United States Patent

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[54] METHOD AND SYSTEM FOR DISTRIBUTION OF ARTICLES IN RESIDENTIAL AREAS

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[52] **U.S. Cl.** **221/1,** 221/13, 221/185, 124/11, 124/51

[51] **Int. Cl.** **B65g 59/00**

[58] **Field of Search** 124/8, 9, 11, 13, 51; 146/74; 119/51; 222/176, 177, 178, 193; 221/1, 13, 185; 89/1.5

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[57] **ABSTRACT**

An automatic method and system for the distribution of articles, such as newspapers, in residential areas. Programmed information concerning a desired distribution route provides the input to a closed-cycle mobile article launcher. A measured quantity, related to the distance travelled by the mobile launcher from an initial reference position on the distribution route, is used to control the rate at which the programmed information is delivered to the closed-cycle firing system of the article launcher. The firing control system can operate as a closed-cycle or as an open-cycle at the command of the vehicle driver.

17 Claims, 7 Drawing Figures

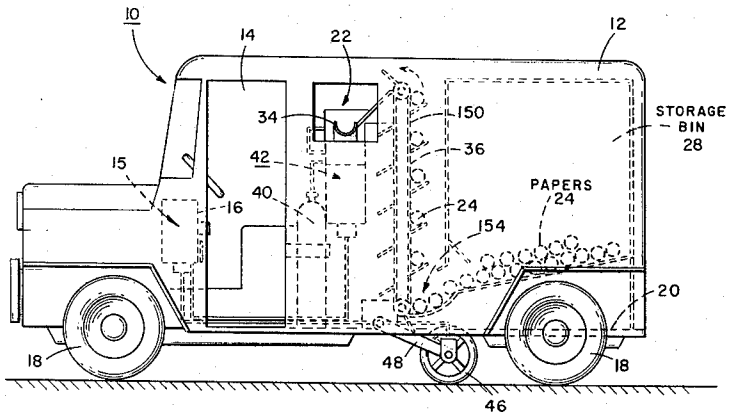


FIG. 3.

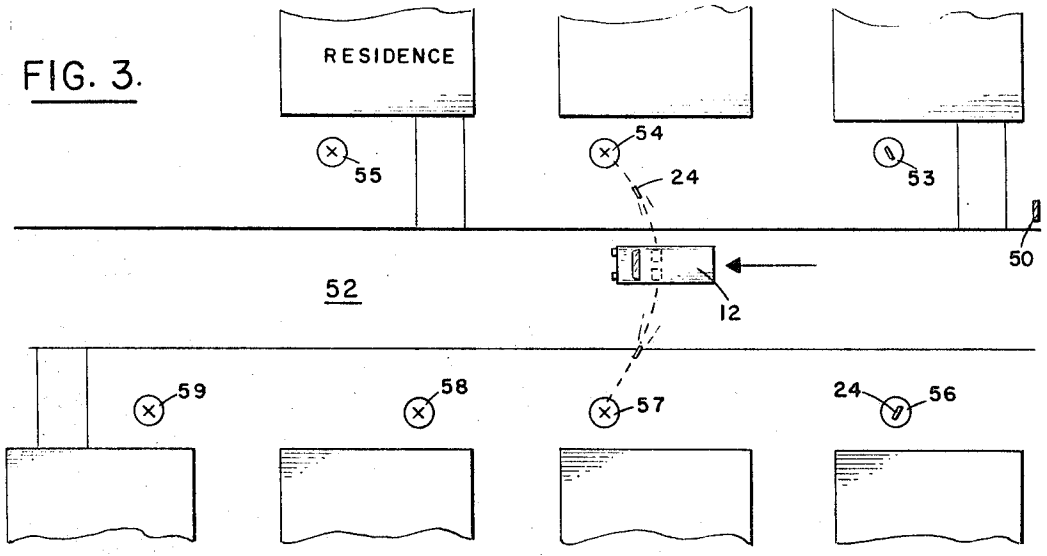
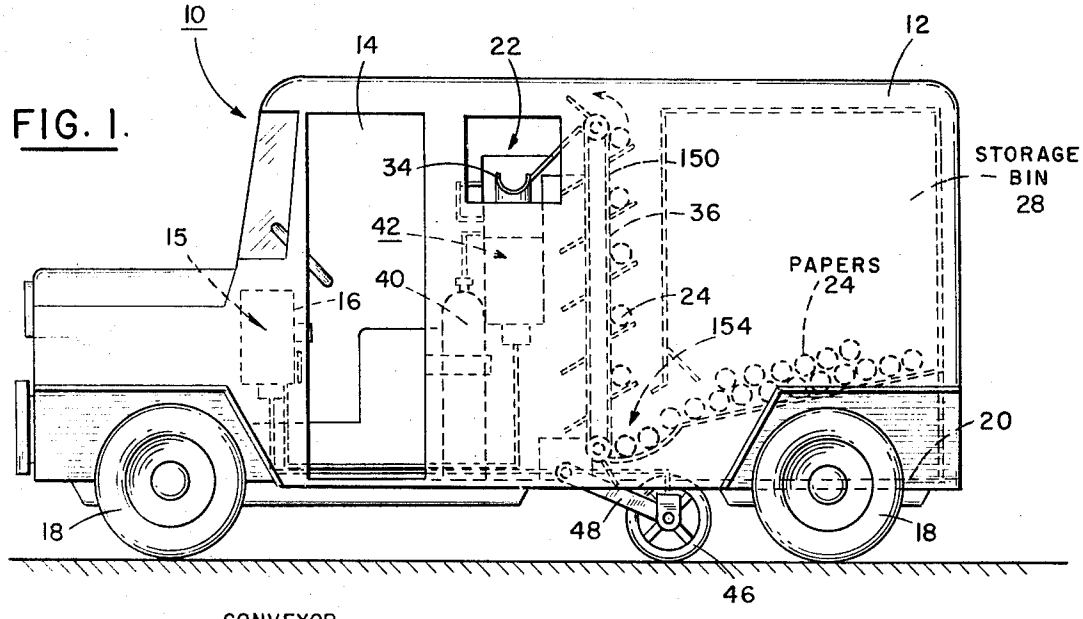


FIG. 1.



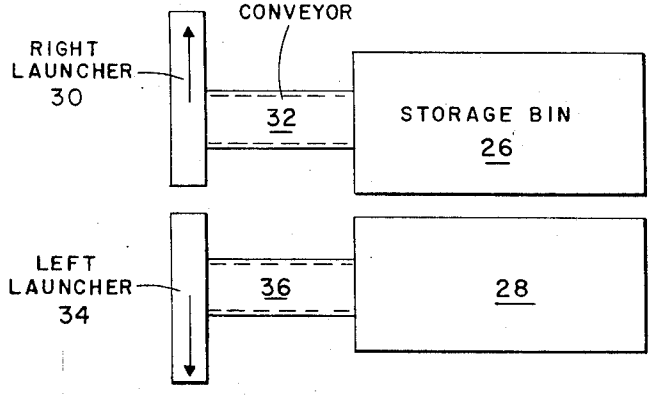


FIG. 2.

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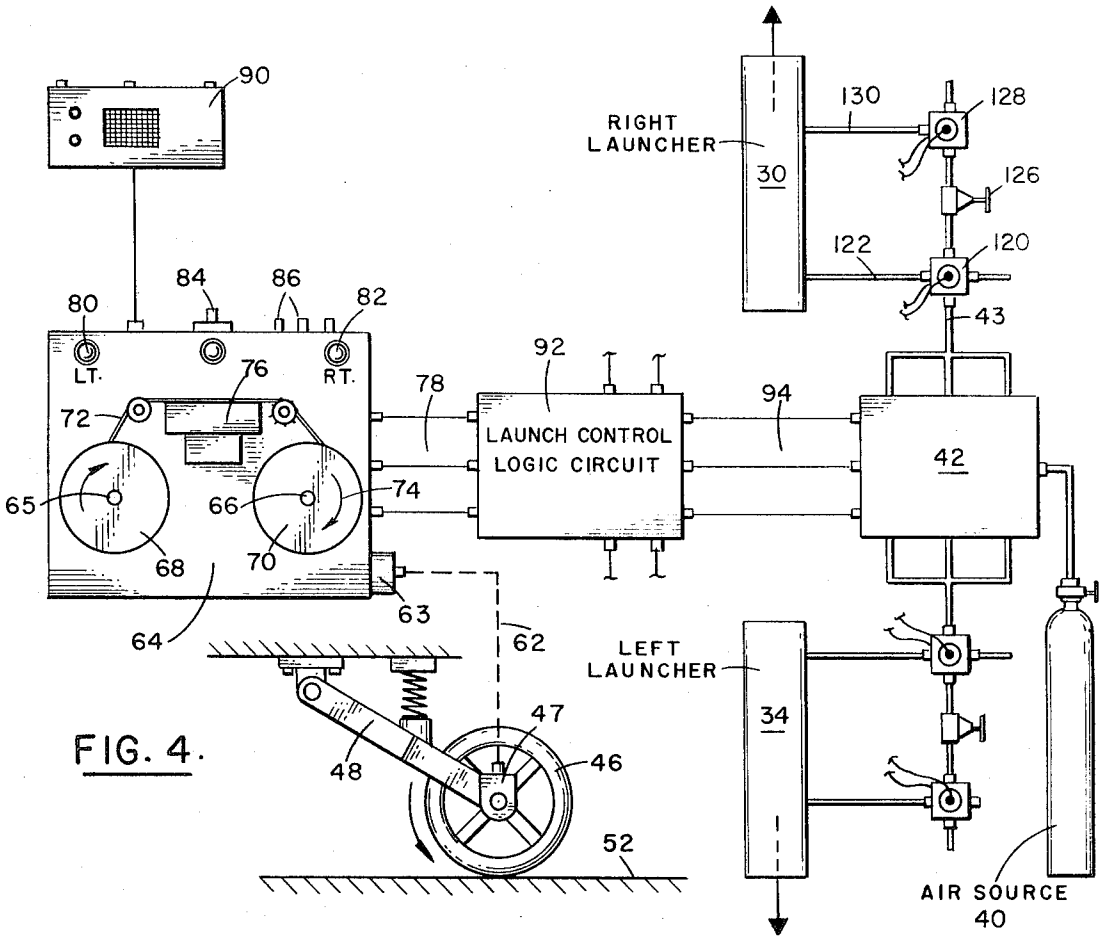


FIG. 4.

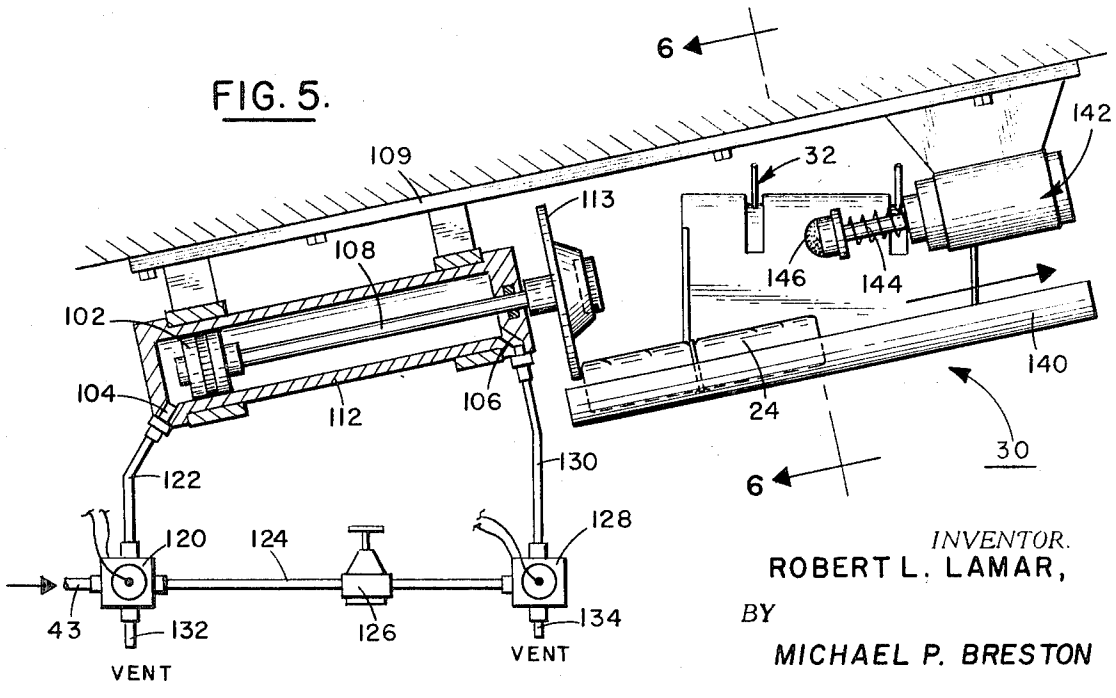


FIG. 5.

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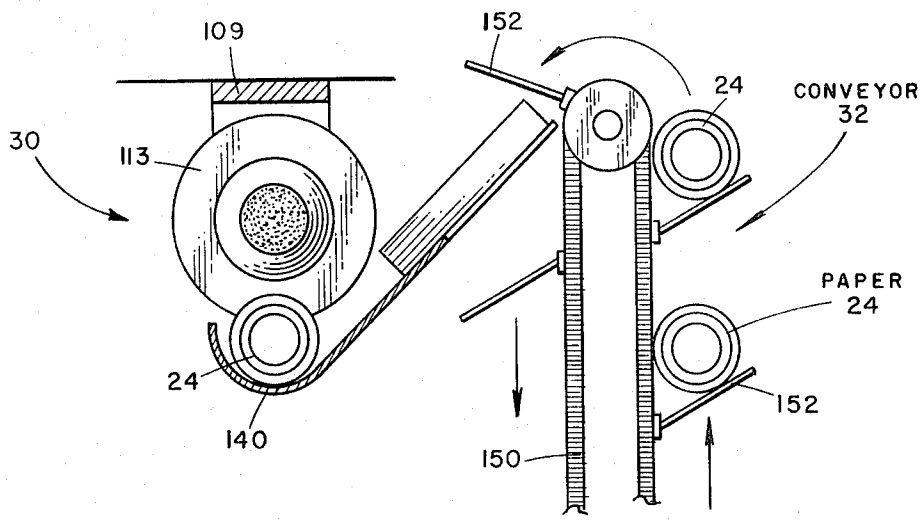


FIG. 6.

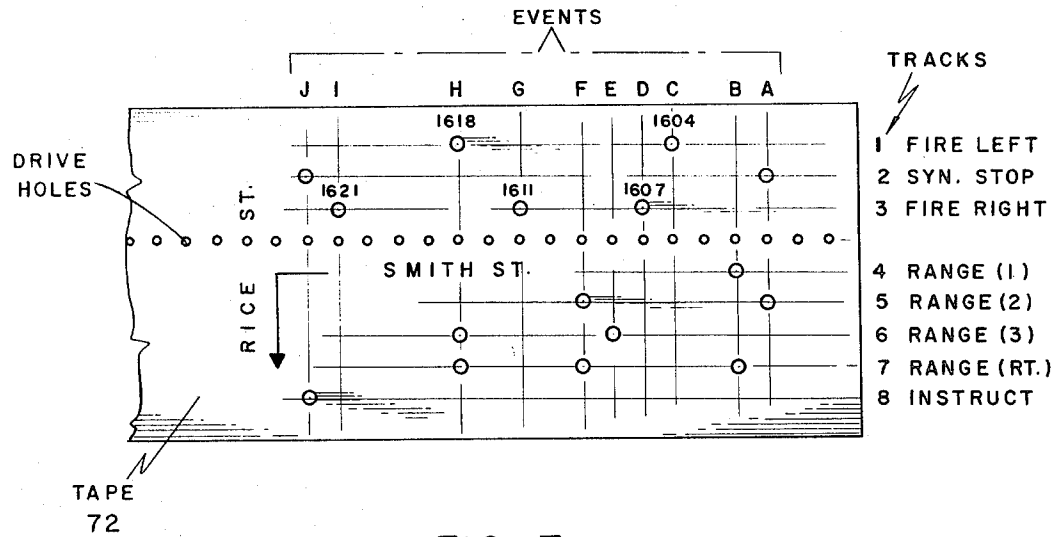


FIG. 7.

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METHOD AND SYSTEM FOR DISTRIBUTION OF ARTICLES IN RESIDENTIAL AREAS

BACKGROUND OF THE INVENTION

As it is presently practiced, the handling and distribution of articles in residential areas is relatively expensive. For example, a typical present day newspaper distribution system requires, within a large city, several distributors. Each distributor employs a number of newspaper boys, each having a predetermined route consisting on the average of 100 deliveries or more. The turnover of such newspaper boys is relatively great and both the distributor and the newspaper publisher continuously receive complaints from unhappy patrons.

SUMMARY OF THE INVENTION

It is a prime objective of this invention to provide a new method and system for the distribution of articles, such as newspapers, within a given residential area. A mobile carrier transports the newspapers in storage bins from which they are individually fed through a suitable conveyer system to a newspaper hurling or launching machine. The firing of the machine is normally controlled automatically by a punched tape which has been programmed in accordance with the desired distribution-route data. This data includes information concerning the number and time of occurrence, as related to distance, of desired firings for a particular vehicle velocity. Other information, as on existing perturbations and obstacles within the distribution route, is also punched into the tape to allow the driver of the vehicle to change the firing system from automatic to manual operation.

As the vehicle travels along its trajectory from a reference position, the distance travelled is measured by a suitable odometer, which can be mechanical, electro-mechanical, or electronic. The unwinding of the prepunched tape is controlled by the odometer, and hence the closed-cycle firing system is also controlled by the odometer. From the tape are derived electric signals which control the inter-actions among the mechanical and electro-mechanical parts used to regulate the energy required for launching the newspapers onto the desired target areas. Suitable circuitry is also provided to compensate for encountered variations in and from the prepunched data on the tape.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of an automatic, article-launching machine in accordance with this invention;

FIG. 2 is a schematic representation of the arrangement of the major parts in FIG. 1;

FIG. 3 is a showing of a typical distribution route travelled by the automatic, article launcher;

FIG. 4 is a block-diagram representation of the automatic, firing-control system used in the launcher of FIG. 1;

FIG. 5 is a view, partly in cross section, of an article propeller which can be used in the system of FIG. 4;

FIG. 6 is a view on line 6—6 in FIG. 5; and

FIG. 7 is a representation of a typical prepunched tape used in the system of FIG. 4.

Referring now to FIGS. 1 through 4, there is shown a mobile, article launcher, generally designated as 10. Launcher 10 includes a self-propelled truck 12 having a driver cabin 14 in which is mounted a control box 15 with an instrumentation panel 16. Truck 12 is propelled on wheels 18, although in arctic countries tracks could be substituted for the wheels.

On the loading platform 20 of truck 12 is mounted an automatic, article-launching machine, generally designated as 22. Although the machine 22 can be adapted for launching various articles, its primary purpose will be described in connection with the launching of rolled newspapers 24 stored in at least one, but preferably two storage bins 26 and 28. From bin 26 the newspapers 24 are fed to a right-ejector 30 by a conveyer 32. Similarly, a conveyer 36 feeds the newspapers 24 from storage bin 28 to a left ejector 34.

While different energy sources could be used for conveying and ejecting the newspapers onto their targets, it is preferred to use a compressed air source 40. The application of the compressed air from source 40 is controlled and regulated by an electro-mechanical control system 42 which is in turn controlled and operated by an electronic control system inside box 15. Although one of the wheels 18 could be used for measuring distance travelled by truck 12, it is preferred for greater accuracy to employ a well-calibrated fifth wheel 46 which is supported on a suitable spring suspension 48.

Referring more specifically to FIG. 3, truck 12 will start on its distribution route from a reference position 50 in a typical residential street 52. The object is to deliver automatically the newspapers 24 from bins 26 and 28 onto target areas 53, 54 and 55 on the right-hand side of street 52, and onto targets 56, 57, 58 and 59 on the left-hand side of street 52. While only seven targets are shown in FIG. 3, it will be understood that ordinarily a typical street 52 will contain many patrons receiving newspapers 24. The target areas are on the front lawns of the patrons at convenient locations. To achieve a closed-circuit, launching system, information concerning the particulars of each distribution route 52 must first be obtained and stored on a suitable storage medium from which it can be retrieved as a function of the motion of truck 12. The characteristics of this motion are conveniently selected as the distance travelled by truck 12 from the reference position 50, as well as the velocity of truck 12.

A preferred system for achieving a closed-circuit firing system is shown in FIG. 4. The fifth wheel 46 serves as an odometer wheel which is suitably coupled by a coupling device 47 to a flexible-drive shaft 62. Drive shaft 62 is coupled to a drive-synchronizing mechanism 63 of a tape deck, generally designated as 64. A shaft 65 supports a tape supply spool 68, and a shaft 66 supports a pickup spool 70. A tape 72 moves from supply spool 68 to the pickup spool 70 in the direction of the arrow 74. The linear motion of tape 72 is synchronized by the mechanism 63 with the rotation of the drive shaft 62 and hence with the rotation of the odometer wheel 46. The information stored on tape 72 is read out by a suitable, conventional, readout mechanism 76 which supplies electric signals onto lines 78. Mounted also on the tape deck 64 are indicator lights 80 and 82. Indicator light 80 lights up when the left ejector 34 is actuated, while indicator light 82 lights up when the right ejector 30 is actuated. For manually controlling the closed circuit-ejector mechanism, there is provided a stop-and-start button 84. Other tape deck controls 86, such as are normally found on tape decks, for advancing and reversing the tape 72, are also provided. It may be desired to issue instructions for special situations concerning the delivery of certain newspapers, or to warn the driver of obstacles which he may encounter. The is accomplished by connecting to the tape deck 64 a magnetic tape recorder 90. Magnetic tape recorder 90 is actuated by the prepunched information on tape 72.

The lines 78 provide input signals to a launch-control, logic circuit 92 which includes conventional electronic circuitry for controlling the timing and operation of the regulators, valves, and other electro-mechanical elements in the electro-mechanical system 42. The signals from the logic circuit 92 are fed via lines 94 into the electro-mechanical system 42. As previously mentioned, the energy source is preferably compressed air which may be obtained from the air tank 40. It is the object of the electro-mechanical system 42 to regulate the amount of force applied to the ejectors 30 and 34.

This invention is not concerned with the particular elements which go into making the electronic and electro-mechanical systems 92 and 42. Closed-circuit control systems are well known. The theory of cybernetics will allow the formulation of the requirements and the design of any particular control system desired, as well as the formulation of the criteria for judging the performance thereof. Basically the electronic and electro-mechanical control systems 92 and 42 provide a means by which a variable force is caused to conform to the

stored data on tape 72. Such an energy control system constitutes a closed-cycle, control system or servo system. As is well known to those skilled in the art, the servo system is governed by a system of equations, including distance travelled and velocity of travel, which can be written explicitly in dependence on the physical components selected for accomplishing the ejection of the newspapers 24. The servo system can be constructed with parts that are commercially available, that are simple, rugged, and reliable.

Referring now to FIGS. 4 through 6, the description of only one ejector system will be given since the other ejector system is identical. The selected ejector system is that cooperating with the supply bin 26, conveyer 32, and right launcher 30.

Launcher 30 may include a reciprocating piston 102 which is actuated by air pressure admitted through ports 104 and 106. Piston 102 is mounted on one end of a center shaft 108. Mounted on the other end of shaft 108 is a propeller plate 113 which could be of circular configuration. Piston 102 slides in a cylinder 112 which is secured to a structural member 109 attached to the frame of truck 12. The air pressure is received on line 43 from the electro-mechanical system 42. A four-way, solenoid-operated valve 120 allows, in one of its positions, for the air pressure to fluidly communicate between line 43 and a line 122 connected to port 104 for exerting a force on piston 102. In another position of valve 120, air pressure communicates between line 43 and a line 124. Line 124 includes a pressure regulator 126 and is connected to a three-way, solenoid-operated valve 128. In one of its positions, valve 128 allows air pressure to flow from line 124 through the regulator 126 into a line 130 connected to the other input port 106 for returning the piston 102 to its rest position. When piston 102 moves from right to left, as viewed in FIG. 5, valve 120 will vent the air pressure in cylinder 112 to the atmosphere through a vent pipe 132. Similarly, when piston 102 moves from left to right, valve 128 will vent the pressure in cylinder 112 to the atmosphere through a vent pipe 134. Regulator 126 allows a controlled return of the piston 102 to its rest position.

Cooperatively positioned near plate 113 is a launch trough 140 which receives from the conveyer system 32 a newspaper 24 for ejection to one of the selected target areas. To arrest the motion of plate 113 there is provided a suitable energy-absorbing device, such as a pneumatically operated shock absorber 142, which includes a spring-biased, slidable piston 144 having at its free end a resilient bumper 146 in alignment with the line of travel of plate 113. Thus plate 113 will successively propel a newspaper 24 through the trough 140 in accordance with the programmed information on tape 72.

The conveyer system 32 may include a rotating belt 150 from which extend a plurality of arms 152. Papers 24 are fed by gravity to a lowermost position 154 in bin 26. From this position each arm 152 picks up and lifts a paper 24. The motion of the conveyer belt 150 is synchronized with the motion of the ejector piston 102. After a paper 24 is ejected through the trough 140, another paper is delivered by an arm 152 to the trough 140.

Referring now to FIGS. 4 and 7, the tape reader 76 is a conventional, eight-track tape reader adapted to read out the punched information from the tape 72. The tape includes eight information tracks. Each track includes a series of punched holes. The location of each hole within each track is a function of the measured distance from a reference location, such as location 50 on the distribution route 52.

An exemplary arrangement of the tracks and the punched information can be as follows:

Track 1 has its holes punched to control the points along the trajectory travelled by truck 12 at which the left launcher 34 is actuated or fired. Similarly, Track 3 controls the firing points for the right launcher 30. A hole in Track 2 provides a signal for controlling the synchronizing mechanism 63, thereby disengaging the movement of tape 72 from the distance-measuring device or odometer wheel 46. The ability to disengage the tape-drive mechanism from the distance-measuring device is an important feature, since it is nearly impossible to control or anticipate the actual trajectory of truck 12 along the distribution route 52. For example, truck 12 may not be able to follow a substantially straight trajectory due to obstacles present on the street. Since errors relating to distance travelled by truck 12 would tend to accumulate, it is desirable to periodically obtain a signal from Track 2 for the automatic disengagement of the tape-drive mechanism from the distance-measuring device. By manually actuating the start button 84, the driver can re-engage mechanism 63 with the distance-measuring device 46 at the next reference point along the desired trajectory.

The holes in each of Tracks 4, 5 and 6 provide signals for the proper selection of the required force to be applied to the propeller plate 113. The holes in Track 7 provide signals for guiding the applied energy to the right launcher 30. The absence of a hole in Track 7 will cause the application of the energy to the left launcher 34.

Holes in Track 8 provide signals for actuating the magnetic tape recorder 90, thereby providing the driver with needed or desirable audible instructions. The tape recorder plays back previously recorded instructions and then automatically stops.

Thus by pre-recording data both on tape 72 and on the magnetic tape of the magnetic tape recorder 90, it is possible even for a driver who is not familiar with the route to rapidly and automatically accomplish a large number of paper ejections in a relatively short time period.

The programming of the information is made on the assumption that truck 12 is travelling at a nominal speed, say between 30 to 35 miles per hour. If the truck is moving at a velocity less than the nominal velocity, then a delay is introduced into the logic circuit 92, so that the instant of firing is correlated with the actual velocity of the truck. For example, when the truck is stationary or moving at a very low velocity, the truck would fire at a position along the trajectory nearly at a right angle to the desired target area. The faster the truck is moving, the greater will be the distance from the firing position to the perpendicular extending from the target area to the trajectory.

In the operation of the apparatus 10, the odometer wheel 46 measures the distance travelled by truck 12 from a reference position 50. The rotation of wheel 46 is coupled mechanically by shaft 62 (or electrically by the generation of suitable pulses) to the tape drive mechanism 63. With the movement of tape 72, successive holes in the various Tracks will cause the proper force selection within the electro-mechanical system 42. The necessary information is contained within Tracks 4, 5, 6 and 7. As the tape 72 further advances, Tracks 1 and 3 are read out by the tape reader 76 causing either or both of the launchers 30 and 34 to become actuated. A hole in Track 2 will cause the disengagement between the odometer wheel 46 and the tape-drive mechanism 63. Prior to this disengagement, a hole in Track 8 (event J) will cause instructions to be issued by tape recorder 90 to the operator or driver. The driver will receive information concerning the selection of the next reference point 50 along the trajectory 52. When the truck reaches the next desired reference point 50, the driver actuates button 84 to re-engage the odometer wheel 46 with the tape drive mechanism 63 thereby commencing a new closed-cycle operation.

While the means coupling the odometer wheel 46 with the tape drive mechanism 63 is shown as being a flexible drive shaft 62, it will be appreciated that the odometer wheel 46 can be made to generate a series of pulses the inter-spacings of which will be a function of the distance travelled by the odometer wheel 46. A suitable motor (not shown) can be made to step in synchronism with the generated pulses and thus drive the tape 72 in synchronism with the odometer wheel 46.

This invention lends itself for both manual or automatic operation in accordance with the distribution conditions prevailing at the time the vehicle moves along its trajectory on said route. Corrections for trajectory errors can be made by the operator by actuating the manual controls 86, thereby ad-

vancing or retarding the tape 72 relative to the readout means 76.

What I claim is:

1. A method for distributing domestic articles to designated residences along at least one predetermined distribution land route including the steps of:

determining distribution information relative to said residences from a reference position on said route;

storing the determined distribution information;

moving an article-launching land vehicle along said route from said reference position;

measuring at least one route parameter relating to the vehicle's motion as the vehicle moves along said route from said reference position;

progressively releasing the stored distribution information; and

launching said articles from said vehicle to their respective designated residences in accordance with the contents of the released information.

2. The method of claim 1 wherein,

said articles are newspapers.

3. The method of claim 2 wherein,

said distribution information includes the distance of each residence from said reference position along the vehicle's trajectory on said route.

4. The method of claim 3 wherein,

said distribution information further includes the amount of energy required for launching each newspaper to its designated residence.

5. The method of claim 4 wherein,

said distribution information further includes the position of each residence with respect to the direction of travel of said vehicle on said route.

6. The method of claim 1 wherein,

said parameter is the distance travelled by said vehicle from said reference position.

7. The method of claim 6 wherein,

said stored information is progressively released at a rate determined by the value of the measured distance.

8. The method of claim 7 wherein,

said articles are newspapers.

9. The method of claim 8 wherein,

said distribution information is stored as a pattern of holes on a tape.

10. The method of claim 9 wherein,

said distribution information includes the distance of each residence from said reference position along the vehicle's trajectory on said route.

11. The method of claim 10 wherein,

said distribution information further includes the amount of energy required for launching each article to its designated residence.

12. The method of claim 11 and further including the steps of:

converting into electric signals the information released by said tape, and

selecting said amount of energy required in accordance with said electric signals.

13. The method of claim 12 wherein,

said stored information includes instructions for the vehicle's driver relative to said route.

14. The method of claim 13 wherein,

said instructions are obtained from a magnetic tape recorder which is controlled by said electric signals.

15. The method of claim 14 wherein,

said distribution information is stored with respect to the vehicle's nominal velocity along said route.

16. The method of claim 15 and further including the steps of:

measuring the actual velocity as the vehicle moves along said route;

comparing the measured actual velocity with said nominal velocity to obtain a velocity correction factor; and

controlling the time of launching of said newspapers from said vehicle to their respective target areas in accordance with said velocity correction factor.

17. A mobile system for launching newspapers to designated buildings along a predetermined land distribution route, said system comprising:

launching means for launching each newspaper to its designated building;

feeding means for progressively feeding each newspaper to said launching means;

automatic control means for synchronizing said feeding means with said launching means;

storage means for storing distribution information relative to said buildings from a reference position on said route, and

said control means being operable in accordance with the content of the distribution information progressively reproduced from said storage means.

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