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COMBINED SENSING AND SWITCH DEVICE

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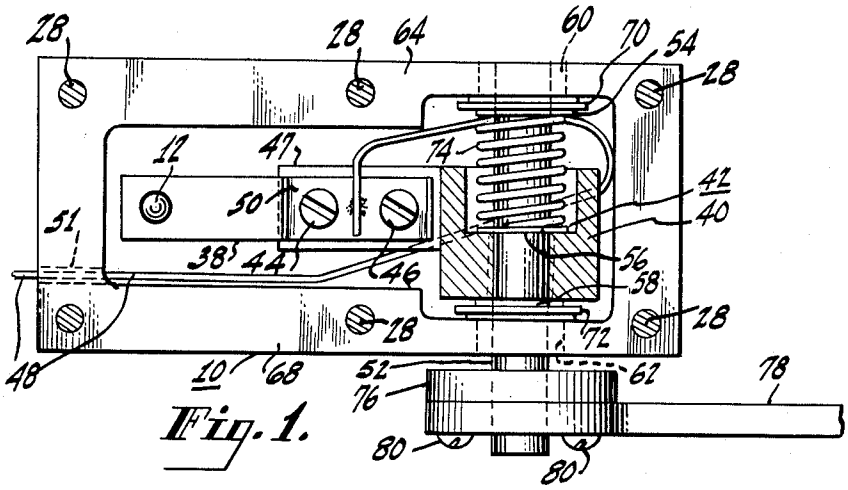


Fig. 1.

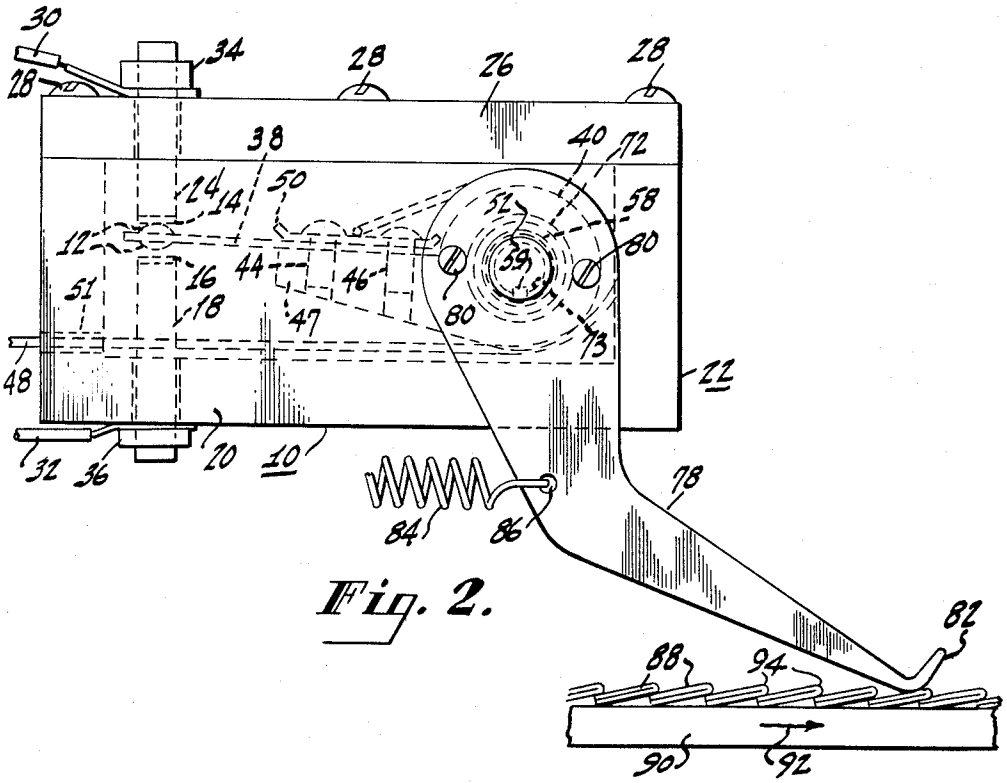


Fig. 2.

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COMBINED SENSING AND SWITCH DEVICE

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1 Claim. (Cl. 200—61.41)

This invention relates generally to sensing devices for sensing changes in contours of objects, and more particularly to a novel combined sensing and switch device wherein the linear displacement of a movable contact necessary to actuate the switch is relatively short, and wherein the linear displacement of the actuating means for the switch may be relatively much longer. The device of the present invention is particularly useful for sensing each of the folded edges of a series of overlapping newspapers on a conveyor belt for counting purposes.

It is necessary for operators of a newspaper plant to keep track of the number of newspapers being printed. In most modern newspaper plants, the completed newspapers are deposited on a conveyor belt in a continuous stream of overlapping newspapers with their folded edges exposed. It has been proposed heretofore to count these newspapers by sensing their projecting folded edges, but no device for accomplishing the counting satisfactorily has been available commercially. Thus, a device which can sense newspapers satisfactorily regardless of the thickness thereof and which, in combination with suitable switch means is capable of providing, with the aid of suitable circuitry, discrete electrical signals for each newspaper which is sensed would be highly desirable to count newspapers accurately as they are fed from the press.

Accordingly, it an object of the present invention to provide an improved combined sensing and switch device that is adapted to sense the folded edges of newspapers on a conveyor belt and to produce fast and accurate switching of the type suitable for counting purposes.

Another object of the present invention is to provide an improved device for the aforementioned purpose that will respond to various articles, such as newspapers, of varying thicknesses, without requiring any critical adjustments.

A further object of the present invention is to provide an improved device as above set forth that is relatively simple in construction and operation, easy to manufacture, and highly efficient in use.

In accordance with the present invention, the improved device comprises a single pole, double throw switch of novel construction. The device employs a slip clutch between its actuating means and the switch contact means. A movable contact is moved from one fixed contact to the other by means of an arm that is fixed to the driven member of the slip clutch. Switch actuating means are fixed to the driving member of the slip clutch. The actuating means comprise a pivoted follower that is spring biased in a direction to contact newspapers moving on a conveyor belt but is free to pivot in either a clockwise or a counter-clockwise direction about its pivot axis. Since the newspapers are aligned in an overlapping and somewhat inclined arrangement, with their folded edges exposed, the follower will pivot or rock to some extent alternately clockwise and counter-clockwise, so that it will have an up and down component of motions for each newspaper it senses. This action causes the movable contact to move from one fixed contact to the other. The switch of the present invention may be adjusted to sense newspapers that are relatively very thin by adjusting the travel displacement of the movable contact to a very short distance. When relatively thicker newspapers are to be counted, the displacement of the follower is relatively much larger than necessary to actuate the movable contact through the slip clutch. Any overdriving of the slip clutch after the switch is actuated, however, merely causes the slip clutch to slip, thereby preventing damage to the switch.

The novel features of the present invention, both as to its organization and method of operation, as well as additional objects and advantages thereof, will be understood more readily from the foregoing description when read in connection with the accompanying drawing in which:

FIG. 1 is a plan view of one form of combined sensing and switch device according to the present invention with its cover removed and a portion of the clutch shown in cross-section; and

FIG. 2 is a side elevational view of the device showing its follower in contact with folded newspapers on a conveyor belt.

Referring, now, more particularly to the drawing, there is shown a combined sensing and switch device **10** having a single pole, double throw switch wherein a movable contact **12** of the switch is adapted to move between a pair of fixed contacts **14** and **16**. The fixed contact **16** is fixed, by any suitable means, to the end of a screw **18** that is screwed into the bottom wall **20** of a box-like housing **22**. The housing **22** is made of insulating material which may be transparent plastic material. The fixed contact **14** is fixed, by any suitable means, to the end of a screw **24** that is screwed into the cover **26** of the housing **22**. The cover **26**, which may also be of transparent plastic material, is fastened to the housing **22** by any suitable means, such as screws **28**. Electrical conductors **30** and **32** are connected to the fixed contacts **14** and **16** by means of nuts **34** and **36** on the screws **24** and **18**, respectively. The screws **24** and **18** provide adjustable means for spacing the fixed contacts **14** and **16** at any desired distance from each other.

Means are provided to move the movable contact **12** between the fixed contacts **14** and **16**. To this end, the movable contact **12** is fixed adjacent one end of a metal arm **38** by any suitable means, such as riveting. The other end of the arm **38** is fixed to the driven member **40** of a slip clutch **42** by means of screws **44** and **46**. The driven member **40** is a cup-like member of a suitable plastic material such as "nylon," and has a portion **47** which extends laterally outwardly therefrom to support the arm **38**. An electrical conductor **48** is connected to the movable contact **12** by means of a clamp **50** which, in turn, is held in contact with the arm **38** by means of the screws **44** and **46**. The conductor **48** may be soldered to the clamp **50**, as shown in FIG. 1, or the conductor **48** may be clamped firmly between the arm **38** and the clamp **50**. The conductor **48** is brought to the outside of the housing **22** through an opening **51** in one of the end walls of the housing **22** and, together with the conductors **30** and **32**, is connected to a suitable counting device (not shown).

The clutch **42** is driven by driving means that include a shaft **52** and a plurality of driving members in the form of steel washers **54**, **56** and **58**. The washers **54**, **56**, and **58** are fixed to the shaft **52** by any suitable means for rotation therewith. For example, the washers **54**, **56** and **58** may be keyed to the shaft **52**, as by means of a spline **59** (FIG. 2). The washer **56** is slidable in the direction of the axis of the shaft **52**, but it is fixed for rotation with the shaft **52**. The driven member **40** is loosely mounted on the shaft **52** for rotation thereabout.

The shaft **52** is mounted for rotation within bearings **60** and **62** in opposite walls **64** and **68**, respectively, of the housing **22**. A pair of C-washers **70** and **72** are fixed to the shaft **52** adjacent the bearings **60** and **62**, respectively, as by being seated in coaxial grooves **73**, to position the shaft **52** and to prevent it from sliding out of the bearings **60** and **62**. A spring **74** is disposed between

washers 54 and 56 to provide a frictional force between the washers 56 and 58 on the one hand, and the driven member 40 on the other. The washer 58 is disposed between the C-washer 72 and the driven member 40.

It will now be understood that, as the driving means of the clutch 42, that is, the shaft 52 and its driving washers 54, 56, and 58, are rotated, the driven member 40 will rotate because of the frictional force between the driving washers 56 and 58 and the driven member 40. The spring tension provided by the spring 74 produces a sufficient frictional force between the driving and the driven members of the clutch 42 to move the movable contact 12 from one to the other of the fixed contacts 14 and 16, depending on the direction in which the shaft 52 is rotated.

Actuating means are provided to rotate the shaft 52 selectively, either clockwise or counter-clockwise. A collar 76 is fixed to a portion of the shaft 52 that extends outside of the housing 22. The collar 76 may be integral with the shaft 52. An arm or follower 78 has one end fixed to the collar 76 by means of screws or rivets 80. The lower end of the follower 78 has an upwardly and outwardly turned toe 82.

The follower 78 may be biased in one direction in order that the movable contact 12 may be always in contact with one of the fixed contacts when the switch is not actuated. Thus, as seen in FIG. 2, a spring 84 which has one end engaging the follower 78 through a hole 86 in the follower 78 and its other end (not shown) anchored to a fixed object, biases the follower 78 to rotate in a clockwise direction, whereby the movable contact 12 engages the fixed contact 14 in the absence of any external actuating force on the follower 78.

The operation of the combined sensing and switch device 10, in accordance with the present invention, will be described in connection with the counting of newspapers 88 arranged in overlapping alignment on a conveyor belt 90, not shown to true scale. Let it be assumed that the conveyor belt 90 is moving in the direction indicated by the arrow 92. The sensing device 10 is fixed so that the toe 82 of its follower 78 rests on the newspaper 88. It will now be understood that when the folded edge 94 of one of the newspapers 88 comes under the follower 78, it rotates the shaft 52 and the washers 54, 56, and 58 of the slip clutch 42 counter-clockwise as viewed in FIG. 2. This action rotates the driven member 40 which is mounted loosely on the shaft 52 but in frictional engagement with the washers 56 and 58. The arm 38 is thus also moved counter-clockwise to bring its contact 12 into engagement with the fixed contact 16. When the movable contact 12 hits the fixed contact 16, further counter-clockwise movement of the arm 38 is arrested. Any additional force in a counter-clockwise direction on the follower 78 causes the clutch 42 to slip. This slippage occurs between the washers 56 and 58 and the "nylon" driven member 40. After passing the folded edge 94 of a newspaper 88, the follower 78 is gradually lowered by the action of the spring 84 to thereby cause the shaft 52 to turn in a clockwise direction. This causes the arm 38 to move the movable contact 12 from the fixed contact 16 back to the fixed contact 14. Again, any over-

driving of the follower 78 causes slippage of the clutch 42. Thus, it will be understood that the use of the clutch 42 permits unlimited overtravel of the follower 78 for a relatively small linear displacement of the movable contact 12. With this arrangement, papers of varying thicknesses can be counted without making any critical adjustments for the thicknesses of the papers.

From the foregoing description, it will be apparent that there has been described an improved combination sensing device and switch adapted to sense changes in the contour of one or more moving objects and to provide signals which may be used in determining the count or some other feature, such as thickness, for example, of such objects. While the device of the present invention has been described in connection with means for counting newspapers emerging from a newspaper press, it will be understood that the example used is merely illustrative and is not to be construed in a limiting sense. Since the device 10 is of the single pole, double throw type, each newspaper sensed will cause the movable contact to first touch one fixed contact and then the other for a single count. This results in a more accurate switch for counting purposes. The electrical circuits for counting have not been shown or described because they form no part of the instant invention. It will be understood, however, by those skilled in the art that, with the aid of suitable circuitry, two discrete signals, one from each fixed contact, may be obtained successively by means of the single pole, double throw switch of the present invention.

What is claimed is:

In combination, a switch comprising a pair of contacts, means to mount said contacts in a spaced-apart relationship to each other, a movable contact, a rotatable clutch having driving means and driven means, an arm to move said movable contact from one of said pair of contacts to the other, said arm being substantially rigid between said driven means and said movable contact, said movable contact being adjacent to one end of said arm, means rigidly connecting the other end of said arm to said driven means to rotate therewith when driven, actuating means connected to said driving means to cause said arm to rotate in one direction and to move said movable contact from one of said pair of contacts to the other when actuated, said clutch being adapted to slip after said movable contact touches one of said pair of contacts if said actuating means are still actuated, means connected to said actuating means to bias said actuating means normally in a direction opposite to said one direction whereby said movable contact normally touches only said one contact in the absence of an actuating force on said actuating means, and means to connect electrical conductors to each of said contacts.

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