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54 **Transfer mechanism with jam detector.**

57 A mechanism for transferring a pair of side-by-side cartons from one processing station to another, and accompanying device(s) for detecting any jam-up during the transfer, should one occur for any reason. One embodiment includes a photoelectric unit, a vacuum sensor, and a strobe signal for timing and detecting the presence of both signals to shut down the machine if either signal is abnormal. Another embodiment includes a second strobe signal for use as a back-up for the first strobe, or in lieu thereof, for timing and detecting the photoelectric signal only.

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Transfer Mechanism With Jam Detector

5 This invention relates generally to transfer mechanisms and, more particularly, to means for detecting whether or not the product being handled has actually been transferred.

10 In machines wherein a product, such as a paperboard carton, must be processed through a plurality of internal transfers prior to being filled with a liquid product, in the event of an unsuccessful transfer of some one carton at
15 any of the transfer points oncoming cartons will continue to index and feed into the jammed carton. If undetected, there results an increased load on the indexing devices, which may break or damage machine components.

20 It is apparent that various mechanical or other type means may be used to determine that a transfer has occurred at a particular transfer point.

25 A general object of the invention is to provide an improved means for detecting a product transfer at a predetermined transfer point.

30 Another object of the invention is to provide novel electronic means for detecting the transfer of a paperboard carton at a predetermined transfer point in a forming, filling and sealing machine.

35 A further object of the invention is to provide electronic means coupled with photoelectric and vacuum sensing means for detecting any jam-up of a paperboard

carton at a particular transfer point in a packaging machine.

5 Still another object of the invention is to provide means consisting of a photoelectric sensor, a vacuum sensor, and at least one strobe signal adapted to detect the presence of signals from both sensors.

10 These and other objects and advantages will become more apparent when reference is made to the following description and accompanying drawings.

15 Figure 1 is a side elevational view of a fragmentary portion of a machine embodying the invention;

Figure 2 is a side elevational view of a second fragmentary portion of the machine embodying the invention;
20 and

Figure 3 is a graphic representation or chart of the timing operation of the Figure 2 structure.

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Referring now to the drawings in greater detail, Figure 1 illustrates a loading type of transfer point as may be used to transfer bottom sealed cartons 10 two-at-a-time from an indexing conveyor means 12, moving from left to right in
30 Figure 1, to resilient carriers 14 moving at a right angle with respect to the conveyor. In this instance, the carriers each consist of an inverted U-shaped bracket whose side walls are normally urged toward one another until
35 spread slightly to admit and retain a carton 10 therebetween. To arrive at this point, the cartons 10 typically will have been stripped from a mandrel (not shown) and placed on a stationary rail 16 extending laterally from

between a pair of parallel endless conveyors 12 mounted around sprockets 18, as more fully shown and explained in U.S. patent no. 4,566,251, issued January 28, 1986.

5 The transfer of the pair of cartons 10 from the conveyor 12 to the carriers 14 is accomplished by a lifting mechanism 20, having a support platform 22 above which the cartons are positioned as they leave the rail 16. During the dwell period of the indexing cycle of the conveyor, the
10 lifting mechanism 20 extends between the conveyors and raise each two side-by-side cartons vertically upwardly into the spring biased carriers 14.

 At this transfer station it is very critical that the
15 carton properly transfer from the conveyors 12 to the carriers 14. Upon successful completion of the transfer, a conveyor 24 associated with the carriers 14 indexes the cartons onto support rails 26 for the start of a further process step, such as the sterilization process. Sensors,
20 represented at 28, are mounted on the support platform 22 and serve to detect an increase in the force necessary to lift the cartons 10 into the carriers 14. This sensor can be a load cell, a strain gauge device, a spring loaded plate and proximity switch, or a similar device that is capable of
25 an instant response to an increase in the force needed to lift the carton. This response or increased force load would be sensed by the control system and immediately stop the conveyor 24 to prevent further jamming of the carton, damage to the machine, and lost downtime. A carton jammed
30 at this point in the machine can be easily removed without major machine problems. Otherwise, a jam in the machine could cause a compromise of the commercial sterility, and complete machine resterilization may be required, which involves a substantial amount of downtime.

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 Referring now to Figure 2, once a process, such as a sterilization process has been completed, it becomes necessary to transfer the now sterilized cartons 10 back

between another pair of parallel endless indexing conveyors 30 mounted around sprockets 32 to be transported through a filling station and a top sealing station prior to discharge. At this unloading transfer point each pair of
5 cartons 10 will have been carried from a direction toward the reader, or out of the paper, to be transferred to the conveyors 30 moving from left to right in Figure 2.

An unloading device 34 serves to raise a pair of vacuum
10 cups 36 upwardly to engage the pair of cartons 10 being held in the carriers 14. The vacuum cups engage the bottoms of the cartons and pull them down onto a stationary rail 38 and into compartments 40 between the conveyors 30 which will be indexed for the further processing of final filling and
15 sealing of the cartons.

A pair of photoelectric sensors 42 will detect the presence of two cartons as the latter move into the unload station. This fact is recorded and stored in the logic
20 system of the machine control unit. The vacuum cups 36 are operatively connected to vacuum sensors 44, which serve to detect the increase in vacuum after the unloading device has raised the cups 36 to grip the bottoms of the cartons. This event is also noted in the machine control unit, and as the
25 unloading device 34 is cycled and the two cartons are pulled into the conveyor compartments 40, a comparison is made of the signals to determine if cartons that were sensed in the carriers 14 had successfully passed by the photoelectric sensors 42, and had been subjected to sufficient vacuum, as
30 sensed by the vacuum sensors 44, to be pulled into receiving compartments 40. If both signals are not correct within a predetermined time period, the machine control system will be caused to stop, thereby preventing jamming of the cartons at this transfer station.

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Figure 3 shows the logic and timing of the photoelectric sensor 42 (PES) and the vacuum sensor 44 (VS), a first strobe signal that is used to detect the presence of

both signals, and a second strobe signal that is used to detect the presence of only the PES signal. A number of conditions will cause the machine to be stopped:

- 5 1. If the PES signal a or b for either carton 10 is lost after being detected prior to the beginning of the first strobe signal c, the machine will be stopped.
- 10 2. If the PES signal a or b is lost for either carton 10 after being detected prior to the end of the first strobe signal c, the machine will be stopped.
- 15 3. If the PES signal a or b is detected and no VS signal d or e is detected for either carton 10, the machine will be stopped.
- 20 4. If the PES signal a or b is detected and the VS signal d or e is lost for either carton 10 prior to the end of the first strobe signal c, the machine will be stopped.
- 25 5. If no PES signal a or b is detected, the VS signal d or e will be ignored and the machine will not be stopped.

30 The strobe signals are unrelated to the PES or the VS signals, and are developed from other timing signals in the machine and synchronized to the conveyor movements. The second strobe signal f is optional and may be used either to back up the action of the first strobe signal c, or in lieu thereof. This second strobe signal f serves to detect that the PES signals a and b have shown that both cartons 10 have
35 been removed, i.e., moved completely past the photoelectric sensors 42 and, hence, have been deposited in the compartments 40 of the conveyors 30. Should any one carton

not pass by the photoelectric unit, the pulse would continue as represented by the dash lines in Figure 3.

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It should be apparent that the invention provides a novel and efficient means for assuring that transfers of a product, such as paperboard cartons, have occurred at the inlet and outlet of crucial processing operations, such as a sterilization chamber, wherein jam-ups would cause substantial downtime, not only in unjamming and possible machine damage, but in complete resterilization time before the machine can be restarted.

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While but two embodiments have been shown and described, other modifications are possible within the scope of the following claims.

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CLAIMS

1. A transfer mechanism, comprising transfer means for engaging and transferring two cartons from one processing station to another, and detection means operatively connected to the detection means for assuring that the transfer of
5 both of the cartons is completed.
2. A transfer mechanism comprising vacuum actuated transfer means for engaging and transferring at least one carton from one processing unit to another, photoelectric means for detecting the presence of the said at least
10 one carton in the said one processing station, vacuum sensors operatively connected to the transfer means for detecting the increase in vacuum once the transfer means has engaged the said at least one carton and for stopping the processing units when the carton is detected by the
15 photoelectric means but proper vacuum is not available, to prevent jamming at the transfer point.
3. A transfer mechanism according to claim 2, and a strobe signal for noting whether either of the cooperating photoelectric and vacuum sensing signals is detected and
20 then lost or is not detected prior to the end of the strobe signal, and for stopping the processing units should either occur.
4. A transfer mechanism according to claim 2, and a strobe signal for detecting that the photoelectric signals
25 have shown that the said at least one carton has been removed from the one processing unit and deposited in the other.

5. A transfer mechanism according to claim 3, and a second strobe signal for backing up the action of the first-mentioned strobe signal by detecting that the photoelectric signals have shown that at least one carton
- 5 has been removed from the one processing unit and deposited in the other.
6. A transfer mechanism according to claim 2 adapted to two side-by-side cartons to detect jamming of either carton.
- 10 7. A transfer mechanism according to any one of claims 1 to 6 wherein the detection means is one of a load cell, a strain gauge device and a spring loaded plate and proximity switch.
8. A transfer mechanism constructed and arranged
- 15 substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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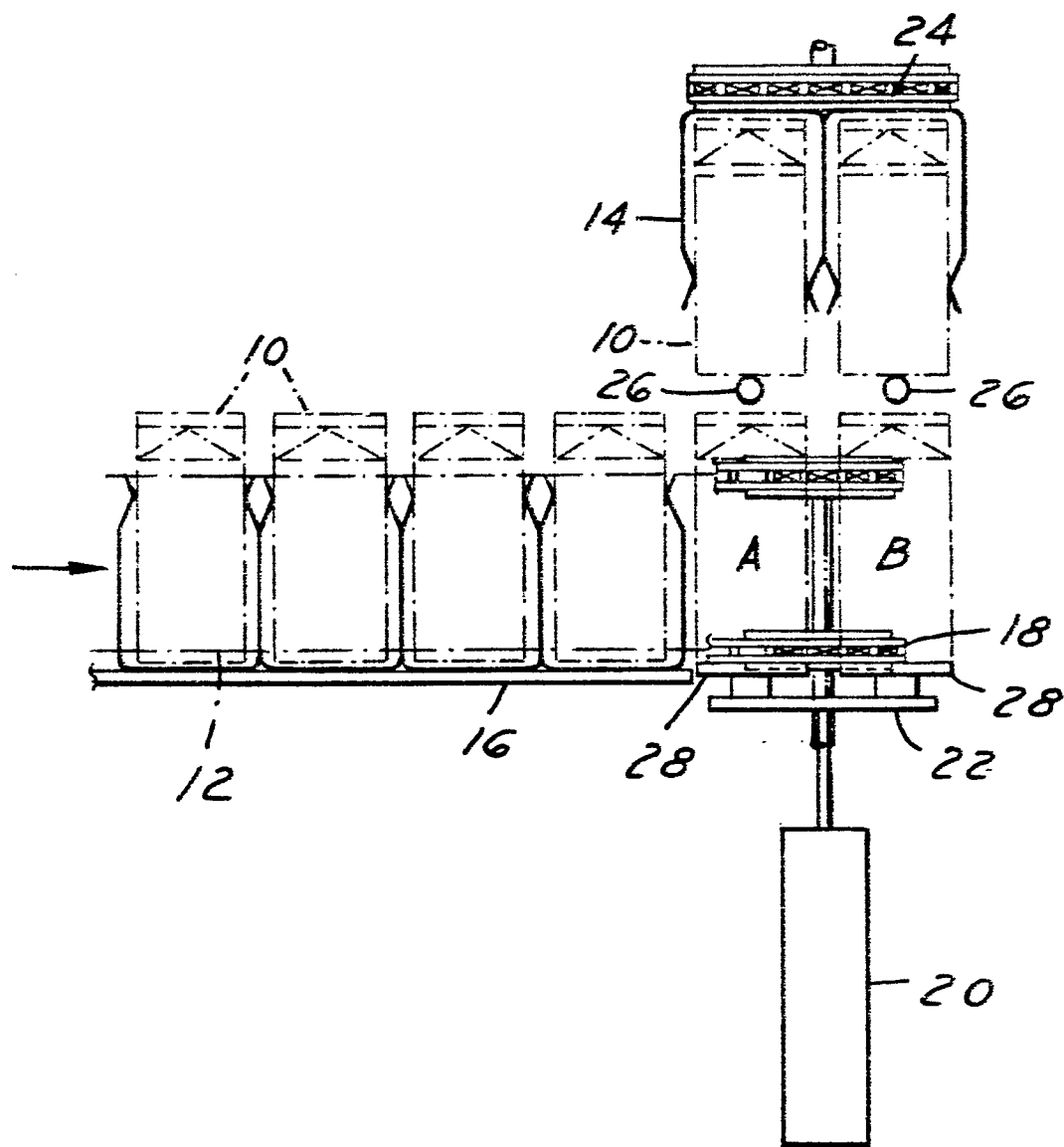
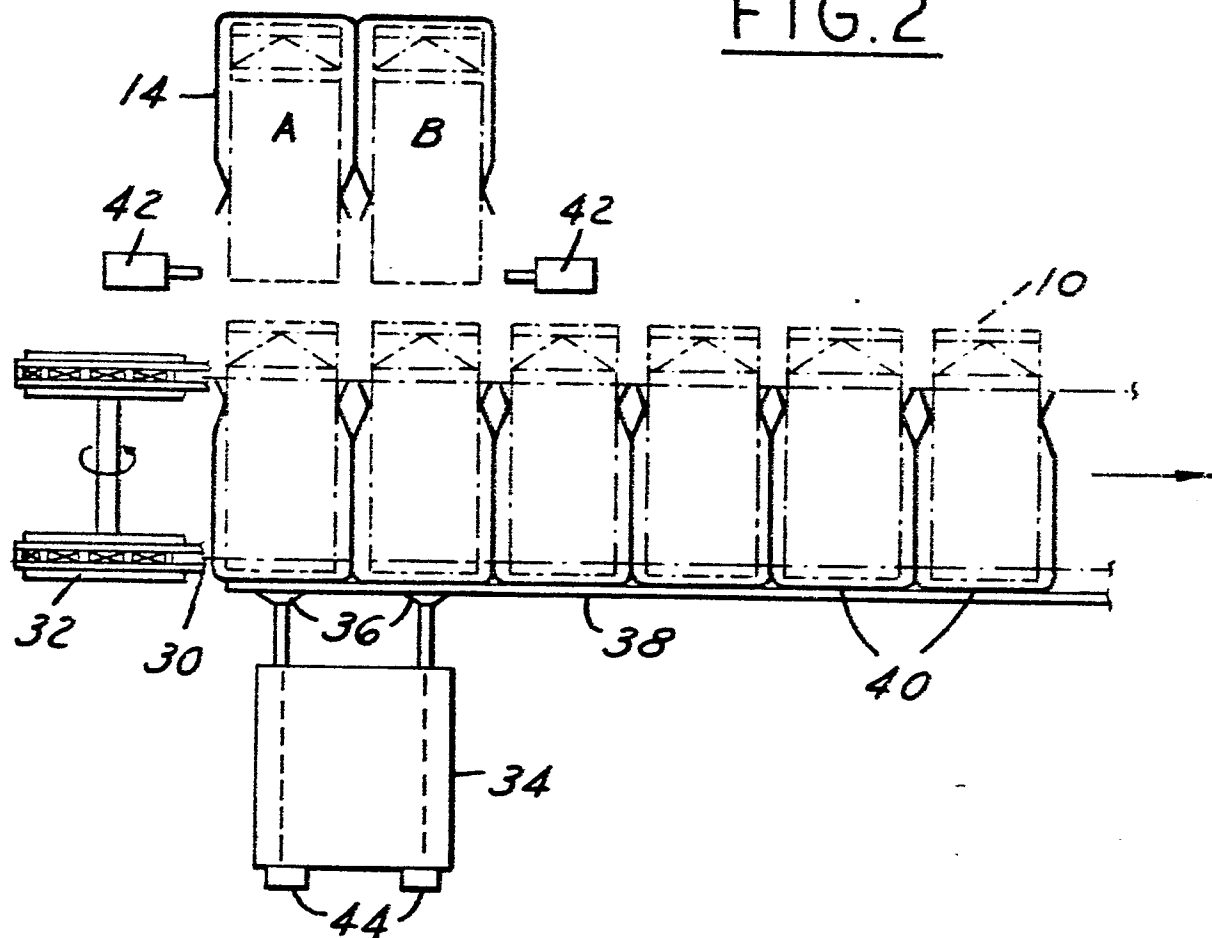
FIG.1

FIG.2FIG.3