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An Experimental Dual Track Conveyor System For Processing Poultry

U. S. DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Transportation and Facilities Research Division
in cooperation with
The University of Georgia
College of Agriculture Experiment Stations

PREFACE

This report is based on research that is part of a project dealing with the more efficient work methods, equipment, and facilities for processing chickens in commercial processing plants. The findings provided basic information necessary for establishing design requirements of a dual track power-free conveying system for use in poultry processing plants.

This work was conducted under the supervision of John A. Hamann, marketing research analyst, Transportation and Facilities Research Division, Agricultural Marketing Service, U. S. Department of Agriculture, and Harold D. White, agricultural engineer, College Experiment Station, University of Georgia College of Agriculture Experiment Stations, Athens, Ga. Acknowledgment is made to P. D. Rodgers, agricultural engineer, College Experiment Station, and to Fred Henry, industrial engineer, formerly with the Agricultural Marketing Service, for their valuable comments and assistance in conducting this study.

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Washington, D. C. May 1964

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SUMMARY

Chickens may be routed through processing plant operations in the future suspended from individual carriers that will allow mechanical transfer from one conveyor to another at any point in the plant where there is a change in processing rates. Conveying chickens in this manner would reduce or eliminate the need to transfer them by manual labor, which costs processors millions of dollars each year.

The conveying principle that was studied for adaptation to poultry processing operations is referred to as the dual track or power-free system. The system utilizes two overhead tracks. One track supports a powered conveyor cable or chain. The second, mounted beside or above the first, supports a train of individual carriers from which the product to be conveyed is suspended. Drive dogs mounted on the powered conveyor push the free-rolling carriers through the various operations.

Research work was undertaken to adapt this principle to modern large-volume processing plants by developing an individual-bird carrier, a mechanical line divider, an individual carrier diverter, mechanical line converging units, and the necessary electrical control system. These units were built into an experimental conveyor system which proved to be mechanically feasible when tested under simulated processing loads.

The test results indicated that the adaptation of this principle to poultry processing plants would necessarily be an evolutionary process due to the modifications needed in present-day methods and equipment.

AN EXPERIMENTAL DUAL TRACK CONVEYOR SYSTEM FOR PROCESSING POULTRY

by Roger E. Walters, Rex E. Childs, and Harold D. White [1]

INTRODUCTION

Processing live poultry into a ready-to-cook product in a large plant involves many different operations. Birds are transported through the various processes by overhead monorail conveyors. Not all operations can be performed efficiently at one conveyor speed. Therefore, separate conveyors are normally used for killing and defeathering, eviscerating, sizing, chilling, draining, cutting up, and packing (fig. 1). Transferring birds from one conveyor to another through the plant requires large amounts of manual labor. Manufacturers of materials handling equipment have solved problems of transferring products from one conveyor to another in other industries, but there is no evidence of mechanical equipment having been developed for transferring poultry from one monorail conveyor to another.

The main reasons for this lack of development in transfer equipment for poultry are the particular way in which poultry is shackled during processing, the fast production rates required in modern plants, and the different rates of speed of the various plant conveyors.

This study had two main objectives: First, to determine for equipment manufacturers and processing plant operators the requirements for a conveying system that would move poultry through various processing operations requiring different line speeds without manual transfer; and second, to design, develop, construct, and test this conveying equipment to determine its feasibility for use in current poultry processing operations.

An extensive search of the literature on conveyors was made, and manufacturers of conveying equipment were asked about the availability of new types of conveyors or conveyor components that might be used in poultry processing plants.

A field study was made to evaluate different monorail conveying systems currently used for conveying poultry through the processing areas. [2] These preliminary studies revealed that the mechanical features of the present

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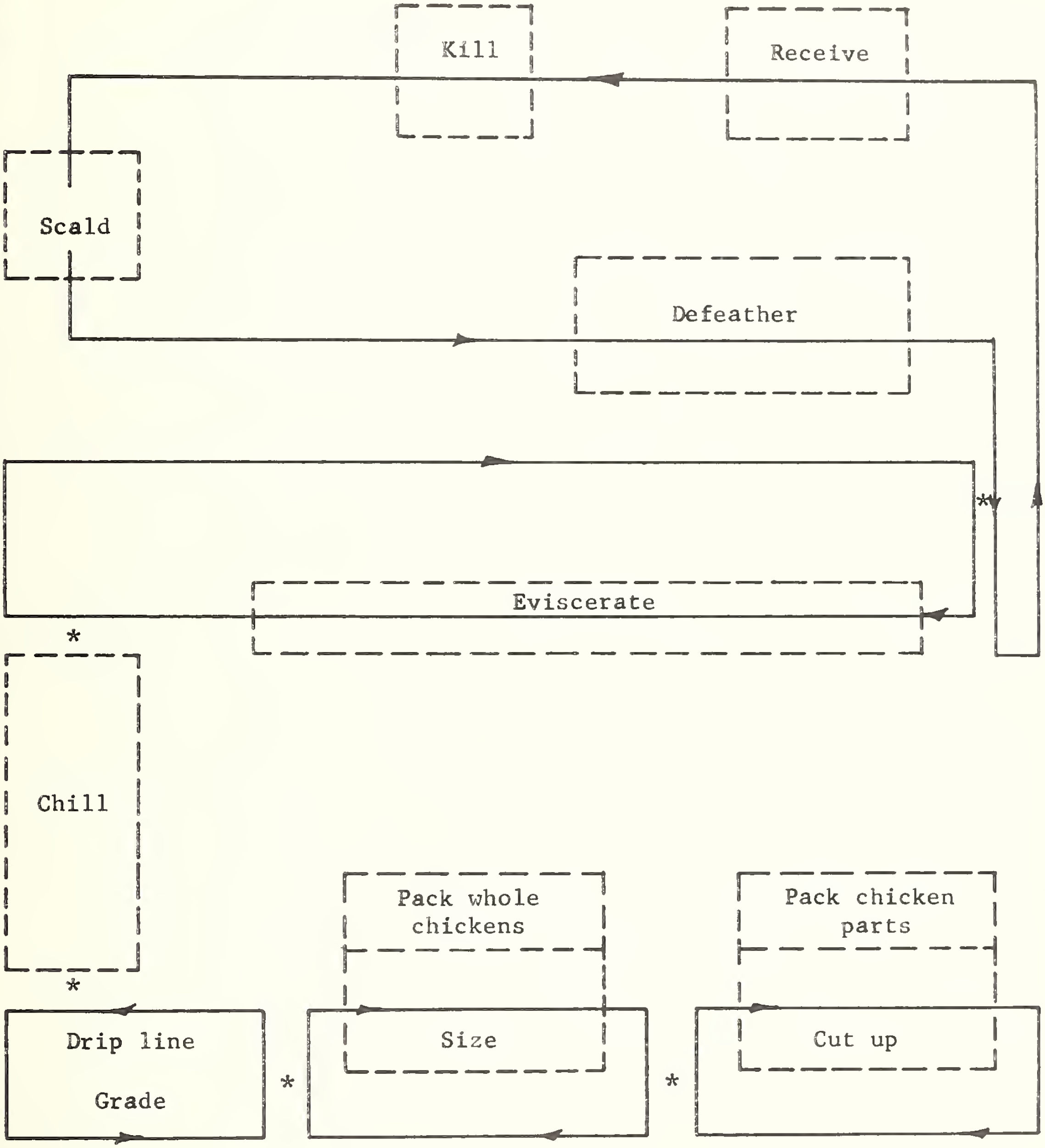
[1] Mr. Walters, agricultural engineer, and Mr. Childs, industrial engineer, are in the Transportation and Facilities Research Division, Agricultural Marketing Service. Mr. White is an agricultural engineer in the College Experiment Station, University of Georgia.

[2] Childs, Rex E., and Walters, Roger E. Monorail Conveyors Used in Eviscerating Poultry. U. S. Dept. Agr., AMS-290, 15 pp. 1959.

CONVEYOR LAYOUT OF A TYPICAL POULTRY PROCESSING PLANT



* Point of manual transfer of chickens.

Figure 1

single monorail cable conveyors allowed little possibility of converting these systems to automatic transfer of birds from one conveyor to another. It was, therefore, decided to explore the use of a different type of conveying principle for processing chickens.

The dual track (commonly referred to as power-free) conveying principle is not new and is used in many other industries with various conveying requirements. The principle involves the use of two monorails mounted either one over the other or side by side in areas where one track supplies a source of power for the adjoining "free" track. One monorail supports a continuous chain or cable-powered conveyor. The other supports independent carriers from which the product is suspended (fig. 2). Drive dogs mounted at intervals on the powered conveyor push the carriers (by engaging a pusher bar mounted on each carrier) into the various free (gravity powered) areas as the layout prescribes.

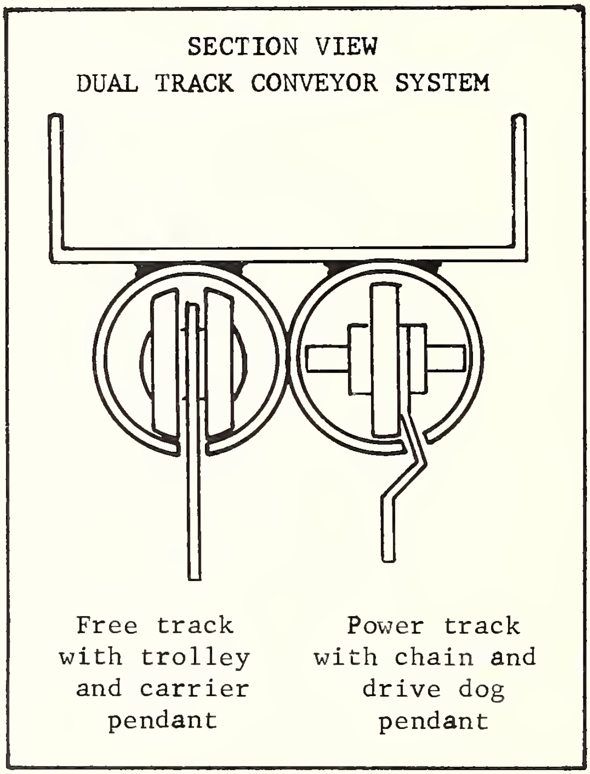


Figure 2

Where this conveying principle is applicable, it is very flexible in that the independent carriers can be diverted from the main line onto free (gravity powered) lines and then returned to the main line mechanically. This research explored the possibilities of adapting this conveying principle to poultry processing operations.

The first phase of this work was to evaluate an existing dual track conveyor system for its adaptability to poultry processing. The second phase consisted of developing and testing the component parts of a dual track conveying system with new or modified features and then assembling these units into an experimental conveyor and testing it.

AN EXPERIMENTAL, COMMERCIALLY DESIGNED DUAL TRACK CONVEYOR

In collaboration with an equipment manufacturer, an experimental layout of a dual track conveying system (fig. 3) was designed for testing simulated poultry processing operations. The design was based on work rates and operation sequences for the different poultry processing operations.

Description of the System

The experimental commercial dual track system provided for a continuous set of tracks that circumscribed the entire system layout (fig. 3). Free branch lines (simulated "eviscerating" lines) were provided so that carriers could be diverted off the main line (simulated "defeathering line") mechanically, at predetermined points by central controls. Also included was a bypass loop of dual track conveyor similar to the main line. Theoretically, this arrangement of equipment could be used to test the dual track (power-free) conveying principle when product is moved through one fast process and into one that is one-fourth as fast; for example, defeathering 5,000 birds per hour per conveyor and eviscerating 1,250 birds per hour per conveyor. At the feed-out units (fig. 3), carriers were to be returned to the main line four at a time at the same rate they were fed into the lines. Carriers were to be routed onto the bypass loop automatically at any time one or more of the simulated "eviscerating" lines became filled to capacity because of processing delays. Then, when a space became vacant on the main line, a carrier would automatically be routed from the bypass loop back onto the main line. If at any time the bypass loop became filled, the entire system would automatically stop.

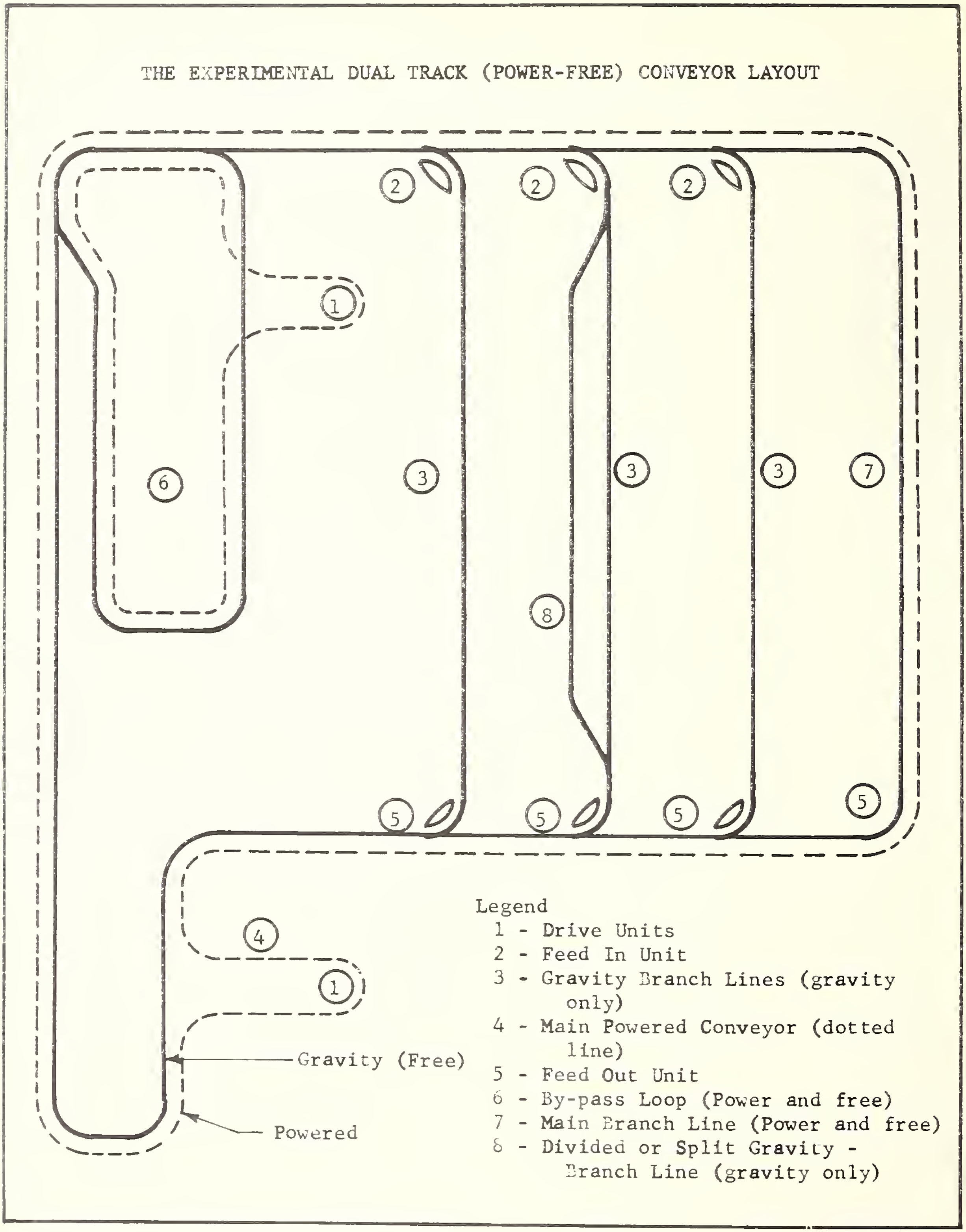
The system was designed to work as follows: Individual carriers routed around the main line were to be diverted into four separate lines by allowing the first of four carriers to continue around the perimeter on the main line (referred to as the main branch line, fig. 3, item 7) and switching the next three carriers onto successive gravity lines (fig. 3, item 3). As the four leading carriers exit from the gravity lines and main branch line switching points, the cycle is repeated.

The design provided for speeds of 30 to 60 feet per minute on both the 135-foot-long main line and the bypass loop. The carriers were moved along the main line by drive dogs attached to the power chain on 4-foot centers. The overflow or bypass loop was 55 feet long and stored up to 15 carriers. This loop was similar to the main line except drive dogs were spaced 18 inches apart.

The simulated eviscerating lines were 30 feet long and each held up to 12 carriers. Two of the gravity lines were straight while the third (fig. 3, item 8) was divided into two shorter gravity lines.

Overriding-type drive dogs (fig. 4) were used to permit continuous movement of the powered line in the bypass loop and main branch line (fig. 3, items 6 and 7).

THE EXPERIMENTAL DUAL TRACK (POWER-FREE) CONVEYOR LAYOUT



Legend
1 - Drive Units
2 - Feed In Unit
3 - Gravity Branch Lines (gravity only)
4 - Main Powered Conveyor (dotted line)
5 - Feed Out Unit
6 - By-pass Loop (Power and free)
7 - Main Branch Line (Power and free)
8 - Divided or Split Gravity - Branch Line (gravity only)

Figure 3

The carriers were 2 feet long and were supported by two 4-wheel trolleys, one at each end of the carrier. Four hangers per carrier were suspended on 6-inch centers, each hanger supporting one shackle (fig. 5).

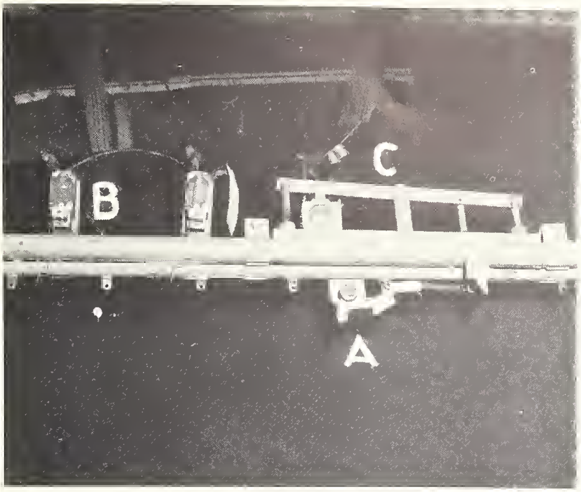


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Figure 4.--(A) Overriding-type drive dog that releases under predetermined force (note tension spring), (B) limit switches, and (C) holding coils and carrier release mechanism.

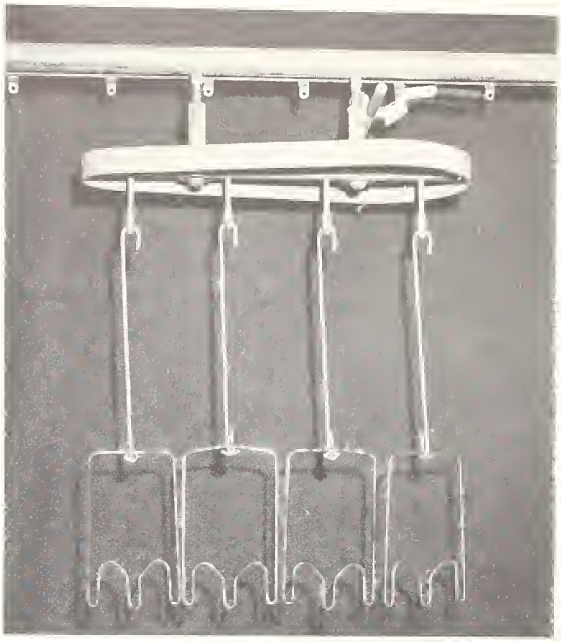

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Figure 5.--Carrier supporting four shackles. Note drive dog engaging pusher bar on carrier.

This carrier and shackle arrangement was spaced on 4-foot centers to accommodate the speed of the switching frogs; the frogs operated at about four cycles per minute. With this arrangement, it was possible to send 4 carriers with 16 shackles down each auxiliary line per minute.

An index tab on each carrier was positioned to operate a control that routed the carrier into the same gravity section each time it cycled through the system. Thus, considering carriers in groups of four, the first would continue past the gravity lines and stay on the main line. The next three carriers would be switched in sequence into the three gravity lines. Escape mechanisms at the end of each of the gravity lines (and the main branch line) discharged carriers onto the main line at 15-second intervals completing a system cycle.

Limit switches with holding coils and relays (fig. 4) were used as the control elements to operate the solenoids which properly positioned the switching frogs at each gravity line entrance and at all points where mechanisms allowed carriers to reenter the main line.

The system was operated to synchronize components, detect and eliminate impractical features, and determine operating limitations.

Tests and Evaluation

Test runs of the experimental conveying system disclosed that design features of some components, which appeared feasible on the drawing board, were impractical in actual operation. Bypassing these components during the tests permitted timing and endurance runs of the remaining components. (The endurance tests of the workable components disclosed that a number of design features were inadequate for poultry processing and indicated that several parts were not sturdy enough.)

The components that proved impractical and were not tested for endurance were the bypass loop, the split gravity line, and the main branch line (fig. 3, items 6, 7 and 8).

The bypass loop design was not practical because of the probability that birds routed into the temporary storage loop would remain there for long periods awaiting an opening to occur on the main line. Further, the bypass loop could not be synchronized with the main line unless they were powered by the same unit.

The split gravity branch line was not workable because the gravitational force was insufficient to drive carriers through the control devices. Increasing the slope at this point to furnish the carriers with sufficient force to operate the converging switch would have required a major structural change of the entire system.

Operating the system with carriers on the main branch line also proved to be impractical because each drive dog was required to override a minimum of 10 carriers, with 3 or more drive dogs overriding simultaneously. The vibrations, produced by the continuous overriding, were transmitted to all parts of the system, making it virtually impossible to maintain proper control adjustments. It was also very noisy. After numerous attempts to use these three components, (the bypass loop, split gravity line, and gravity part of the main branch line), they were disconnected so that the remaining components could be operated and their performance observed.

The components of the system that were tested included the main powered line and three gravity branch lines with the switching mechanisms (fig. 6). The powered main line was first operated alone with carriers removed for proper adjustment. Then, with carriers installed, it was operated in conjunction with each of the gravity lines to determine operating characteristics and to make fine adjustments to the controls for each component. Finally, with simulated loads on the carriers, the entire system which appears in figure 6 was operated as a unit.

An operating log was kept of each day's tests, recording the length of time of each failure-free operation, types of failures, reasons for the failures, and the corrective action which was necessary. During these periods of operation, observations were also made of the value of system components when applied to various poultry processing operations, and potential problems that might be encountered.

COMPONENTS OF THE ORIGINAL DUAL TRACK (POWER-FREE) CONVEYOR SYSTEM THAT WAS TESTED

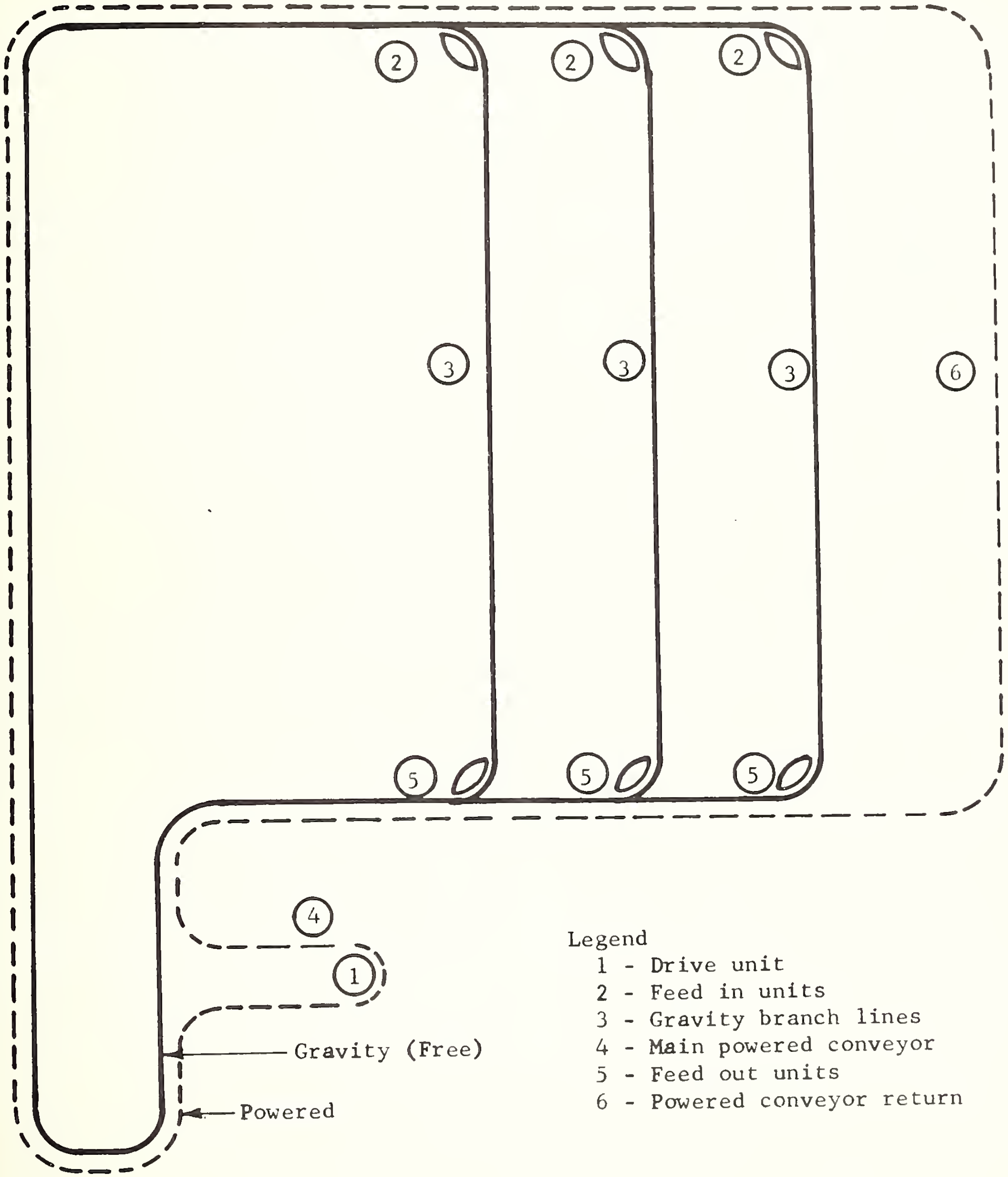

Figure 6

The major problems encountered during the testing of the experimental conveying system centered around the auxiliary power units which were intended for systematically routing carriers into and out of the gravity branch lines. Correction of these defects, however, would have required a major design change in the units themselves and possibly in the track switching mechanism too.

Failure of some of the design features was probably more significant than the mechanical failures. The multiple-bird carriers prevented the mechanical selection and removal of individual birds from the processing line, an inefficient and impractical arrangement for modern poultry processing plants. Furthermore, the spacing of drive dogs on 4-foot centers required excessive conveyor footage. Floor space in plants is already limited in this respect. Several attempts were made to correct these defects, but it became obvious that major design changes would be required. It was concluded that the original conveyor design (shackle carriers, auxiliary power units, etc.) could be effectively used only to a limited extent in processing plants. Because of increased production rates, changing processing techniques, and diversification of processing operations since the conception of the original design of the experimental conveyor, it was decided that its application to present processing operations should be limited to handling only bulky packages such as crates of processed poultry or coops of live chickens.

After this appraisal, the equipment was redesigned to meet a wider range of applicability.

IMPROVED DESIGN OF THE EXPERIMENTAL CONVEYOR

Although the original commercially designed, experimental dual track system did not prove to be practical for routing poultry through all the various processing operations, it did point to the potential value of the conveying principle provided that birds were conveyed on individual carriers. Based on this potential, a single-bird carrier with the necessary controls and switching mechanisms was developed.

Individual Bird Carrier

A carrier for suspending individual birds was designed and constructed from the original four-bird carrier trolley. Figure 7 shows the stages of development from one of the original carrier trolleys to an individual bird carrier. The pendant was lengthened and the wheels were surrounded by metal strips that extend beyond the wheels and serve as a bumper and spacer between carriers.

The longer pendant insured better contact with the drive dogs that push the carriers. Since the carriers move into, through, and out of the powered area close together at short intervals, it was essential that they be spaced evenly; bumpers provided this uniform spacing. The shape of the bumper is influenced by the type of tracking system used. The carrier shown in figure 7 was constructed for and worked well in an enclosed track.

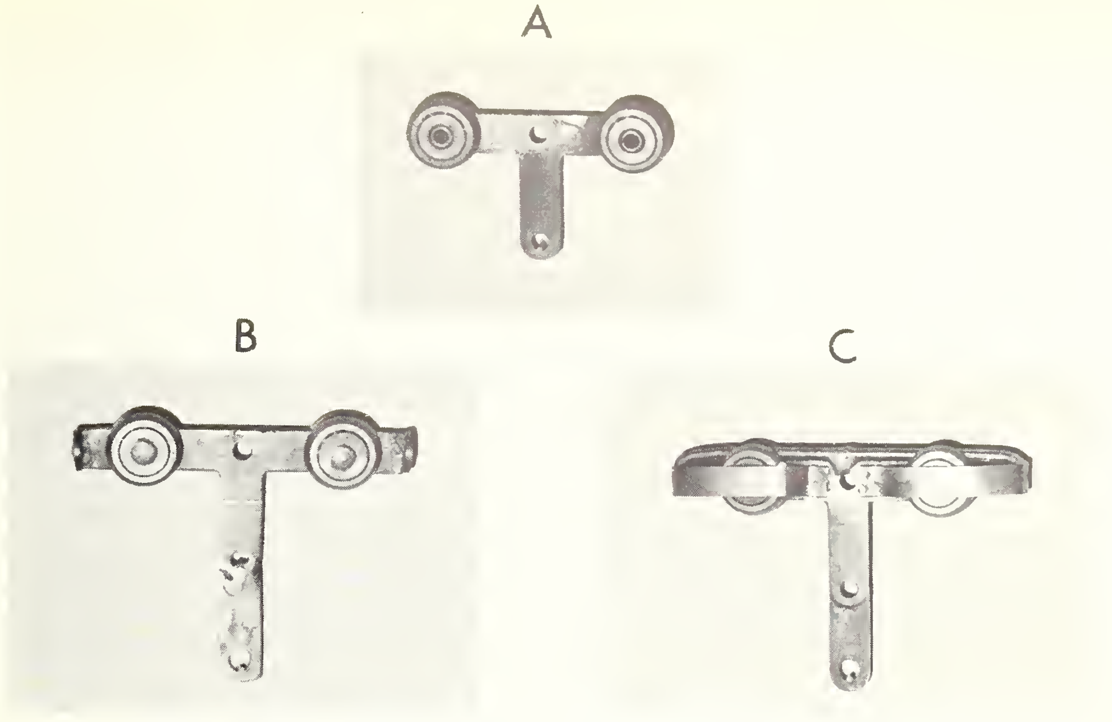

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Figure 7.--A single-bird carrier developed from a set of carrier trolleys: (A) original pendant, (B) pendant is extended, and (C) metal bumper-spacers added.

Mechanical Line Divider

To divide carriers on one conveyor line into two or more slower moving lines at various points throughout the processing plant, a mechanical line divider (fig. 8) was designed and tested. It is mechanically indexed by the carriers as they move through the unit. The carrier pendant (entering from line A) strikes the cam-shaped rear section of the divider, causing it to pivot (as carrier enters line B) and to position the point of the divider along the opposite side of the track (permitting next carrier to enter line C). The movement of the divider routes carriers in equal numbers onto two lines.

The line divider should be located in the system so as to require each carrier to be pushed through the unit by the power line. The point of the divider mechanism must be held in position against the side of the track so that the carrier pendant can pass through unobstructed. The mechanism should also be designed so that the carrier pendant will strike the cam section in time to force the point of the divider to the opposite side of the track before the next carrier is pushed to the point of entry at the switch head. For carriers spaced 6 inches apart, the length of the divider from point to cam section would have to be less than 6 inches.

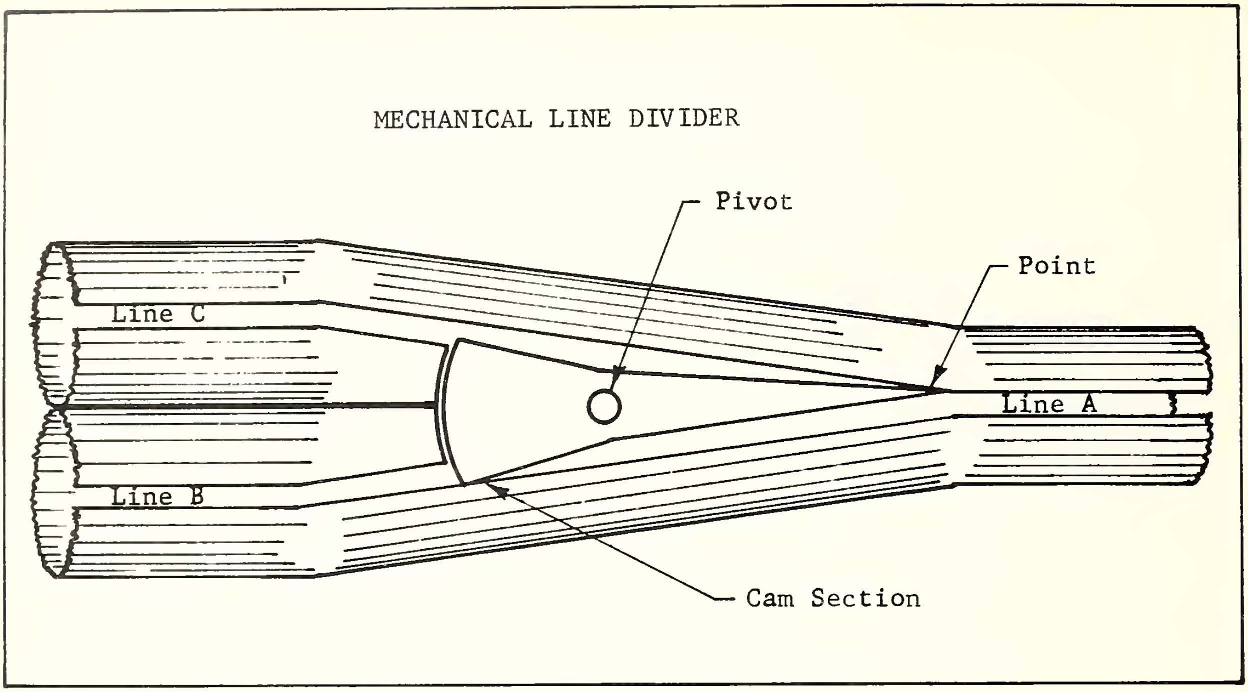

Figure 8

Carrier Converger

Maximum labor efficiency in poultry processing plants can be achieved more easily if two or more slow-speed conveyors are converged into one fast conveyor line at certain points. Such a converging unit (fig. 9) was designed and constructed. It is pictured in figure 10. The unit has two solenoids (fig. 9), one mounted on each of the two lines, and an alternate impulse relay. Two limit switches are used, one to actuate the impulse relay and one to operate the solenoids. During operation, the electrical control system for the converging unit (fig. 11) allows trolleys to move by gravity one at a time from each line alternately. The limit switch in series with the alternate impulse relay changes the switch position after each trolley, thus causing the carrier release solenoids to operate alternately. In figure 9, carrier A has been released and carrier B is being held; carriers C are moving into position by gravity. The limit switch in series with the release mechanism is actuated from index points on the conveyor drive chain.

The switch is positioned and adjusted so that it opens the release mechanism only long enough to allow a single carrier to pass and is timed so that the carrier arrives at the line junction at the proper time to move between two drive dogs on the powered line.

Converging the carriers from two lines in an alternate sequence into one line is not too complicated when the two lines are supplied with equal numbers of carriers. But in the poultry processing operation, unequal numbers of carriers may appear on the two lines, or one of the two lines may be empty while the other is completely filled, because of differences in the processing rates. A special system was developed to control the flow of carriers through the converging unit when one line was filled. It operates exactly as the control system described above except that when a line fills to capacity the backed up carriers close limit switches 12 and 13 (fig. 12), which in turn set the timer in motion. The normally open switches are wired in series with timer 1, and a normally closed contact on relay 6, also in this circuit, keeps solenoid 7 closed at any time solenoid 8 is open.

When the timer is energized, it energizes relay 2 which in turn energizes relay 3. Relay 3 then interrupts the power supply to solenoid 8 and makes a circuit through the contacts on relay 6 so that a carrier is supplied for every drive dog by carrier release solenoid 7. The timer is preset for a period which allows all but three or four carriers to leave the line before normal alternate sequence operation is resumed.

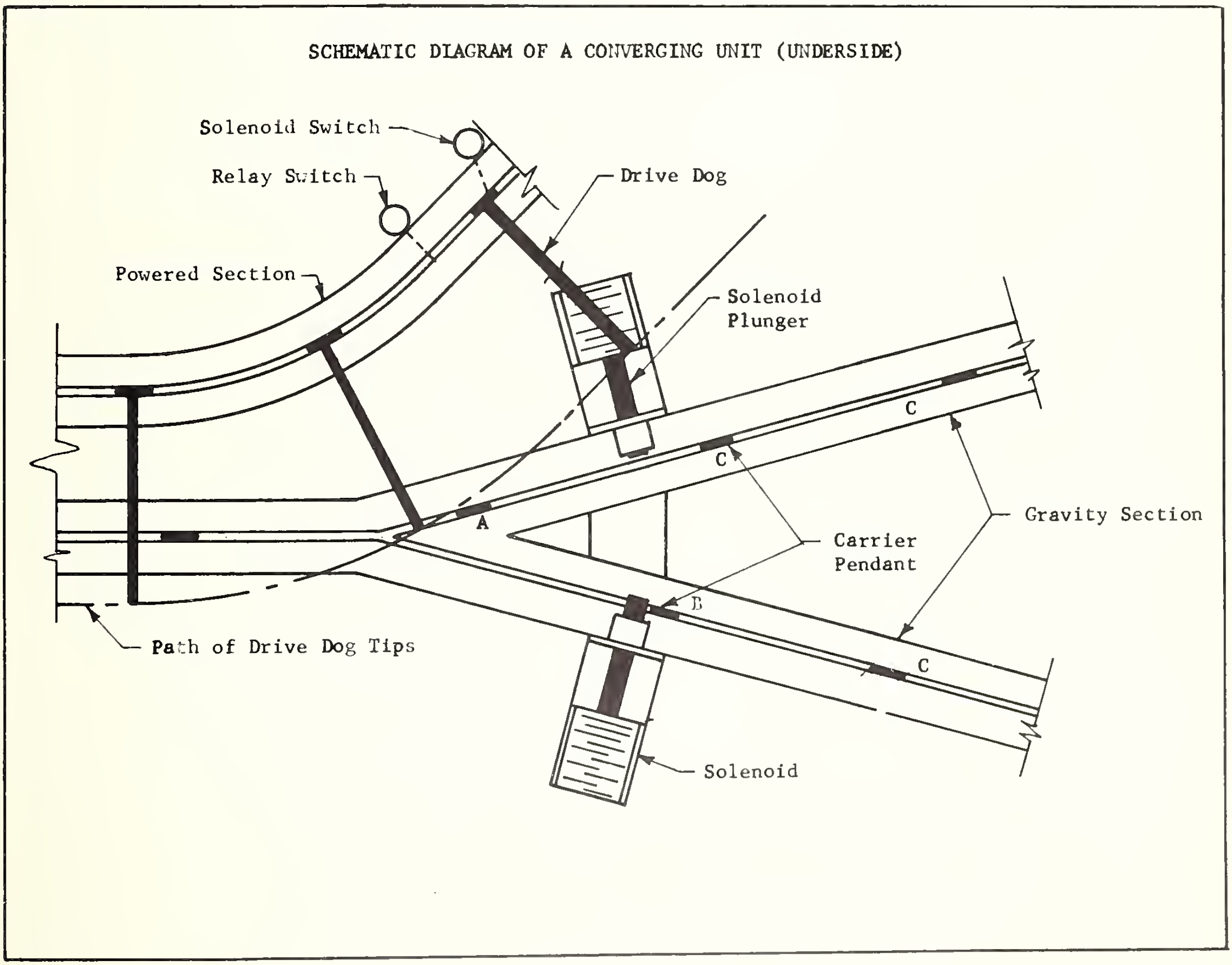
SCHEMATIC DIAGRAM OF A CONVERGING UNIT (UNDERSIDE)

Figure 9

Relay 2, through a set of contacts on relay 6, keeps solenoid 7 from being deenergized during a release cycle. This prevents the occurrence of an empty drive dog on the main power line each time the controls revert to the alternate line operation. At any time the line having a variable supply becomes empty, carriers are supplied continuously to all drive dogs from the opposite line. Limit switch 9, mounted adjacent to solenoid 7, is adjusted so that it is in the normally closed position when the variable supply line is empty. When there are no carriers in the line and the switch is in the normal position, relay 4 is energized. This breaks the circuit to solenoid 7 and completes the circuit to solenoid 8 (through contacts on relay 6), releasing a carrier for each drive dog on the power line.

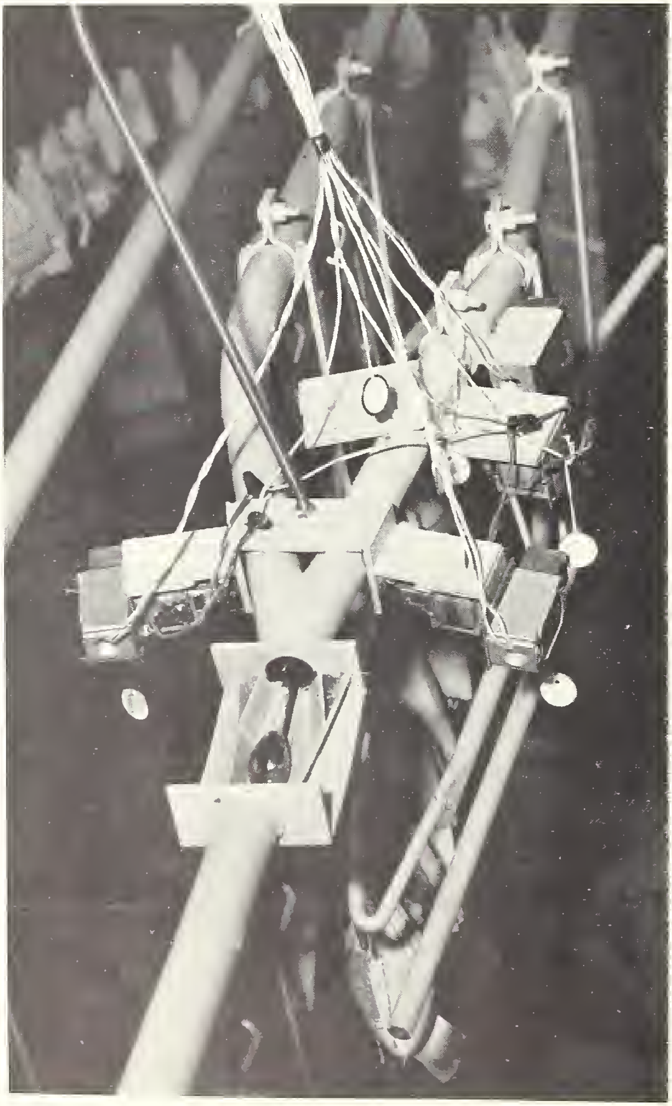

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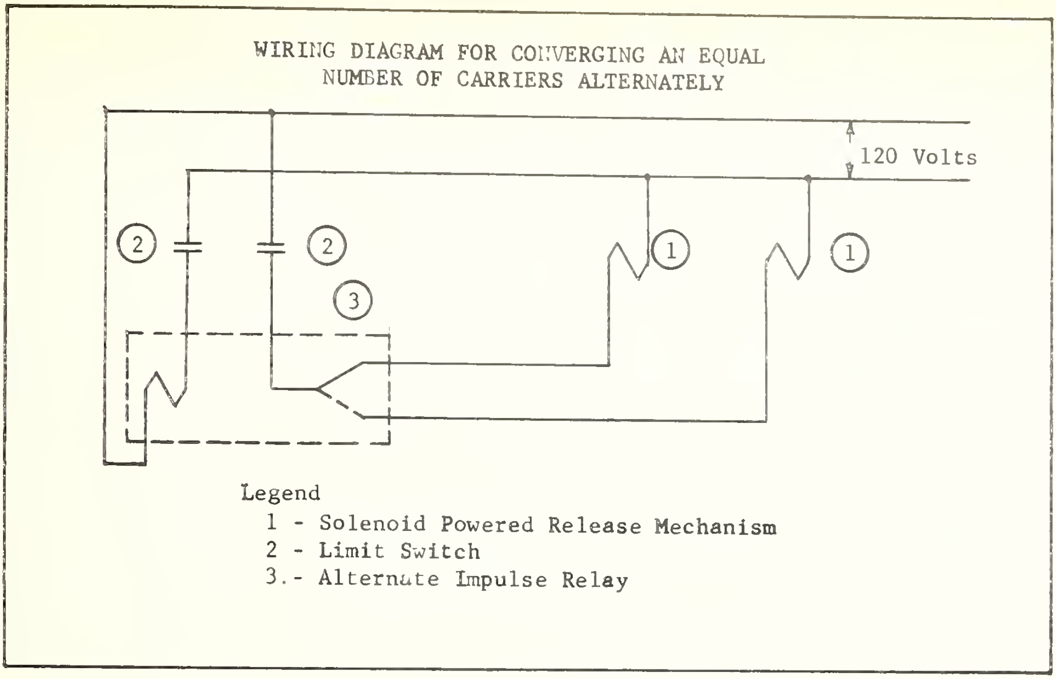
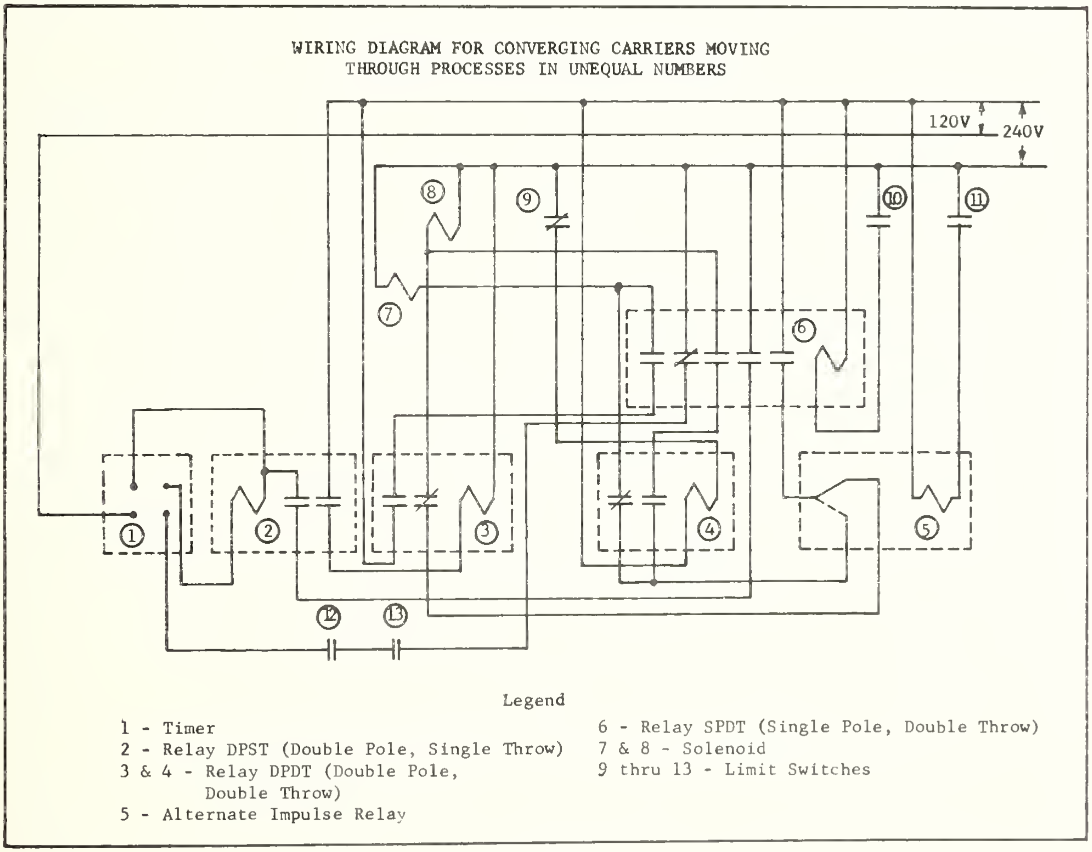
Figure 10.--A converging unit for routing carriers from two into one gravity line on experimental conveyor.



WIRING DIAGRAM FOR CONVERGING AN EQUAL NUMBER OF CARRIERS ALTERNATELY

Legend
- 1 - Solenoid Powered Release Mechanism
- 2 - Limit Switch
- 3.- Alternate Impulse Relay

Figure 11



WIRING DIAGRAM FOR CONVERGING CARRIERS MOVING THROUGH PROCESSES IN UNEQUAL NUMBERS

Legend
- 1 - Timer
- 2 - Relay DPST (Double Pole, Single Throw)
- 3 & 4 - Relay DPDT (Double Pole, Double Throw)
- 5 - Alternate Impulse Relay
- 6 - Relay SPDT (Single Pole, Double Throw)
- 7 & 8 - Solenoid
- 9 thru 13 - Limit Switches

Figure 12

Carrier Diverter

A simple carrier diverter (fig. 13) was developed. It consisted of a solenoid-operated switching frog and controls. In normal operation, the frog is positioned to leave the main conveyor line open. A limit switch is mounted and positioned so that an indexed carrier will trip the limit switch, causing the frog to close the main line long enough to allow that particular carrier to enter a branch line. A manual control system (fig. 14) was also developed which could be used to divert carriers onto the branch line. It consisted of a relay, two limit switches, and a solenoid. In operation, limit switch 3 was hand actuated and limit switch 4 was mounted on the powered track. Limit switch 4 was adjusted so it would not be actuated at times when switching the frog could cause the system to malfunction.

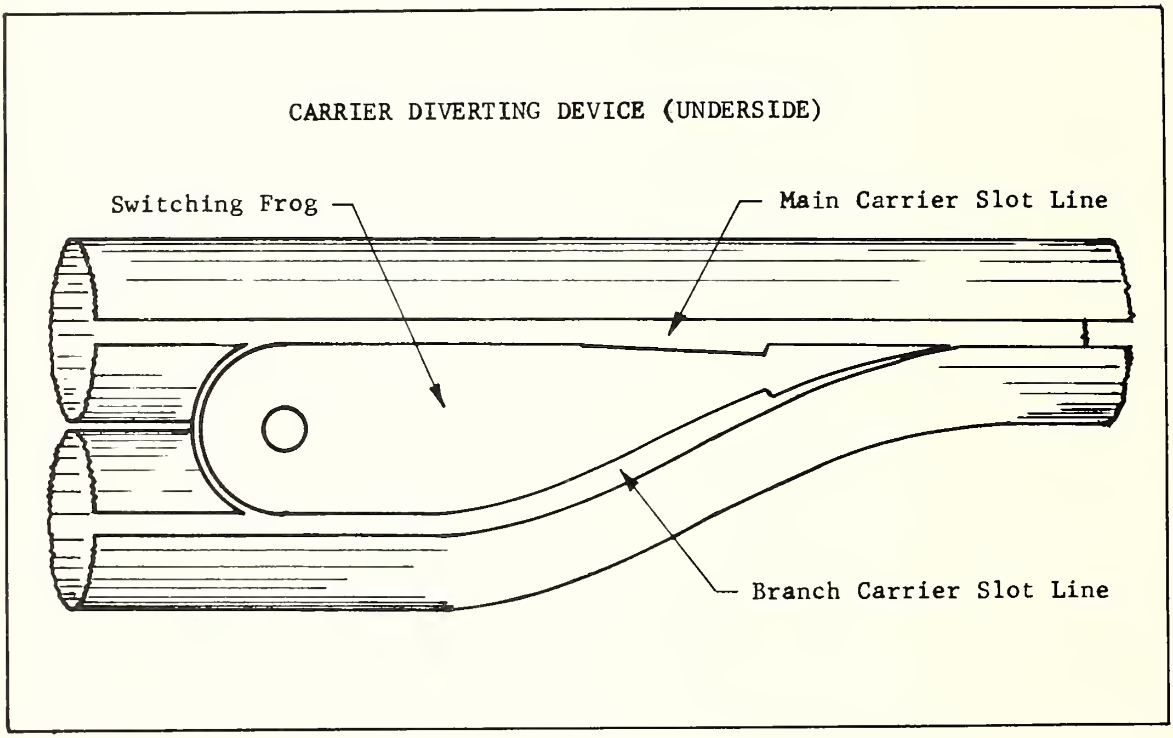


Figure 13

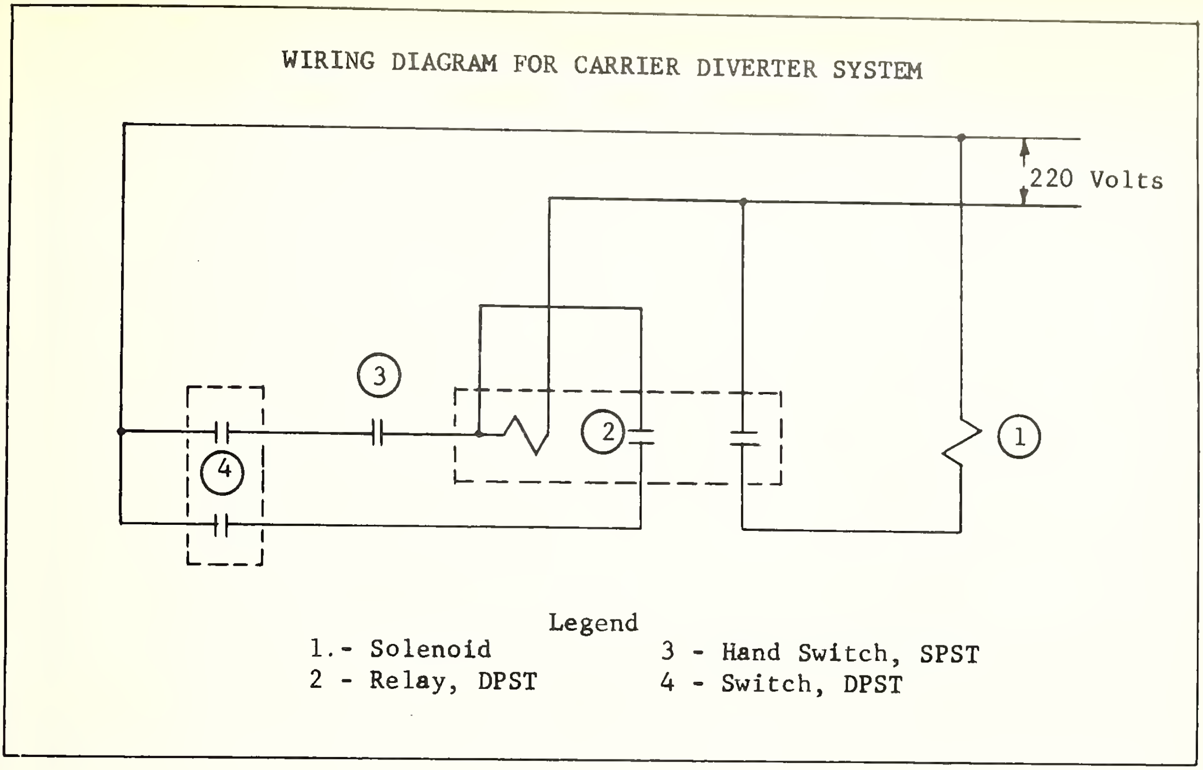


Figure 14

Operating and Testing the Improved System

The carrier, automatic carrier divider, carrier converger, and carrier diverter developed as a part of this research were installed in a small experimental power-free conveyor system (figs. 15 and 16). Figure 15 is a general view of the experimental system that was designed and constructed at the University of Georgia agricultural engineering laboratory. Figure 16 is a schematic diagram of the conveyor system. The diagram shows the line divider, two line convergers, the individual carrier diverter, two drive units, the power and gravity (free) lines, and the limit switches and solenoids.

The system works as follows: Carriers on the carrier conveyor are pushed along the track by drive dogs on the power conveyor. As carriers reach the individual carrier diverter they can be removed from the main line at will, in continuous or intermittent sequence. The auxiliary power unit pushes the diverted carriers to the gravity section of the branch line (C). Carriers remaining on the line are moved through gravity lines A and B in equal numbers. Forward movement on branch lines A, B, and C is effected by force of gravity.

Whenever the carrier diverter is employed, it is possible for branch lines B and C to have an unequal number of carriers on them. Converger #1 is employed to allow these unequal numbers of carriers to enter branch line D. Controls were designed and adjusted to route carriers through this converger under three possible conditions: (1) If either line B or C becomes completely filled, all carriers are fed from the full line until this condition is corrected; (2) if

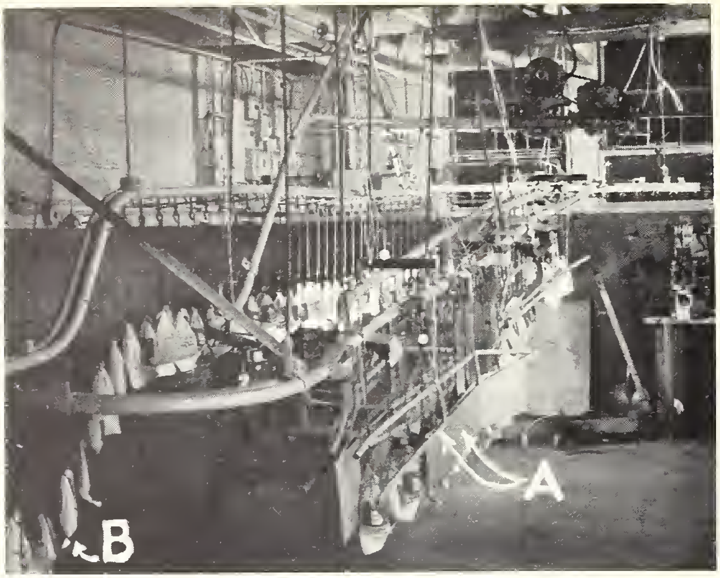


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Figure 15.--General view of the conveyor system using the components which were developed. (A) Guide rails and plates to prevent swaying and entanglement of shackles, and (B) weights used to simulate pendulum action during normal operation.

either line is emptied, carriers are fed continuously from the other line; and (3) if both lines are loaded equally, carriers are fed from either line alternately. Converger #2 is similar in design and functions in the same manner for lines A and D.

The power-free conveyor system (fig. 16) was tested first by routing carriers (with empty shackles attached) through the system at a constant line speed. Then line speeds at rates up to 160 shackles per minute were tested. The same tests were then repeated using simulated load conditions for each carrier. For these tests, small bags of sand (fig. 15) were attached to the shackle chain or 3/16-inch rod to simulate the normal load and determine the problems resulting from the pendulum action of suspended loads moving at changing speeds and directions.

The individual carrier diverter, line divider, and converging units 1 and 2 functioned satisfactorily so long as the carriers were properly positioned as they approached these mechanisms.

The carriers with shackles or simulated loads moved through the converging units by gravity. The tests showed that smoother carrier flow would be possible if a section of powered conveyor were used at converging points instead of a gravity section.

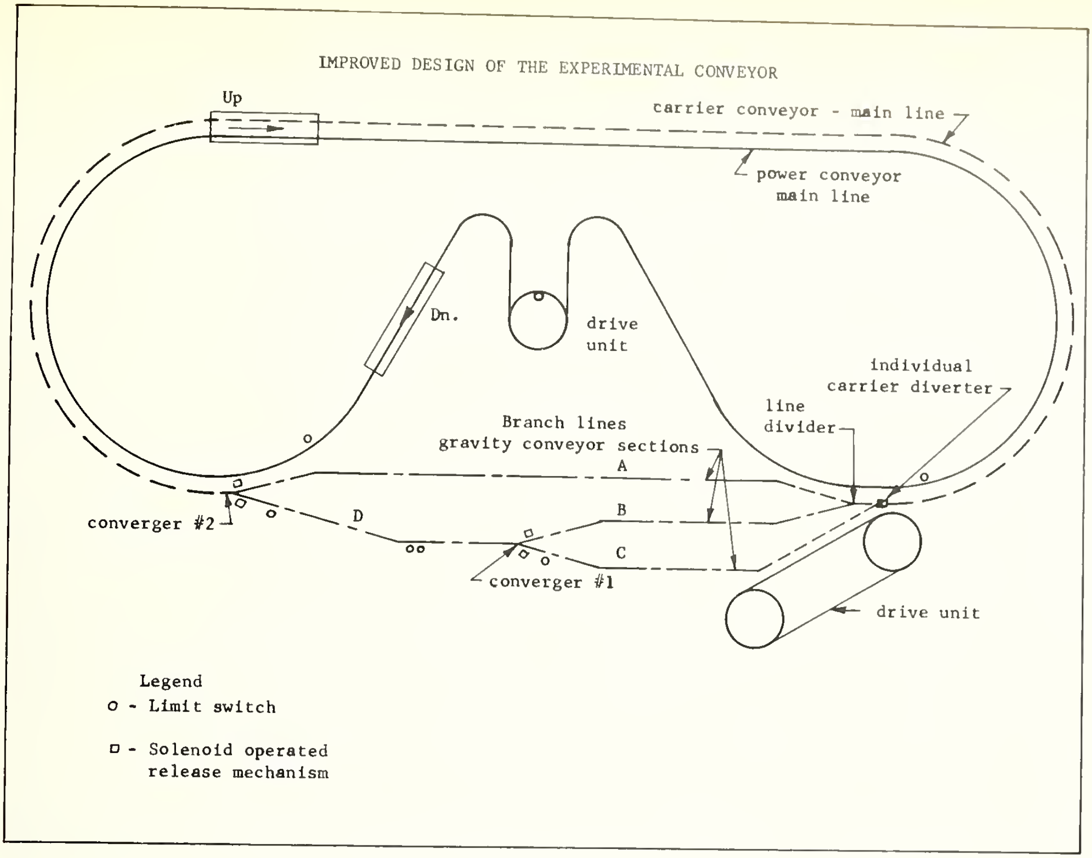

Figure 16

At first the pendulum action of the empty or loaded shackles caused the line to become entangled and the converging mechanism to malfunction. Several methods of stabilizing the shackles and loads were tested. Guide bars and plates (fig. 15) were effective in reducing this problem. Further tests showed that entanglement of shackles and the load they carried was less frequent when the gravity sections (lines A, B, C, and D) were kept filled with carriers.

APPLICATIONS AND ADVANTAGES OF A DUAL TRACK CONVEYOR SYSTEM

A dual track (power-free) conveying system with individual bird carriers developed for commercial use would provide the following advantages over the conventional all-powered system: (1) The labor for manual transfer of poultry from one line to another can be eliminated or greatly reduced; (2) improved crew balance and better individual job performance can be achieved through carefully controlled line speeds that fit each stage of the total process; (3) empty shackles can be removed from the processing line to reduce the labor loss resulting from passing them through the process; and (4) individual birds can be diverted from the main production line to special processing areas such as further inspection stations, cut-up areas, or special packing stations, without additional labor and without causing product congestion at diversion points.

Design Requirements

Design requirements for a dual track power-free conveying system, developed from test results and based on current chicken processing methods, are:

1. Carriers should be designed to support individual birds to allow for variations in production rates for various operations and to permit the removal, rerouting, or reentry of empty or loaded shackles.

2. Individual bird carriers should be designed so that they can be conveyed with a center distance equal to or only slightly greater than a shackle's width to keep conveyor length and floor space requirements to a minimum.

3. Carrier switching components for diverging (dividing) and converging shackles must be capable of: (a) Accommodating both rapid processes (160 carriers per minute) and slow processes (20 carriers per minute); (b) routing carriers onto and off of lines at random sequences; and (c) routing carriers onto and off of lines continuously.

4. Temporary storage areas, in which birds might accumulate for further processing or because of different production rates for various operations (defeathering vs. evisceration), should be of the in-line type to insure "first-in, first-out" handling.

5. Pendulum action of birds and hangers during changes in line speed and direction must be controlled. Controls should be as simple as possible and should be designed so that the operation can be stopped and started when necessary without danger of damaging the equipment.

6. The system must be constructed so that it can operate continuously in a highly humid atmosphere.

7. The conveying system should not be complex; it should require only simple adjustments that can be made quickly.

8. The system should be designed for easy cleaning and maintenance.

Conveyor Application

Figure 17 shows a schematic layout which illustrates how dual track power-free conveying might be employed to advantage in a poultry processing plant. A line divider is employed at any point where a slower line speed can produce better crew balance, improve workmanship, or reduce floor space requirements. Examples shown are at killing, scalding, eviscerating, inspecting, sizing, chilling, grading, cutting up, and packing stations. Divisions can be made by the line divider at these or other points where their use proves to be beneficial. The line converger is used to return birds to a single line for operations that will make the best use of equipment and labor at a higher line speed. The individual shackle diverter is used to divert birds for special purposes (such as trimming or final inspection), or by size or quality from the sizing station to specific operations (such as ice-packing or cut up), and to route empty shackles out of processing lines. Reliable diverting, diverging, and

A SCHEMATIC LAYOUT OF A POULTRY PROCESSING OPERATION
ILLUSTRATING THE USE OF DUAL TRACK POWER-FREE CONVEYING

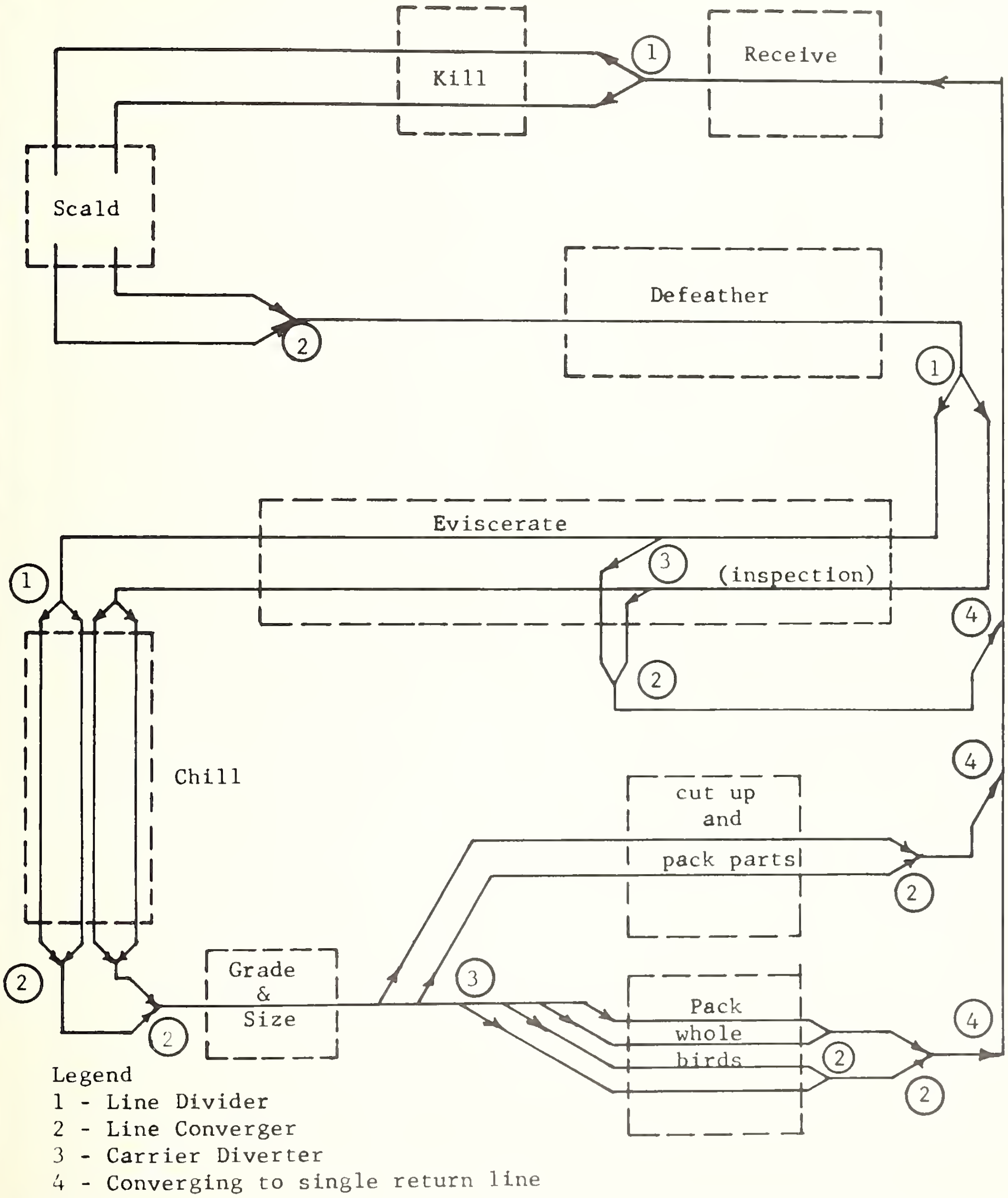

Figure 17

converging devices for routing individual birds through processes involving different production rates will make the power-free conveying principle feasible for reducing the labor requirements of poultry processing operations.

CONCLUSIONS

This developmental research demonstrated that:

1. It is feasible to apply the power-free conveying principle to poultry processing operations.

2. Powered sections are requisite for successful application of the principle when using individual bird carriers in multiprocess operations.

3. Gravity sections of the conveyor line are readily adapted to present methods of chilling, shackle storage, and shipping, and to some kinds of additional processing.

4. The dual track power-free conveying principle would provide maximum flexibility in routing individual production units through every phase of the processing operation.

5. The system would help maintain product quality by conveying birds at proper production rates and reducing contamination caused by manual handling.

6. Labor costs would be reduced through elimination of manual transferring operations.

7. It is highly questionable whether all poultry processing operations can be converted to this type of conveying system while current processing methods and equipment are used.

8. Conversion of present conveyor equipment to meet the specifications of a power-free system will be exceedingly difficult without major modification of equipment and plant. Conversion of existing conveyor systems, therefore, should be limited to auxiliary lines at first and eventually include the main processing lines.

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