DOCUMENT FEEDING CONTROL MEANS

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This invention relates to feeding control means used in connection with the feeding and sorting of checks or like documents in a machine of the type disclosed in patent application Serial No. 602,191, filed August 6, 1956.

More particularly this invention relates to means for preventing misoperation of the machine and possible mutilation of checks during a check feeding operation or to means whereby checks which move out of a determined timed relation during any feeding cycle will cause the feeding operation to be discontinued before misoperation occurs.

In the device of the above named patent application checks of varying length, width and thickness are fed from a stack along one of their long edges at high speed by combined belt and vacuum feed elements to a synchronizing or timing element, then are advanced past a reading head to one of a number of stacking positions in accordance with data read. The checks advance in an end to end spaced relation and while some lead or lag of check movement is permissible, any movement beyond determined limits could result in misoperation of the machine and consequent mutilation of checks.

Hence, it is one object of this invention to provide means, whereby an electrical sensing test is made at a number of points simultaneously during each cycle of check advancing operation to determine whether the checks are moving within determined spaced limits, and if not, to cause a signal to be generated and directed to the feed means, which will stop the check advancing operation in sufficient time to prevent check mutilation.

It is a further object to effect an electrical test during a determined part of each cycle of feeding operation at a time when a space should occur between pairs of the several advancing checks at several electrical sensing positions and thereby develop a signal capable of energizing power release devices when the area where space should occur is blocked by any part of a check.

It is also an object to provide a plurality of photosensitive elements in the path of advancing checks to detect the check spacing positions, and, through electrical means, cyclically generate a signal at the time a space should be detected between each of the advancing checks and to otherwise gate combined photosensitive and cyclical signals to a power release device if any cyclical signal does not coincide with a normal space position.

It is also an object to control individual check feeding belt portions and associated idler roller units by releasing the idler roller units from their normal belt engaging positions when the power to the machine is cut off by any of the cyclic tests and sensing controls thereby preventing further feed of the checks by momentum.

A preferred arrangement of the invention is shown in the following drawings wherein:

Fig. 1 is a plan view of the check feeding device generally showing the means for advancing checks from a starting position to a synchronizing unit, and the further feed past a reading unit to one of the several stacking positions;

Fig. 2 is a diagrammatic plan view of the mechanism of Fig. 1 showing several stacking positions as normally located in a complete machine;

Fig. 3 is an enlarged plan view of a portion of the stacker feed units with an associated idler wheel unit in a belt engaging or check feeding position;

Fig. 4 is a front elevational view of the idler roller unit supported on the deck of the sorting machine and includes electromagnetically controlled unit release means and resetting members;

Fig. 5 is a plan view of a portion of the idler roller unit and separator feeding structure, shown in Fig. 3, but with the idler roller unit in a released non-feeding position;

Fig. 6 is an enlarged sectional view taken along the line 6—6 of Fig. 3;

Fig. 7 is a detailed view of a fragmentary portion of Fig. 6 showing the idler rollers in the released position of Fig. 5;

Fig. 8 is a diagrammatic plan view of the structure shown in Fig. 1 showing driving means and photo-sensitive elements and associated light beam elements in their specific timing locations in the path of the check feed;

Fig. 9 is an enlarged sectional view of cyclically operative electrical signal generating means, also the synchronizer disc and paddle elements with separate drives thereto;

Fig. 10 is a fragmentary detail showing the normal spacing between ten inch checks;

Fig. 11 is an electrical chart diagram showing check wave and signal patterns as effected by photosensitive elements and cyclically operative electrical signal generating means; and

Fig. 12 is an electrical block diagram illustrating the steps involved in the development of and in directing electronic signals to power and idler roller release devices for the purpose of discontinuing the power drive and releasing the idler roller devices when a jam condition is anticipated.

Referring to the drawings in detail, Fig. 1 includes a check supporting deck 10 and a hopper 11 within which checks are stacked on their lowermost long edges in a starting position and are normally urged against a front wall 12 where the foremost check is urged by means of an agitator 13 toward check feeding and separating belt elements 14 and 15 respectively. The check feeding belts comprise continuously running toothed timing belts 16 supported by toothed pulleys 17, which drive the belts in a forwardly or advancing direction. The separator elements 15 comprises continuously running toothed timing belts 18 supported by toothed pulleys 19, which drive said belts in a reverse direction relative to the belts 16.

By means of the above arrangement of the check feed and separator elements, the foremost check, which is normally engaged with the lead end of the belts 16, is prevented from advancing due to the reverse movement of the separator belts 18. However, by means of a vacuum chambered element 22 and grouped openings 23 in the said belts 16, the foremost check is adapted to be drawn to the surface of the advancing belts 16 whenever a group of openings 23 moves through the vacuum chamber. At this stage of operation, the counter action of the reverse feed belts 18 is overcome and the check advances the extent of the reach of the belts 16. By means of idler rollers 20, engaging the belts 16 at the pulley positions at the end of each belt reach, the feed of the check is continued.

The check continues to advance between guide elements 24 and 25 between a rotating synchronizing disc...
26 and idler rollers 26a, whereby the leading end of the check is moved into engagement with timing paddle elements 27 carried by slower rotating discs 31—34. See Figs. 1, 8 and 9. The idler roller 30 is supported by two idler rollers 34. The latter provide means for the feed of the check past a member 32 and a reading head 35 and for advancing the check to an intermediate driven belt element 45 and an endless belt 37. The intermediate belt element 36 is provided for the purpose of including a second read head in this area if desired. From the belt and idler roller structures 36—37, the check continues to move in a substantially linear path past gated openings 41 of a series of check stacking stations 46. See Fig. 2. Each of the stacking stations includes closed loop timing belts 38 supported by suitable pulleys. One reach 42 of the belt 38 in cooperation with idler roller units 37a provides for the check advancement. Each idler roller unit 37a comprises four roller belts 39 disposed within a bracket 44. Another portion 45 of each of the stacker belts 38 moves around a pulley 39 in a direction away from the linear feed path of the checks and has a check deflecting element 46 associated therewith which is arranged to move in the path of the leading edge of a check if said check is to be directed to the stacking station area 46, associated with said deflector 46.

Referring to Fig. 8, drive means to the several check feeding elements is shown in dot and dash lines wherein a motor indicated at 48 provides a source of power. From a motor driven shaft 51 a stacker feed belt pulley 52 is driven to effect the drive for the stacker belts 38. From the shaft 52, a pulley and belt drive is provided to a shaft 53. From the shaft 53 a pulley and belt drive 53a is provided to a shaft 54 which has the paddle disc 31 fixed thereon. See Fig. 9. A second pulley and belt drive from the shaft 53 is provided, as indicated at 53b, to drive the synchronizer disc 26 at an increased speed relative to the paddle elements. Through gearing indicated at 56, a drive is provided to a shaft 57 and through a pulley and belt drive 58, a drive is provided to a shaft 59 for the drive of the separator belts 18. A pulley and belt drive 58a from the shaft 59 to a shaft 60 provides a drive for the advancing feed belt 16.

By means of additional motors, 48a and 48b, located as indicated in Fig. 2, and suitable drive belts and pulleys (not shown) means are provided for the drive of all of the stacker feed belts 38.

A further drive is provided for the intermediate belt 36 by means of a motor designated SM through a pulley and belt drive indicated at 61 of Fig. 8. Associated with the latter drive are further drives (not shown) to advance the check past the element 32 and read head 35. The motor for this purpose is preferably a synchronous motor which offers the advantage of a constant speed and is unaffected by normal voltage changes.

In the above description the check feeding devices are described in terms intended to generally indicate the several stages through which the checks pass. For a more detailed description of certain of the mechanisms herein referred to, attention is directed to the aforementioned patent application Ser. No. 602,191 and to patent applications Ser. Nos. 705,296 and 627,315.

The present application, as stated, relates to the electrical, electronic sensing and timing control of the check feeding operations, and means for discontinuing check feeding operations when checks move out of a normal timed relation in any feed cycle. These features will now be described in detail.

The machine is cycled to feed checks at twelve inch intervals, and is accomplished by placing the lead opening, of each of a group of openings 23 of the advancing feed belt 16, twelve inches apart. Hence as each group of openings 23 arrives at the vacuum chamber 22, the feed of the foremost check is started on its way toward the several positions and it is finally directed into one of the several stacking positions.

Assuming that two checks ten inches in length are advanced from the hopper 11, the distance between the checks will measure two inches, as indicated in Fig. 10. Under normal feeding conditions either of the two checks can have a gain of one inch while advancing through the machine without causing difficulties. But, if the gain or lag is greater than an inch, a misoperation of the machine and check mutilation could result if means were not provided to disconnect the machine operation.

In order to anticipate such a condition and prevent a check jam, electrical sensing is effected at points twelve inches apart in the check feed path by means of photosensitive units 63 and 63a to effect sensing of the spacing between checks. A wave pattern as indicated at B, Fig. 11, will thus be established, which pattern agrees with checks of varying size as indicated at A. Each photosensitive unit may comprise a photo-transistor T and a lamp L to produce a light beam. See Fig. 3.

Once during each cycle a test signal is effected. Two magnetic elements are fixed to a part of the machine frame F, as indicated at 64 in Fig. 10. The magnetic element 64 is associated with sensing units 63 and the magnetic element 64a is associated with the sensing unit 63a. Two ferrous buttons 65—65 are positioned 180° apart on a disc 66 and move past the magnetic elements 64—64a in a manner to effect a signal during each check feeding cycle. The disc 66 is mounted on the shaft 54 which carries the paddle elements 27—27 and thus is synchronized to the paddle movement. See Fig. 9.

As the ferrous buttons 65 move past the magnetic element 64, a flux action creates a pulse to occur in the element 64 to provide a pattern of pulses or signals as indicated at C of Fig. 11. Each pulse of said pattern will appear in line with an associated space on the wave pattern B when the checks are advancing in a normal order, that is, within the determined space limits.

When, however, a magnetic field is created the check portion of the wave pattern, as indicated by the dot and dash line 68 associated with the check at the left in Fig. 11, a signal is effected which is adapted to control the operation of power shut-off mechanism and idler roller release means. The situation illustrated by the dotted line 68 indicates a condition wherein the leading end of a check had moved beyond its determined timed position and blocked the light beam associated with the photosensitive element 63a at the time a signal or pulse was effected when the button 65 moved across the path of the magnetic element 64. A similar condition would occur with relation to the trail end of a check if the movement of the check lagged sufficiently to cause said trail end to block the light beam of one of the photosensitive elements.

Referring now to the block diagram, Fig. 12, the first two photosensitive units 63 are spaced twelve inches apart and are associated with the stacker station 48 and intermediate stations 49 and 40. A signal from either of the two photosensitive units 63 passes through "Or" gate indicated at 74 and a signal from any one of the several photosensitive units 63a passes through "Or" gate indicated at 75. Each of the "Or" gates 74 and 75 directs signals to two "And" gates 76 and 77 respectively, the "And" gate 76 being associated with signals emanating from the photosensitive units 63, the other "And" gate 77 being associated with signals emanating from the several photosensitive units 63a. B-
fore an output signal can be provided in either of the “And” gates 76 or 77, a second input signal will be directed thereto by means of the magnetic element 64 and the output signal will be directed to an “Or” gate 78. The output from the “Or” gate 78 will be amplified as at 79 and is then directed to a one shot multi-vibrator 82, and to a sensing relay means 83 which control the operation of power shut-off and idler roller release means as indicated at 84.

Referring now to the throw-out mechanism of the idler roller units 37 as seen in Figs. 3, 4, and 5, each stacker belt 35 has a reach 43 stretched between a power driven pulley 87 and pulley 39. The belt 38 is also guided over a pulley 89 to provide the reach 45, previously referred to, which conveys the check to a stacking position when deflected thereto by the deflector 46. Since the actual stacking of the checks forms no part of the invention of this application the details of structure are not shown.

Each check is moved along the several reaches 42 of the belts 38 during transit to a selected stacking station and is maintained in running engagement with said belt reaches 42 by means of the idler rollers 43. The idler rollers are assembled in pairs on four vertical axes within a supporting frame 102. The two outer or end roller assemblies are supported on movable axes, which comprise shafts 103 supported in rocker arms 104, which arms rock about fixed axes 105. Said arms 104 are spring urged as at 106, to maintain the end rollers in engagement with their respective belts at the pulley positions. The two intermediate roller assemblies are mounted on shafts 107—107 which are fixed within the supporting frame 102.

The roller supporting frame 102 is mounted on the free ends of rocker arms 108 and 109 which arms have their opposite ends pivotally mounted on studs 112, 113 respectively. The studs are fixed within the upper base plate 110 of the machine. Springs 114 and 115 are stretched between anchor lugs 114a, 115a in the support 102 and the arms 108 and 109 and normally urge the support in an outward direction. A lug 116 fixed to the lower surface of the supporting frame 102 engages a retractor pin 117 when the idler rollers 43 are in operating engagement with the reaches 42 of stacker feed belts 38. The pin 117 is fixed within a plunger 118, the plunger being slideable within a bearing 119 projecting below the base plate 110 and having its lower end engaged with an arm 121 of a rocker lever 122. The rocker lever 122 rocks on a pin 123 supported by a bracket 124.

By means of a solenoid 125, a rocker lever 126 is rocked to release a latch lever 127 which has the end of a horizontally disposed latch arm 128 normally engaged with a lip 129 at the end of a vertically extending arm 131 of the rocker lever 132. When said lip moves free of the latch arm 128, a spring urged rocker element 132 will be free to rock in a clockwise direction under the pressure of a spring 133. Again, by means of a lug 130 fixed to a wire 134 linked between the rocker element 132 and arm 135 of latch lever 127, a downwardly extending arm 136 of lever 122 is moved to rock said lever 122 and effect release of the pin 117 from the lug 116. This causes the release of the idler roller support 102 which is urged to the release position of Fig. 5 by the springs 114 and 115. By means of the wire 134 and lug elements 130 thereon, a number of lever supports are adapted to be released simultaneously. The continued feed of checks between momentum is thus prevented. Both the power cut-off and idler roller release are effected when a check moves out of a determined timed relation.

Resetting of the latch lever 127, relative to the lip of lever 131, is provided by means of hand crank 137 which is fixed to a shaft 138, said shaft also having the latch lever 127 fixed thereto. After resetting the latch lever, each idler roller support 102 is reset to its latched position with the pin 117 behind the lug 116 as in Fig. 6. The latter is accomplished by manually pushing each of the idler roller supports 102 individually to its latched position.

Before resetting, all the checks which are in transit are removed and returned to the feed hopper.

Having described the invention, what is claimed is:

1. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, sensing devices positioned in the check path for actively sensing the spacing between the advancing checks at a determined time during each cyclic interval, and means operable under control of the sensing devices for discontinuing the drive of the check advancing devices if a portion of any of the advancing checks obstructs sensing during the determined time during any cyclic interval.

2. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, sensing devices positioned in the check path for sensing the spacing between the advancing checks, means for effecting electrical pulsing at a determined time during each cyclic interval, and means operable under control of the combined sensing and pulsing means for discontinuing the drive of the check advancing devices at the time a pulse drive of the check advancing devices at the time of any of the advancing checks obstructs sensing during any cyclic interval.

3. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, electrical sensing devices including a light beam positioned in the check path to sense the spacing between the advancing checks, signal means operable at a determined time during each cycle, and means operable under control of the combined sensing devices and signal means for discontinuing the drive of the check advancing devices at the time of signal operation if a portion of any of the advancing checks obstructs the light beam of a sensing device when the signal is effected by the signal means.

4. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, electrical sensing devices positioned in the check path for sensing the spacing between the advancing checks and thereby effect a signal when sensing is obstructed, means for effecting a second signal at a determined time during each cycle, and means operable under control of the combined first and second signals for discontinuing the drive of the check advancing devices when sensing is obstructed by a portion of any of the advancing checks when the second signal is effected.

5. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, electrical sensing devices positioned in the path of the advancing checks for sensing the spacing between the advancing checks for effecting a first signal when sensing is obstructed, means for effecting a second signal at a determined time during each check advancing cycle, and means operable under control of the combined sensing devices and signal means for discontinuing check advancement if the first signal is in effect when the second signal occurs.

6. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical
sequence between a starting position and a multiple number of operating positions, driven check advancing devices, electrical sensing devices including a light beam for each device positioned in the path of the advancing checks, electronic signal controlled means comprising a first signal effectuated by solid sensing devices when the light beam is obstructed by a portion of any of the advancing checks, means for effecting a second signal at a predetermined time during each cyclical interval, and means operable as a result of the simultaneous operation of any first signal with a second of the two signals for discontinuing the drive of the check advancing devices.

7. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, electrical sensing devices positioned in the check path to sense the spacing between the advancing checks, electronic signal controlled means comprising a first signal effectuated by said sensing devices when sensing is obstructed by a portion of any of the advancing checks, a second signal effectuated at a predetermined time during each cycle, a gate circuit operable when a first and second signal are directed thereto, and means operable by an output signal resulting from said first and second signals passing through said gate circuit to discontinue the drive of the check advancing devices.

8. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check advancing devices, electrical sensing devices positioned in the check path for sensing the spacing between the advancing checks, electronic signal controlled means comprising a first signal effectuated by said sensing devices when sensing is obstructed by a portion of any of the advancing checks, an "Or" gate circuit to receive any of the first signals, a second signal effectuated at a predetermined time during each cycle, an "And" gate circuit operable to pass the combined first signal and second signal and thereby effect an output, and means operable by said output from the "And" gate circuit to discontinue the drive of the check advancing devices.

9. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence between a starting position and a multiple number of operating positions, driven check feeding means, sensing devices in the check path spaced to be normally aligned with the spacing between the checks, means for effecting a signal from any of said sensing devices when sensing is obstructed by a check, means for effecting a test signal once during each cycle, gate circuit means operable for effecting an output when a sensing signal and a test signal are simultaneously directed thereto, and means operable by the output emanating from the gate circuit to discontinue operation of the check feeding means.

10. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence, driven check advancing devices including travelling belts and idler roller units engaging said belts, sensing devices positioned in the check path to actively sense the spacing between the advancing checks at a determined time during each cyclical interval, means operable under control of the sensing devices for discontinuing the drive of the check advancing devices if a portion of any of the advancing checks obstructs sensing at the determined time during any of the cyclical intervals, and means associated with said roller units for effecting disengagement of the idler roller units from said belts.

11. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence, driven check advancing devices including travelling belts and spring urged idler roller units latched in a roller and belt engaging position, sensing devices positioned in the check path for actively sensing the spacing between the advancing checks at a determined time during each cyclical interval, means operable under control of the sensing devices for discontinuing the drive of the check advancing devices if a portion of any of the advancing checks obstructs sensing at the determined time during any of the cyclical intervals, and means associated with said roller units for effecting latch release and consequent disengagement of the idler roller units from said belts.

12. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence, driven check advancing devices including travelling belts and spring urged idler roller units latched in a roller and belt engaging position, electrical sensing devices positioned in the check path for sensing the spacing between the advancing checks, electrical pulsing means operable at a determined time during each cyclical interval, electrical means operable under control of the sensing devices for disengaging the drive of the check advancing devices if a portion of any of the advancing checks obstructs sensing when electrical pulsing is effectuated, and electrical means associated with said roller units for effecting disengagement of the idler roller units from said belts.

13. In an apparatus wherein a multiple number of checks or like documents of varying size are simultaneously advanced in an end to end spaced relation in cyclical sequence, driven check advancing devices including travelling belts and spring urged idler roller units latched in a roller and belt engaging position, and means for effecting unlatching of the roller units under control of each of the advancing checks when any check has moved faster or slower than a determined distance at a determined time during each cycle.

References Cited in the file of this patent

UNITED STATES PATENTS

1,992,840 Rossen Feb. 26, 1935
2,072,236 Wormser Mar. 2, 1937
2,171,362 Guliisken Aug. 29, 1939
2,574,595 Shaw Nov. 13, 1951
2,675,233 Koelan et al. Apr. 13, 1954
2,793,035 Wroblewski May 21, 1957
2,852,250 George Sept. 16, 1958

FOREIGN PATENTS

712,388 Great Britain July 21, 1954