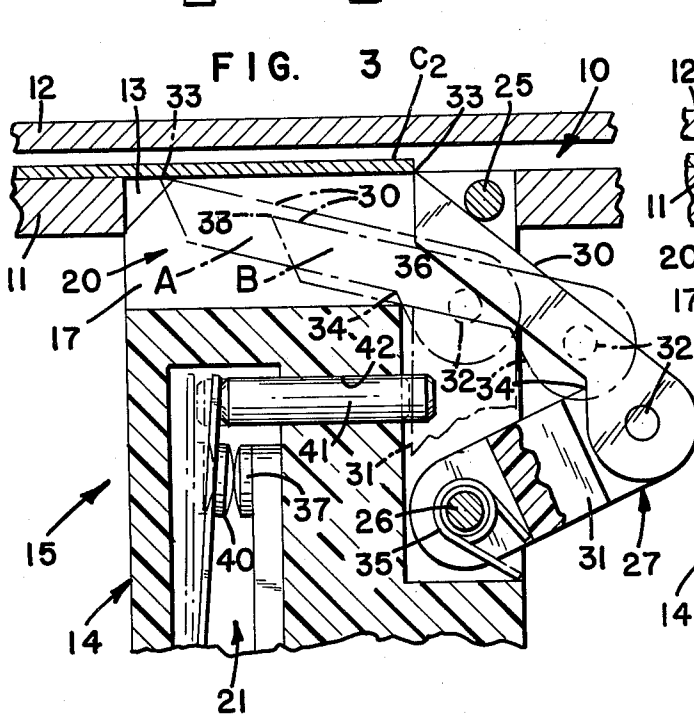
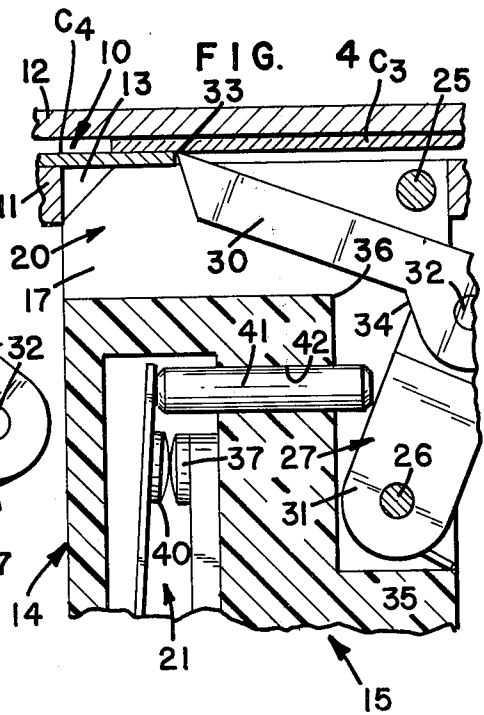
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[57] **ABSTRACT**

Sensing apparatus for giving electrical signals in accordance with the movement of a plurality of cardlike objects in a path of travel. A jointed arm has an initial position in which it is held by resilient and cam means, and projects into the travel path of the objects. When the edge of an object contacts the arm it drives the latter out of the initial position and closes a switch. Continued travel of the object moves the arm against a stop which withdraws it from the path of travel, and the spring and cam means returns it to a rest position, near the initial position, where the switch is open and where the arm rides against the under surface of the object. If a second object underlaps the first object the cycle is repeated. As the object passes out of the travel path the arm returns to the initial position.

12 Claims, 4 Drawing Figures





SENSING SWITCH HAVING RESILIENT FINGER SENSOR FOR DETECTING A DOCUMENT

BACKGROUND OF THE INVENTION

This invention relates to the general field of data processing, and more particularly to apparatus for automatically handling and operating upon objects in card-like form such as checks, computer cards, and similar documents. It is frequently desirable to count, photograph, endorse, or otherwise deal singly with large numbers of such documents in a manner which assures that no one of them will be overlooked.

My previous U.S. Pat. Nos. 3,202,779 and 3,461,225 are directed to sensing switches, which are means giving electrical signals whenever an object moves through a path of travel, and disclose apparatus which operates on a basis of continuous rotation to give the desired signals.

SUMMARY OF THE INVENTION

The present invention comprises mechanism for accomplishing the desired function by combined linear and pivotal oscillation. An arm is initially positioned to be contacted by the edge of a card that moves through the travel path. The arm is jointed, as it moves by reason of the contact with the card it engages a pin which withdraws it from the travel path, but in the meantime it has closed a switch. Under the joint action of gravity, a spring, and a cam the arm is set in a rest position in which it gently contacts the undersurface of the card, which continues to move through the travel path. When the card leaves the travel path the arm returns to its initial position. In the rest position as well as the initial position the switch is open.

If it occasionally happens that two cards enter the travel path in somewhat overlapped relation, the upper preceding the lower, the arm goes through its cycle of operation for each leading edge, thus counting, endorsing, or otherwise handling the two documents individually.

It is accordingly an object of the invention to provide new and improved apparatus for handling documents in the form of card-like objects.

Another object is to provide means for giving an electric signal upon the movement of each of a plurality of card-like objects through a travel path, even though the documents may be in part overlapping.

A more specific object of the invention is to provide such apparatus including a jointed arm together with cam, spring, and gravity actuated means establishing an initial position for the arm in which it extends into the travel path for displacement by a moving card to a point where it is withdrawn from said path, whereupon it returns to a rest position, the arm meanwhile actuating a suitable switching mechanism.

Another object of the invention is to provide such an arrangement in which the arm repeats its cycle of operation if two cards pass through the travel space in partially overlapping relation, and in which the arm returns from the rest position to the normal position when the card leaves the travel path.

Various other objects, advantages, and features of novelty which characterize my invention are pointed out with particularity in the claims annexed hereto and forming a part hereof. However, for a better understanding of the invention, its advantages, and objects attained by its use, reference should be had to the

drawing which forms a further part hereof, and to the accompanying descriptive matter, in which there are illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing FIG. 1 is a fragmentary side elevation of the invention, parts being broken away for clarity of the illustration;

FIG. 2 is a side elevation of the apparatus as seen from right to left of FIG. 1;

FIG. 3 is a sectional view as seen from the line 3—3 of FIG. 2 showing other positions of elements of the invention during an operating cycle; and

FIG. 4 is a view like FIG. 3 showing a special condition of operation of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention comprises a portion of a larger machine in which objects such as checks, computer cards, or similar documents, herein after referred to as "cards," are counted, photographed, endorsed, or otherwise handled. The cards pass through a channel 10 defined by a base plate 11, a guideplate 12, and any necessary side guides not shown. Transport means not shown feed the cards into channel 10 from the left, and withdraw them from the channel at the right for appropriate handling: in FIGS. 1 and 2 card C₁ has passed through the sensing apparatus and card C₂ is about to enter it for sensing. A rectangular aperture 13 is formed in base plate 11 and receives the housing 14 of my sensing mechanism 15. The upper portion of housing 14 has two projecting walls 16 and 17 defining between them a cavity 20 in the form of an inverted L, and is provided with a contact chamber 21. Mechanism 15 is secured below base plate 11 by suitable means including an angle bracket 22 and a bolt 23 received in a tapped hole 24 in housing 14. The opening in base plate 11 between walls 16 and 17 is referred to herein as the path of travel of cards which are to be sensed by the apparatus. A pair of pins 25 and 26 extend between the walls of housing 14, within cavity 20, for cooperation with a jointed arm 27 as will now be described.

Arm 27 includes a finger 30 and a link 31 hinged by pivot means 32 in the form of a pin which does not engage wall 16 or wall 17. Finger 30 has a card engaging tip 33 and a camming surface 34. Link 31 in turn pivots on pin 26, about which it is urged in a counter clockwise direction by a spring 35. Finger 30 rotates freely on pivot means 32, but in the position shown is maintained with tip 33 contacting guideplate 12 because of engagement between camming surface 34 and an abutment 36 in housing 14.

Chamber 21 contains a fixed contact 37 and a movable contact 40, the latter being urged by its resilient nature toward the former, but being held out of contact therewith by a pushrod 41 extending through a hole 42 in housing 14 and contacting link 31. Contacts 37 and 40 may be used to complete an electric circuit for a counter, endorser, camera, or the like. Chamber 21 is closed by cover 43 which is of transparent material to facilitate inspection of contacts 37 and 40.

OPERATION

The operation of my sensing apparatus will now be explained. The initial position of arm 27 is that shown

in FIG. 1: spring 35 forces link 31 counterclockwise about pin 26, and camming surface 34 engages abutment 36 to raise finger 30 until tip 33 thereof engages guide-plate 12, and push rod 42 displaces contact 40 from contact 37.

As card C₂ enters channel 10 its front edge engages fingertip 33 and holds it against guide plate 12, moving the finger to the right and causing link 31 to pivot clockwise about pin 26. This allows pushrod 41 to move to the right, by reason of the pressure of resilient contact 40. This continues until the upper surface of finger 30 engages pin 25, which pivots the finger counterclockwise about pivot 32 until the tip moves below the edge of the card, as shown in the solid lines in FIG. 3. Two actions can now occur: finger 30 may rotate freely in a counterclockwise direction about pivot 32 under the action of gravity, and link 31 may rotate in a counterclockwise direction about pin 26 under the action of spring 35. The mechanism goes through a number of intermediate conditions such as that indicated in dashed lines A, and comes to a stop as shown by dashed lines B, where the fingertip 33 is held in contact with the underside of card C₂ by the action of camming surface 34 on abutment 36. This may be called the rest position of the device: although it is not identical with the initial position, it is still a position in which push rod 41 has disengaged contact 40 from contact 37, so that an operation has been electrically accomplished. This position of the apparatus continues until card C₂ passes out of the path of travel, releasing fingertip 33 and allowing the arm to return to its initial position and await the next card.

In normal operation of the transport system the cards reach my mechanism one at a time, with spacing between them. Occasionally it happens, however, that two successive cards are not spaced but may even overlap. FIG. 4 shows such a situation, card C₃ having been sensed and arm 27 having returned to its rest position: an overlap is shown between cards C₃ and the ensuing card C₄. It is clear that the leading edge of card C₄ can engage fingertip 33 and cause another sensing operation, even though there is no space between cards C₃ and C₄. This operation is possible for very considerable overlaps: the travel of finger 30 in the sensing operation is small compared to the length of the cards, and as soon as the rest period has been attained an overlap operation is at once possible.

Numerous objects and advantages of my invention has been set forth in the foregoing description, together with details of the structure and function of the invention, and the novel features thereof are pointed out in the appended claims. The disclosure, however, is illustrative only, and changes may be made in detail especially in matters of shape, size, and arrangement of parts, within the principle of the invention, to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. Apparatus for electrically sensing the presence of an object in a path of travel therefor comprising, in combination:

pivot means (32) defining an axis of rotation spaced from and orthogonal to the direction of said path; link means (31, 26, 35) mounting said pivot means for resiliently opposed movement, out of an initial position, having a principal component aligned with said direction;

a gravity responsive finger (30) mounted on said link means for free pivotal movement about said pivot means in response to the force of gravity;

abutment means (36) limiting the movement of said finger in response to gravity, said finger and said abutment means being so configured that when said link means brings said pivot means into said initial position, said finger is positioned to protrude into said path for engagement by the leading end of an object traveling therealong to cause gravitationally opposed movement of said finger out of engagement with said abutment means accompanied by resiliently opposed movement of said pivot means out of said initial position;

release means (25) in the path of said finger at an extreme of the movement thereof for withdrawal of said finger from engagement by said leading edge, so that said pivot means may be resiliently returned to a rest position near to but displaced from said initial position;

and control means (37, 40, 41) mounted for actuation by said link means to perform a switching function when said pivot means is not in one of said initial and rest positions.

2. Apparatus according to claim 1 in which the link means comprises a link pivoted about a second axis.

3. Apparatus according to claim 2 in which the second axis is parallel to the axis defined by said pivot means.

4. Apparatus according to claim 1 in which the objects are card-like, and in which upon said withdrawal said finger returns to engagement with a surface of the object which is parallel to said direction, thereby preventing said first means from fully reaching said initial position.

5. Apparatus according to claim 2 in which the control means includes an actuator contacted by said link when said pivot means is in the initial and rest positions.

6. Apparatus according to claim 1 together with means defining a substantially closed channel for directing the travel of said objects, said finger in the initial position of said pivot means extending across said channel to contact the inside of the opposite wall thereof.

7. Apparatus according to claim 6 in which said objects are card-like, together with feed means for advancing the cards through the channel in generally one-by-one spaced relation.

8. Apparatus according to claim 6 wherein upon said return of said pivot means said finger is spaced from said opposite wall by the dimension of said object transverse to said channel, to prevent said pivot means from reaching said initial position.

9. Apparatus according to claim 8 wherein completion of the travel of said object enables said pivot means to reach said normal position.

10. Apparatus according to claim 1 wherein the presence of an object in said path initially prevents said finger from causing said link means to reach said initial position.

11. Apparatus according to claim 7 wherein said apparatus lies beneath said path of travel.

12. Apparatus for electrically responding to the movement of cards driven through a path of travel having a known direction comprising, in combination:

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means including horizontal upper and lower plates
defining the path of travel laterally;
a housing mounted beneath an aperture in the lower
plate;
a jointed arm comprising a generally vertical link, a 5
generally horizontal finger, and means mounting
one end of the finger for pivotal movement at one
end of the link, said finger including a camming un-
dersurface and a card engaging tip remote from the
link;
means for pivotal movement, about an axis remote 10
from and orthogonal to the path of travel, out of an
initial position in the housing;
resilient means for urging the link toward its initial
position;
an abutment in the housing positioned beneath the 15
finger to engage the camming surface thereof,
when the link is in its initial position, to displace the
finger upwardly through the aperture in the lower
plate until the tip of the finger engages the upper 20
plate;

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the arrangement being such that when a card enters
the path of travel it engages the tip of the finger and
displaces it in the direction of travel, thereby caus-
ing pivotal movement of the finger and the link;
means carried by the housing for engaging the finger
after a predetermined movement thereof with a
moving card, to withdraw it below the bottom of
the card, whereupon the finger drops gravitation-
ally into engagement with the abutment and the
link is resiliently drawn toward its initial position
until the camming surface pivots the finger upward
into contact with the bottom of the card, to define
a second, rest position of the links;
a pair of contacts normally completing an electric
circuit;
and a push rod engaging one of said contact and
mounted for engagement by said link to break the
circuit when the link is in its initial and rest posi-
tions.

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