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SWITCH OR DEFLECTOR DEVICE FOR DIRECTING THE PRODUCTS OF PRINTING MACHINES


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13 Claims. (Cl. 271—64)

1 This invention relates to improvements in switch or deflecting mechanism (hereinafter referred to as "switch" mechanism) for use in diverting from one path to another the products passing from a printing machine. This need for diversion arises in different conditions and hitherto difficulty has been experienced in obtaining a satisfactory switching action especially at high operating speeds. It has been common to provide what may be termed a gate supported for pivotal movement about an axis disposed in the line of approach of the products to be switched and the invention is especially concerned with this kind of switch. It is usual to dispose the axis of pivotal movement at the end of the switch which is remote from the operating part which is presented to the oncoming products. With this arrangement, the free or operative edge of the switch has to be swung completely across the line of approach of the products and difficulty arises from the fact that (especially in high-speed machines) this movement has to be effected in a very short time, for unless the switch movement over completely in the time available, the oncoming products are liable to hit the free end of the switch and so be mutilated and cause a "jam" to occur.

The main object of this invention is to provide a switch device which will enable this difficulty to be avoided and this object is achieved broadly stated according to this invention by providing a switch device which is mounted for switching movement about an axis which is adjacent to the presented surface of the switch; with this arrangement, the presented surface has only a relatively small movement; indeed it may be said that the action of the presented surface of the switch is merely to give a small directional lead to the oncoming products whereas the pass naturally along the appertaining side of the switch. Obviously the time available for the operation of the switch can thus be increased as compared with that of the normal arrangement. The invention further consists in providing an improved operating mechanism for the switch whereby the switch will be changed over or reversed without appreciable shock, this being effected by a mechanism which operates progressively to pick-up and pass from the switch.

The invention is illustrated in the accompanying drawings in which Figure 1 is an end elevation, Figures 2 and 3 detail views to a smaller scale of the switch elements of this invention, Figure 2 being a part cross sectional view and Figure 3 a part side elevation, Figure 4 an end elevation showing the parts illustrated in Figure 1 in a second position, Figure 5 a modified form of switch and Figure 6 a modified arrangement of mechanism for operating the switch.

2 The switch comprises a number of elements S (Figures 2 and 3) spaced along a shaft I disposed across the line of approach of the products P, the direction of approach being indicated by the arrow X. In Figures 1-5 the products will issue from the nip of rollers 2, 3 in a more or less horizontal direction.

In the construction shown in Figures 1-3, each element S is of approximately the shape of a major segment of a circle the chord of which is however slightly curved, this face indicated at 4 forming the operative or deflecting face. The shaft 1 is arranged to be angularly moved first in one direction and then in the other direction by mechanism hereinafter described and the elements S are so positioned that in one position of the shaft 1 the deflecting face slopes downwards as seen in Figure 2 from above the line P and in the other position slopes upwards from a point below the line P.

The rollers 2, 3 are grooved as indicated at 7, 8 as seen most clearly in Figures 2 and 3 the grooves being in register with the elements S and the shaft 1 is so disposed that the operating or nose end of the elements can be received in the grooves with the adjoining circular part of the elements passing closely to the root of the grooves. Thus, as seen in Figure 2, the nose of each element S is received in the groove 7 of the upper roller 2 at a time when the operating face 4 is positioned to deflect the products P downwardly; similarly when the operating face 4 is reversed to deflect the products upwardly, the nose of each element S is received in the groove 8 in the roller 3. It will be seen that with this arrangement there is provided by the nose end of each element S a barrier which positively prevents the leading edge of a product from passing except in the direction up or down as determined by the position of the deflecting face 4 between which and one or other roller 2, 3 is formed a gap permitting the passage of the products.

In the modified form of element S shown in Figure 5, the element is symmetrical about a longitudinal centre line and has two deflecting faces 4a, 4b, which join at a nose just ahead of the shaft 1. In this arrangement the nose returns into the grooves 7, 8 in the rollers 2, 3 and performs the same function as that ascribed for the construction shown in Figures 1-4.

In a further modification (not shown) each
element may be in the form of a circular disc mounted eccentrically on the shaft 1, the shaft 1 being eccentrically on the shaft 14 so that the movement of the nose across the line P is small as compared with the usual lane of arrangement of switch where the nose end is at a considerable distance forward of the axis of pivotal movement. Indeed it may be said that the reversal of the elements is effected not so much by bodily movement but rather by a comming action to give the requisite lead to the oncoming products, and as a result the operation can be effected at high speeds without difficulty of operation. It may also be observed that referring for example to Figure 2, it is intended that the element 5 shall be turned in a clockwise direction when it is operated to change the direction of deflection.

The switch, or more precisely, the shaft 1, would, when the switch device is required to effect "counting" of the products, be operated to divert first a number of successive products along one path and then the required certain number having been directed along that path, by switching over divert the succeeding products to another path, and so on.

Such a condition arises for example in connection with counting mechanism wherein there are provided upper and lower conveyor belts illustrated in Figure 1 of the accompanying drawing at 5, 6 to one of which first one counted batch is delivered whereupon the products are diverted to deliver a counted batch to the other conveyor.

While any convenient mechanism can be provided to operate the shaft 1, that shown in Figure 1 is preferred: this mechanism employs the Geneva wheel movement which ensures a rapid but progressive operation and a positive locking of the switch in each extreme position. Thus the shaft 1 has secured to it a Geneva disc 9 having dimensions and grooves 10 which receive alternately driving pegs 11, 12 respectively on brackets 13, 14 mounted on carriers 15, 16 of circular disc form. The carriers are respectively fast with a worm wheel 17, 18 respectively in mesh with worms 19, 20 on a single driven shaft 21 so that the carriers are driven in synchronism and in opposite directions.

The disc 9 has its periphery cut away to provide cavities 22 having a radius equal to that of the discs 15, 16 and the disc 15, 16 have their peripheries cut away to provide cavities 23, 24 respectively of the radius equal to that of the unexcised parts of the periphery of the disc 9. In addition the discs 15, 16 are cut away at 25, 26.

With the parts in the position shown in Figure 1, the peg 12 is the rotation of the disc 16 just about to leave the groove 10 and a part of the circular periphery of the disc 16 has just entered the groove 10. In the disc 9 is thus positively locked against movement although the disc 16 is still able to rotate. Another recess 22 is positioned to enable the circular part of the other disc 15 to move into it. In the continued rotation of the discs 15, 16, the peg 11 enters the groove 10 and at the same time the cut-away part 25 of the disc 16 moves over to register with the disc 9. The disc 9 is now freed from restraint and as the peg 11 runs down the groove 10 it turns the disc 9 in a clockwise direction until it is just about to run out of the groove; thereupon a circular path of the disc 15 moves into one of the recesses 22 in the disc 9 which becomes positively locked in the manner already described in the operation of the peg 12, the recess 22 in the disc 15 permitting the circular path of the disc 9 to move while it is driven by the peg 11. After a predetermined interval the peg 12 on the disc 16 enters the groove 19 and the operation described with respect to the disc 15 is repeated.

The shaft 21 is driven from some part of the machine which is synchronized with the delivery of products to the rollers 1, 2 and hence the operation of the Geneva mechanism is related to the delivery of products; thus, the disc 9 being fast with the shaft 1, the switch discs 8 are caused to be moved first in one direction and then in the other direction and are held locked in each extreme position.

This dual Geneva mechanism has the important operating advantage that each peg 11 or 12 enters smoothly into the groove 10 and gradually imparts drive to the disc 9 up to a maximum then the peg 12 falls back to a minimum when the peg moves smoothly out of the grooves; thus drive is effected without heavy impact or shock, a factor of considerable importance when operating at high speeds.

In the description so far given, the products P are described as passing in a horizontal direction to the switch mechanism: the mechanism can however as shown in Figure 4 be set to handle products passing vertically down from rollers 2, 3.

Reference will now be made to the arrangement shown in Figure 6: this arrangement is intended primarily to give an accelerated motion to the disc 15 and hence the peg 11 when this enters the groove 10 to reverse the switch elements 5 to deflect products upwardly. It will be appreciated that to deflect products upwardly it is to operate against their natural tendency to fall and to counteract this it may be desirable to have a more rapid reversal for upward deflection than for downward deflection. To effect this the shaft 21 is arranged not only to be rotated continuously but also moved axially at intervals, the worms 19, 20 operating additionally as racks and imparting an additional component of rotation to the wheels 17, 18: this additional component being additive during the engagement of the peg 11 with the groove 10 and correspondingly subtractive thereafter, but before the peg 12 comes into operation. The axial movement of the shaft 21 is effected by a rotating disc 27 having a cam track 28 engaged by a follower 29 on a lever 30 pivoted at 31 and having an arcurate slot 32 receiving one end of a link 33 the other end of which is connected to a yoke 34 on the shaft 21.

It may be required to accelerate the operation of both pegs 11 and 12 for effecting both directions of deflection. In this case the mechanism shown in Figure 6 could again be employed but the cam track 28 would have two operating surfaces.

Where, as in Figure 1, the products are caused to change direction from the vertical as they pass from the usual folding-off rollers to the horizontal for laying on the conveyors 5, 6, a convenient arrangement would comprise a third
roller 35, the roller 2 already referred to co-operating not only with the roller 3 but also with the roller 35: the two rollers 2 and 35 form the usual folding-off rollers. Between the rollers 35 and 3 extends a curved guide plate 35 (or plates), which divert the leading edges of the products as they pass vertically from between the rollers 2 and 35 into the horizontal direction to pass between the rollers 2 and 3 whence they are controlled by the switch device of this invention.

What I claim is:

1. In a printing machine a pair of grooved rollers, means to deliver products in a stream between said rollers, a switch device having a convexly curved deflecting surface, means supporting the switch device for angular movement about an axis on the delivery side of said rollers and in line with the line of movement of the products therefrom and means to move the switch device to cause the deflecting surface alternately to co-operate with either roller to provide a product passage, and to simultaneously enter a groove in the other roller to provide a closure to products, the said moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driven member and means to rotate said driven members, so that they pass alternately into and out of drive connection with the driven member.

2. In a printing machine, means to deliver products in a continuous stream, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis disposed in the line of movement of the products and closely behind the deflecting surface, and means to move the switch device about said axis to deflect products in different directions, the said moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driven member and means to rotate said driven members, so that they pass alternately into and out of drive connection with the driven member.

3. In a printing machine a pair of rollers, means to deliver products in a stream between said rollers, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis on the delivery side of said rollers and in line with the line of movement of the products therefrom and means to move the switch device to cause the deflecting surface alternately to co-operate with one roller to provide a product passage and with the other roller to provide a closure to products the said moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driven members for rotation to carry them successively into and out of drive connection with the driven member and means to rotate said driven members so that they pass alternately into and out of drive connection with the driven member.

4. In a printing machine a pair of grooved rollers, means to deliver products in a stream between said rollers, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis on the delivery side of said rollers and in line with the line of movement of the products therefrom and means to move the switch device to cause the deflecting surface alternately to co-operate with one roller to provide a product passage, and to enter a groove in the other roller to provide a closure to products, the said moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, a pair of rotatable driving and locking members, and means to rotate said driving and locking members so that they pass alternately into and out of drive connection with the driven member and during a portion of its rotation each driving and locking member prevents motion of the driven member.

5. In a printing machine, means to deliver products in a continuous stream, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis disposed in the line of movement of the products and closely behind the deflecting surface, and means to move the switch device about said axis to deflect products in different directions, the said moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driving members for continuous rotation such that they successively enter and pass out of engagement with said grooved driven member and means to rotate said driving members.

6. In a printing machine, means to deliver products in a continuous stream, a switch device having a deflecting surface, means supporting the switch device for angular movement, and means to move the switch device first in one direction and then in the other direction, the said switch-moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, a pair of driving and locking members, means supporting the driving and locking members for rotation to carry each of them progressively into and out of drive connection with the driven member and means to rotate said driving and locking members, so that their driving elements pass alternately into and out of drive connection with the driven member and during a portion of its rotation each driving and locking member prevents motion of the driven member.

7. In a printing machine, means to deliver products in a continuous stream, a switch device, means supporting the switch device for angular movement, and means to move the switch device first in one direction and then in the other direction, the said switch-moving means comprising a grooved driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driving members for continuous rotation such that they successively enter and pass out of engagement with said grooved driven member and means to rotate said driving members.

8. In a printing machine, means to deliver products in a continuous stream, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis disposed in the line of movement of the products and closely behind the deflecting surface, and means to move the switch device about said axis to deflect products in different directions, the said moving means comprising a driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driving members for rotation to carry them progressively into and out of drive connection with the driven member and means to rotate said driving members, so that they pass alternately into and out of drive connection with the driven member and means to rotate said driving members.
2,526,916

accelerate at least one driving member as it passes into engagement with the driven member.

9. In a printing machine, means to deliver products in a continuous stream, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis disposed in the line of movement of the products and closely behind the deflecting surface, and means to move the switch device about said axis to deflect products in different directions, the said moving means comprising a grooved driven member supported for angular movement, means connecting the driven member to said switch device, a pair of carriers having driving members and locking surfaces, means supporting the carriers for continuous rotation such that their driving members successively enter and pass out of engagement with said grooved driven member and their locking surfaces prevent its movement during periods when it is not driven, means to rotate said driving members and means to accelerate at least one driving member as it passes into engagement with the driven member.

10. In a printing machine, means to deliver products in a continuous stream, a switch device having a deflecting surface, means supporting the switch device for angular movement about an axis disposed in the line of movement of the products and closely behind the deflecting surface, and means to move the switch device about said axis to deflect products in different directions, the said moving means comprising a grooved driven member supported for angular movement, means connecting the driven member to said switch device, driving members, means supporting the driving members for continuous rotation such that they successively enter and pass out of engagement with said grooved driven member the said driving and driven members having locking surfaces disposed to engage as the driving members pass out of drive connection with the driven member and means to rotate said driving members.

11. In a printing machine, means to direct products in a continuous stream, a switch device disposed in the path of said stream, means mounting the switch device for oscillatory movement and means to oscillate the switch at predetermined intervals, the said means comprising a driven member coupled to the switch, driving members mounted for rotation, a rotatable worm and worm-wheel mechanism to rotate said driving members continuously and unidirectionally to carry the driving members successively into and out of driving engagement with the driven member, and means to cause relative axial movement between the worm and worm-wheel to accelerate at least one driving member as it passes into engagement with the driven member.

12. In a printing machine, means to direct products in a continuous stream, a switch device disposed in the path of said stream, means mounting the switch device for oscillatory movement about an axis disposed in the line of the stream of products and adjacent the face of the switch which is presented to the products and means to oscillate the switch at predetermined intervals, the said means comprising a driven member coupled to the switch, driving members mounted for rotation, a rotatable worm and worm-wheel mechanism to rotate said driving members continuously and unidirectionally to carry the driving members successively into and out of driving engagement with the driven member, and means to cause relative axial movement between the worm and worm-wheel to accelerate at least one driving member as it passes into engagement with the driven member.

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