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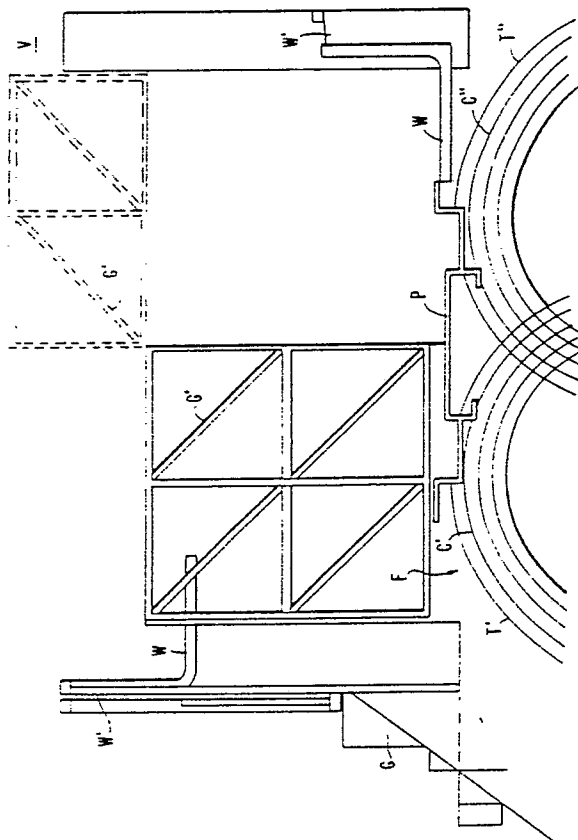
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AT BE CH DE ES FR GB GR IT LI NL SE(71) Applicant: **AUTO-VEYOR INC**
150 Longwood Avenue
Brookline Massachusetts(US)(72) Inventor: **Nevo-Hacohen, Jacob I.**
150 Longwood Avenue
Brookline Massachusetts(US)(74) Representative: **Allsop, John Rowland**
Rowland Allsop & Co. Black Boy Yard 15
High Street
West Wycombe High Wycombe, Bucks. HP14
3AE(GB)(54) **Delivery vestibule system for automobile conveyor garages.**

(57) A novel delivery method and vestibule system for underground and similar conveyors, particularly longitudinally traveling conveyors carrying successive automobile-storage platforms, involving under an open vestibule floor area, conveyor loop structures that carry the platform upwardly into the open floor area for car delivery or removal, with automatic gating and walkway insertion to permit safe parking or retrieval of the car by the owner without attendant assistance, other than car platform selection and platform delivery command.

FIG. 3.



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DELIVERY VESTIBULE SYSTEM FOR AUTOMOBILE CONVEYOR GARAGES

The present invention relates to delivery vestibules for automobile conveyor garages and the like, as of the type, for example, disclosed in my earlier U.S. Letters Patent Nos. 3,197,045, 3,477,666 and 4,493,414; being, however, more generally applicable to storage and presentation or retrieval systems and more particularly those employing conveyors.

The safety and convenience of the delivery or presentation zone for acceptance and retrieval (or inspection or presentation) of, for example, automobiles carried by an underground or other continuous conveyor, as in said Letters Patent, are primary areas of concern in the practical application of such systems. Elevator garages that move up and down and sideways involve the conventional alinement of a car driven onto or from the elevator floor of an exit-entrance space. With the automated systems of said Letters Patent and other similar systems, such elementary delivery techniques are, however, not applicable, being incapable of accommodating conveyors with multiple-space-load-carrying platforms, which require additional areas for each platform, imposing a negative effect on the over-all efficiency considering the useful platform areas in relation to the total floor or building area. This is especially true under circumstances where the vehicle operator is to drive the car to a delivery zone, step out and away from the zone, and then the automatic storage system is to remove the car from the zone; or vice versa, and all without the need for handling by attendants or for further activation or driving of the car, once delivered, until the owner retrieves the car from its storage.

An object of the present invention, accordingly is to provide a new and improved method of and vestibule system for safe, economic and space-efficient delivery and retrieval (or presentation) of automobiles or other objects automatically stored by conveyor apparatus and the like.

A further object is to provide a novel delivery, storage and retrieval system of more general utility, as well.

Other and further objects will be explained hereinafter and are more particularly pointed out in the appended claims.

In summary, from perhaps the broadest viewpoint of its underlying methodology, the invention embraces a method of delivering and retrieving loads to and from platforms carried along a longitudinally extending path by a conveyor moving the platforms to and from the floor area of a vestibule volume, that comprises, looping the conveyor transversely out of the longitudinal path and upwardly

to the floor area and then transversely downwardly back along said longitudinal path; moving the conveyor along the loop to carry successive platforms up into alinement with the floor area and then down again and along said path; stopping a preselected platform when carried into alinement with said floor area; and thereafter, following any of retrieval, inspection or insertion of a load at the platform, removing the platform from said floor area by carrying the same transversely down the loop and longitudinally along said path. This technique has a decided effect on the efficient use of the building area and volume on each of the carrying platforms, and their spacing along the conveyor. In the application to automobile garaging and similar applications, the invention also involves automatic insertion of walkways to the side of the platform when it has been stopped in the open floor area of the vestibule. Preferred and best mode embodiment details are hereinafter presented.

The invention will now be described with reference to the accompanying drawing, Figs. 1A-1C of which are schematic diagrams showing the application of the delivery vestibule system and method of the invention to retrieval of an automobile from conveyor storage;

Fig. 2A-2C are similar views for parking;

Fig. 3 is a cross-sectional view of preferred conveyor loop and walkway apparatus for practicing the invention; and

Figs. 4A-D are longitudinal section of a complete underground conveyor and surface vestibule system similar to the fragmentary views of Figs. 1A-C and 2A-C; and

Fig. 5 is an isometric view of a pair of vestibules operable with adjacent pairs of underground conveyors of the present invention.

Referring to Figs. 1A-1C, a vestibule delivery volume is shown schematically at V, with access (and egress) at ground level G, and the conveyor storage and delivery structure G below ground. The conveyor structure may assume the form of transversely spaced parallel closed-loop pairs of chain roller-link conveyors C traveling in corresponding parallel closed-loop tracks one below each of the opposite access sides of the vestibule V, and carrying the successive platforms transversely supported therebetween, as described in said Letters Patent.

The conveyor system C carries such successive platforms P, shown side or edge-on in Figs. 1A-1C, along longitudinally extending paths past and under the vestibule V. In accordance with the technique of the invention, the floor area F of the vestibule is open. The successive platforms P are

conventionally carried from the left-hand longitudinal section and split into paths extending transversely upwardly along a pair of partially overlapping loops C' and C" into the floor area F, Fig. 1B, and then transversely downwardly and merging back into the longitudinal path at the right-hand side, Fig. 1C. With the sides of the platforms P being attached and carried by the chains of the conveyor loops C' and C" (attachment being effected, for example, as described in said Letters Patent), stable horizontal orientation of the platform is maintained as it is elevated to the floor area F and then carried back down again --essential for the automobile storage or similar applications.

In Fig. 1A, a preselected stored automobile A has been called for delivery at the vestibule V, Fig. 1B, by the attendant, as upon the request of the car owner. When the platform P (carrying the desired car A) reached and at least partially fills the vestibule floor area F, the platform being of less area generally than the open floor area, the same is stopped for enabling access to the vestibule, as by conventional computer command or attendant control of the drive, schematically shown at D. Coincident with and in response to the stopping of the preselected platform P at the floor area F, side walkways W for insertion in or filling the remaining exposed space of the floor area on both sides of the platform, are lowered (as by a vertical pulley or chain drive, or alternatively a tilting or revolving system, not shown), along columns W' on the side vestibule walls from an upper storage position, Fig. 1A, to alignment with the stopped platform, Fig. 1B. Substantially simultaneously, a gate G' at the front or entrance access wall (and a similar gate on the opposing egress or exit wall, not shown) is raised or opened, Fig. 1B, (or alternatively laterally slid open, not shown), so that the car owner may safely, and without assistance of an attendant, enter the vestibule and drive the car A off, whereupon the gate G' is lowered, the walkways W are then raised or otherwise withdrawn, as by upward elevating by tilting, Figs. 4B and C, and the conveyor C causes the platform to be carried downwardly, to join the right-hand longitudinal section of the conveyor, Fig. 1C.

The same sequence performed for parking and storing a car on an unoccupied platform is shown in Figs. 2A-2C; it being understood that the design of the invention, while shown applied to conveyor movement from left to right in the upper section of the overall longitudinal conveyor loop C, is also adapted for reverse-direction movement as where the preselected platform can be delivered to the vestibule V in a shorter time by such reversal of direction of conveyor travel.

A complete system is shown in side elevation in Figs. 4A-4D. A car A has been driven into the vestibule V (Fig. 4A) with the conveyor C at rest and a platform P stopped in the vestibule at floor level and with the walkways W lowered to floor level (the gate, not shown, being open). The driver then leaves the vestibule. In Fig. 4B, the process of receiving the car for storage is commenced with the conveyor C still at rest, but about to start, and the walkways W raised and the gate, not shown, lowered. The conveyor C is traveling in Fig. 4C with the walkways W still raised and the gate still closed; while in Fig. 4D, the car is in underground storage, a new platform is stopped at floor level in the vestibule, and the walkways are again lowered and the gate raised. This would be the condition shown in Fig. 5 for receiving cars-to-be-stored.

In the drawing of Fig. 3, a practical embodiment is shown in which the upper portions of the partially overlapping successive transverse conveyor loops C' and C" are illustrated as roller-link chains (as in said Letters Patent) traveling within corresponding C-shaped tracks T' and T", supporting the platform P in the floor area F of the vestibule V. For illustrative and explanatory purposes only, the left-hand portion of gate G' is shown down and the left-hand walkways in stored upper position, and the right-hand portion of gate G' is shown dotted and raised coincident with the lowered right-hand walkway W, whereas, of course, in practice, the left and right-hand gate portions and walkways will operate in unison. Well-known details of platform-to-chain attachment and the like, as disclosed in said Letters Patent, are omitted in order not to detract from the novel features of the method and system of the invention; it being understood, of course, that the drawings are taken from the entrance side only of the conveyor and vestibule structures, and that, as illustrated in said Letters Patent and previously described herein, a similar parallel conveyor structure C'-C" is disposed under and along the egress side of the vestibule, with the platforms P carried transversely therebetween (into the drawings of Figs. 1A-2C), and the walkways W extending between the access and egress access vestibule sides, Fig. 5.

For automobile garaging purposes, suitable angles of rise (and descent) for the conveyor loops C'-T' and C"-T" have been found to be about 54° to the horizontal, with the open floor area horizontal dimension about 20 feet and the horizontal distance between the uppermost portions of the loops C' and C" about 6 feet when using seven foot-two inch wide platform and three foot wide sidewalks. Other dimensions for modified vestibule sizes, other vestibule geometries particularly adapted for other applications, including an open delivery wall

other than the floor, and further modifications will occur to those skilled in this art, such being considered to fall within the spirit and scope of the invention as defined in the appended claims.

Claims

1. A method of delivering and retrieving loads to and from platforms carried along a longitudinally extending path moving the platforms to and from the floor area of a vestibule volume above said path, that comprises, looping the conveyor transversely out of the longitudinal path and upwardly to the floor area and then transversely downwardly back along said longitudinal path; moving the conveyor along the loop to carry successive platforms up into alinement with the floor area and then down again and along said path; stopping a preselected platform when carried into alinement with said floor area; and thereafter, following any of retrieval, inspection or insertion of a load at the platform, removing the platform from said floor area by carrying the same transversely down the loop and longitudinally along said path.

2. A method as claimed in claim 1 and in which the platform is of area less than that of the floor area and the further steps are performed of inserting walkway means to the side of the stopped platform and alined therewith to permit access thereto and therefrom; and, prior to removing the platform from said floor area, withdrawing said walkway means.

3. A method as claimed in claim 2 and in which the access walls of the vestibule are gated to block access until the walkway means and platform fill the floor area, and the gating is opened upon stopping the preselected platform in said floor area.

4. A method as claimed in claim 2 and in which the platforms are carried by the conveyor between spaced parallel conveyors, passing below and along each access side of the vestibule.

5. A method as claimed in claim 4 and in which the said looping of the conveyor from the longitudinal path is effected by splitting the path into a pair of successive partially overlapping transverse loops in each of said parallel conveyors, the pairs of loops carrying the opposite sides of the successive platforms transversely upwardly between each pair of loops into the floor area and transversely downwardly and then merging along said longitudinal path.

6. A delivery vestibule system for conveyors carrying load-bearing platforms as for the delivery and retrieval of automobiles and the like, the system having, in combination, an open-floor delivery vestibule volume; closed loop conveyor means extending along a longitudinal path below said vesti-

bule and carrying successive platforms; the conveyor means having transversely upwardly and downwardly extending conveyor loop means disposed along said path and immediately under the vestibule floor area to carry successive platforms up into alinement with the floor area and then down again and along said path; means for stopping the conveyor when a preselected platform has been carried into alinement with said floor area for load retrieval, insertion, or inspection; and means for thereafter removing the stopped preselected platforms from said floor area by causing the conveyor means to carry the preselected platform transversely down the said loop means and then carrying the same longitudinally along said path.

7. A system as claimed in claim 6 and in which the area of the platform is less than said vestibule floor area and there is provided means operable as the preselected platform is stopped at said floor area for inserting walkway means to the side of the stopped platform and alined therewith to permit access thereto and therefrom; and means for removing the preselected platform from said floor area after withdrawing said walkway means.

8. A system as claimed in claim 7 and in which gate means is provided at the access walls of the vestibule, and means for opening the gate means only upon the stopping of the preselected platform at the vestibule floor area and the inserting of the walkway means.

9. A system as claimed in claim 8 and in which said walkway means comprises a pair of walkways disposed on each side of the stopped platform and stored above said floor area along the side walls of the vestibule between the access walls, the walkway inserting means comprising means for lowering the walkways into alinement with the stopped platform on either side thereof; and said withdrawing means comprising means for elevating the walkways back into the stored position.

10. A system as claimed in claim 6 and in which the said conveyor loop means comprises a pair of successive partially overlapping conveyor loops transversely extending upwardly and downwardly out of said longitudinal conveyor path and supporting a side of the platform between them to raise the platform upwardly in horizontal orientation to the floor area and then downwardly in horizontal orientation back into and along the longitudinal path.

11. A system as claimed in claim 10 and in which the said closed loop conveyor means comprises a pair of similar spaces parallel longitudinally extending closed loop conveyors passing below and along each access side of the vestibule and supporting the platforms between them, each of the pair of longitudinally extending closed loop conveyors having its pair of successive partially overlap-

ping transversely extending conveyor loops disposed immediately below said vestibule floor area and access walls.

12. A system as claimed in claim 11 and in which said conveyors and conveyor loops comprise roller link chains traveling in corresponding tracks.

13. A delivery vestibule system for conveyors carrying load-bearing platforms and the like having, in combination, a volume having an open wall area; conveyor means remote from the vestibule and carrying successive platforms along a path running longitudinally past the open wall area; the conveyor means being provided with loop means at the region of the open wall area looping toward and then away from the same to carry successive platforms transversely out of said path into alignment with said area and then transversely away from the same and back longitudinally along said path; means for stopping the conveyor means when a preselected platform has been carried into alignment with said open wall area for load retrieval, insertion or inspection; and means for thereafter removing the stopped preselected platforms from said wall area by causing the conveyor means to carry the preselected platform transversely away along the loop means and then longitudinally along said path.

14. A delivery vestibule system as claimed in claim 13 and in which said conveyor loop means comprises a pair of successive partially overlapping conveyor loops transversely extending toward and away from said open wall area out of the longitudinal conveyor path and supporting the platform between them to maintain a predetermined platform orientation throughout.

15. A delivery vestibule system as claimed in claim 14 and in which said closed loop conveyor means comprises a pair of similar spaced parallel closed loop conveyors extending longitudinally along access sides of the vestibule and supporting the platforms between them, each of the pair of closed loop conveyors having its pair of successive partially overlapping transversely extending conveyor loops disposed immediately to the side of said open wall area and access sides.

16. A delivery vestibule system as claimed in claim 9 and in which said walkway elevating and lowering means operable in a vertical direction parallel to said side walls.

17. A delivery vestibule system as claimed in claim 9 and in which said walkway elevating and lowering means tilt the walkway upwardly and downwardly adjacent said side walls.

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FIG. 1A.

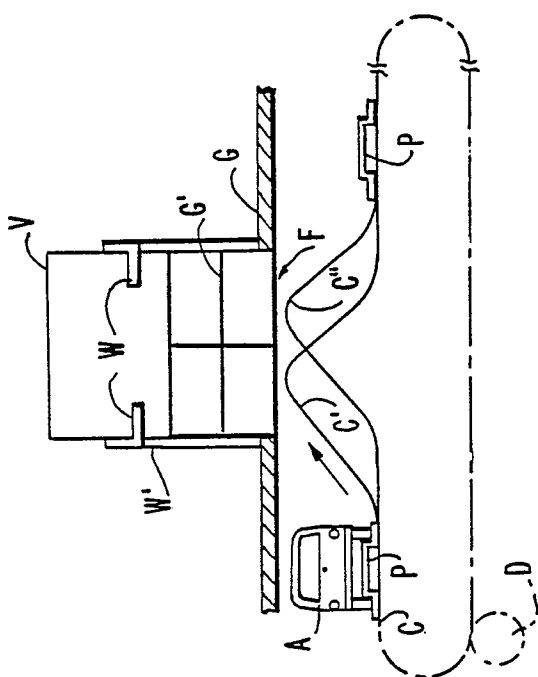


FIG. 1B.

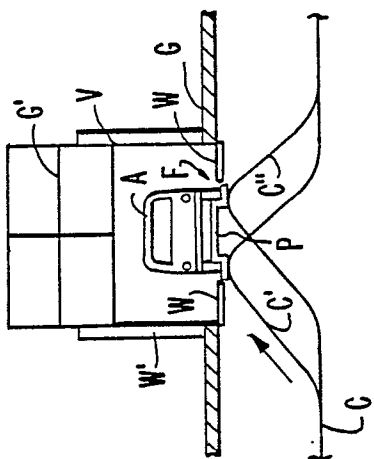


FIG. 1C.

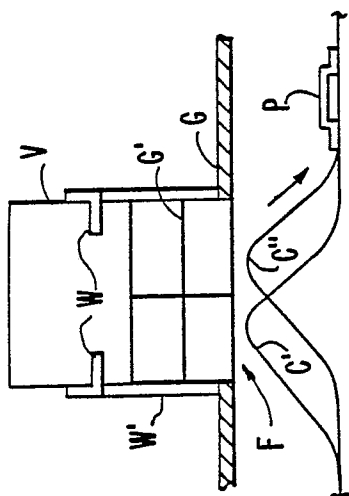


FIG. 2A.

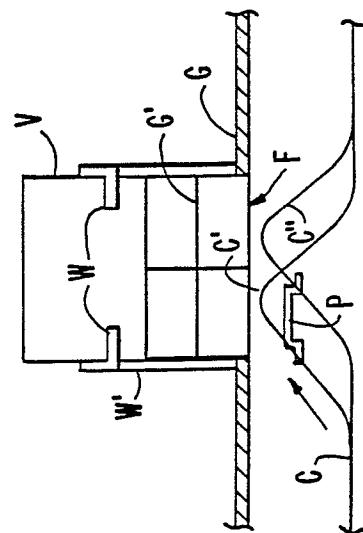


FIG. 2B.

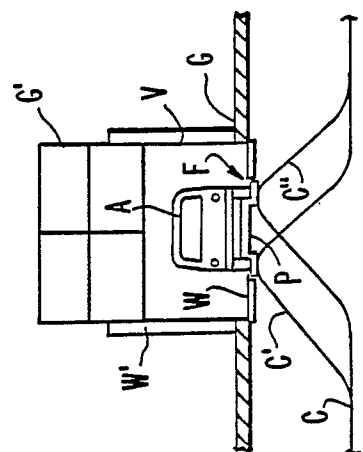
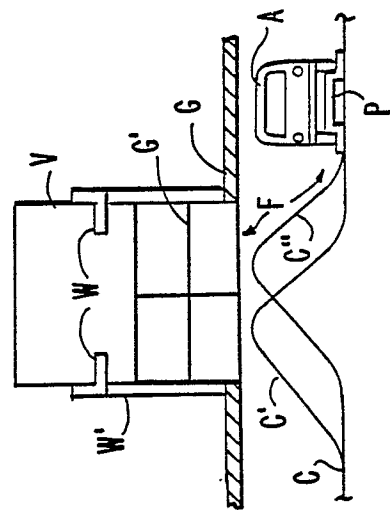
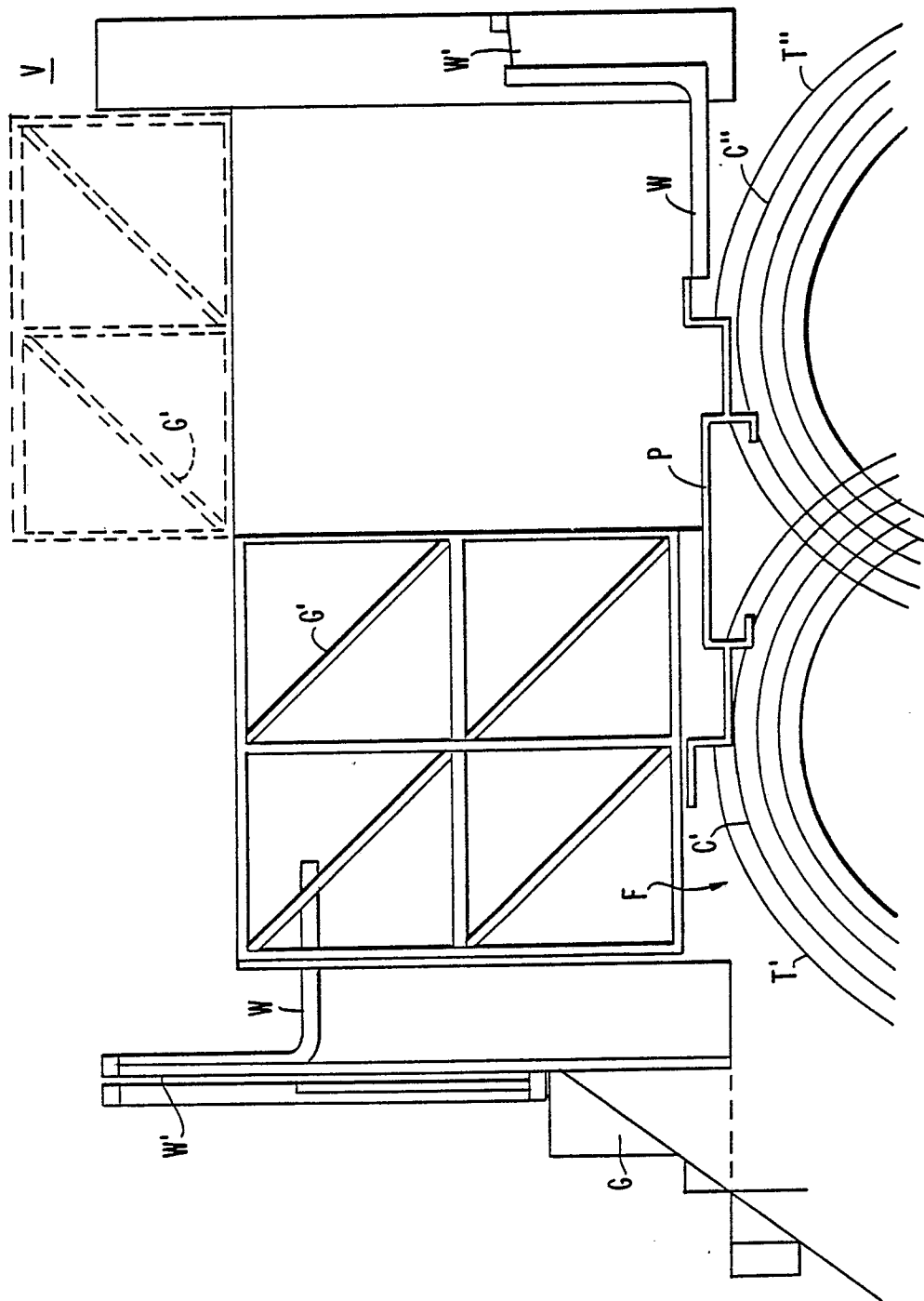


FIG. 2C.



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FIG. 3.



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FIG. 4A.

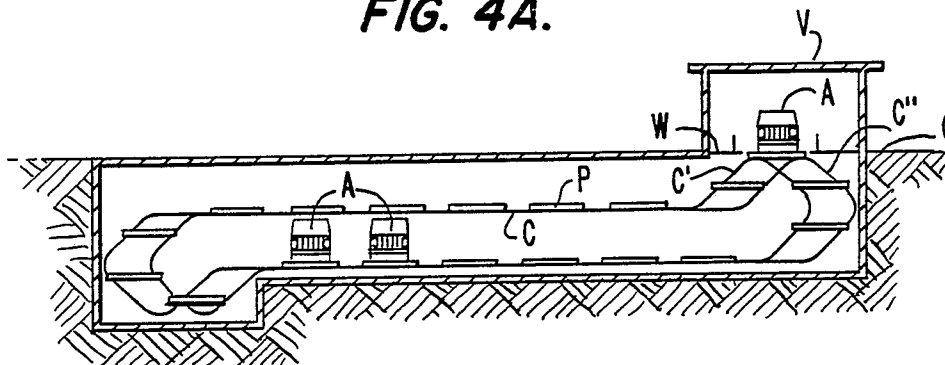


FIG. 4B.

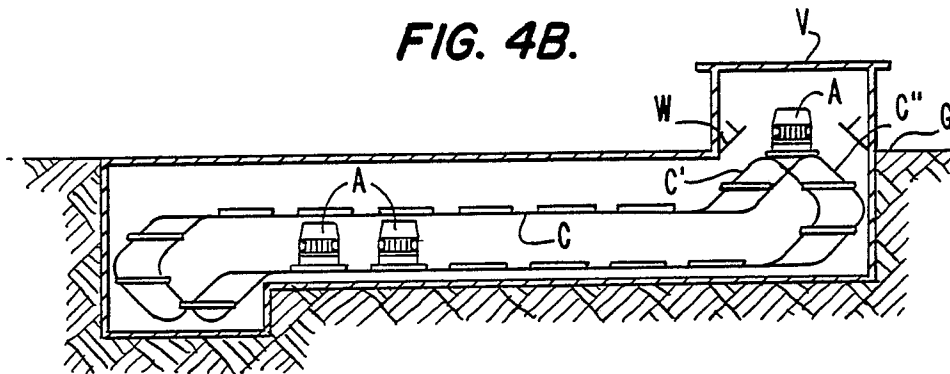


FIG. 4C.

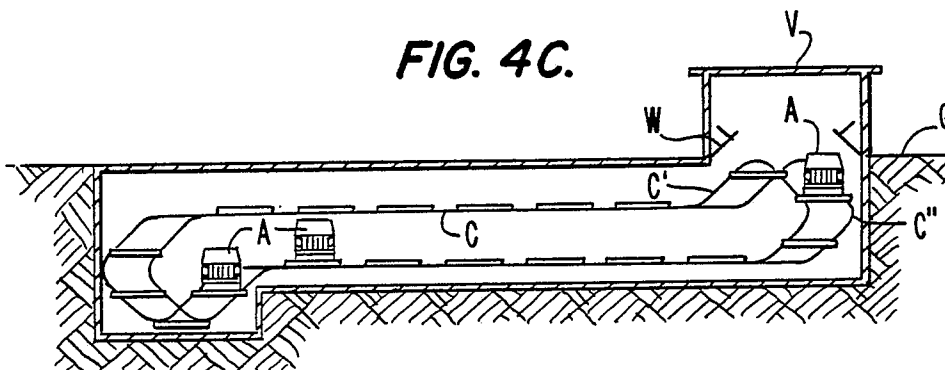
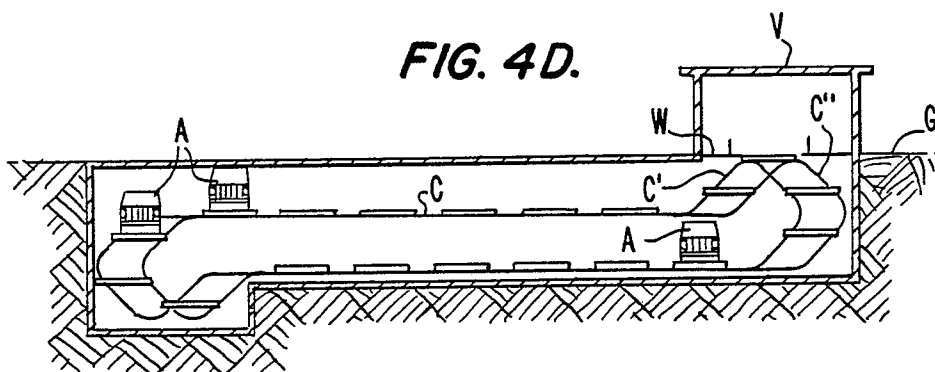
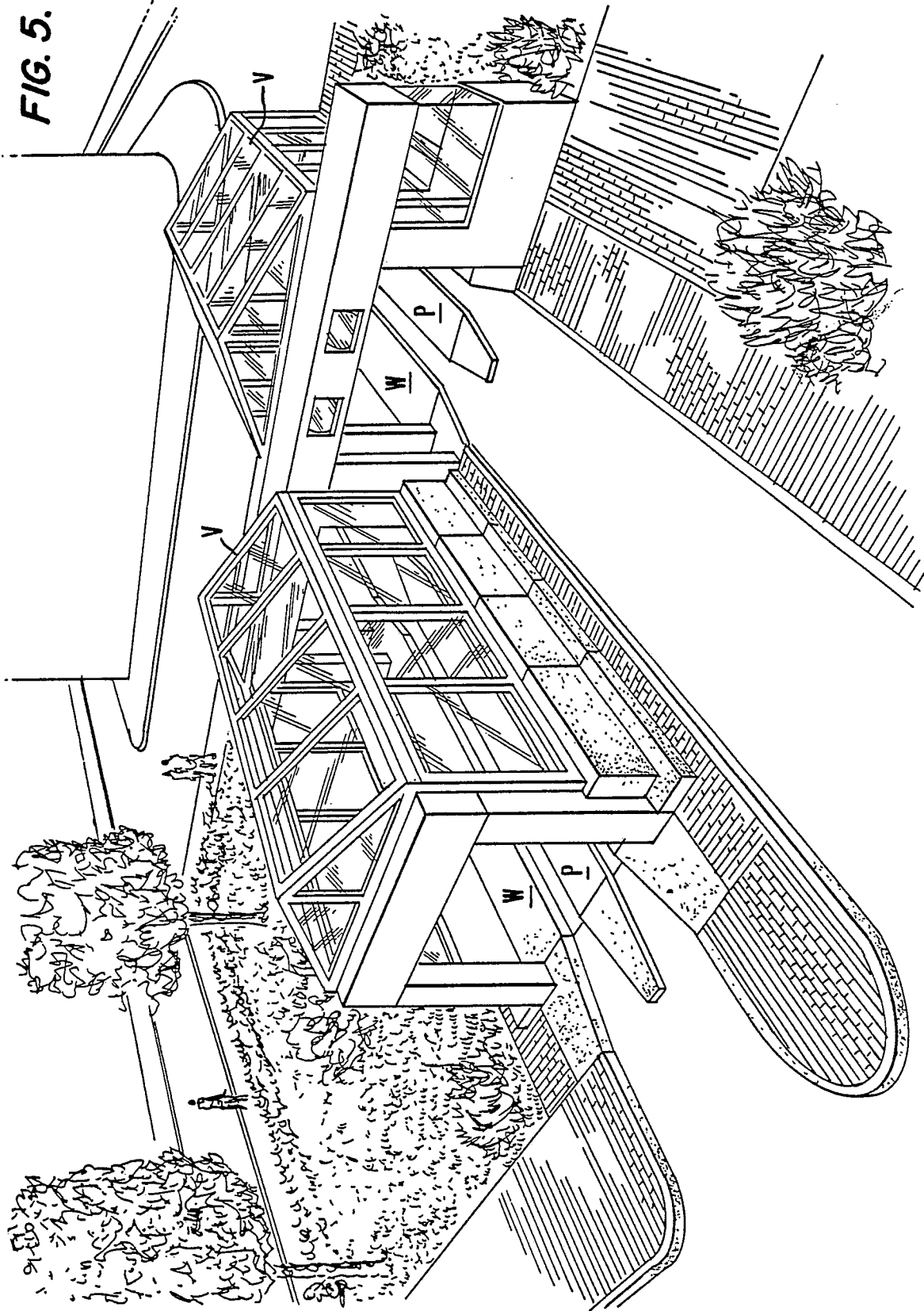


FIG. 4D.



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FIG. 5.





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-3 688 921 (ZAHA) * Column 5, line 28 - column 10, line 19; column 13, line 16 - column 14, line 9; figures *	1,2,4-7,9-15	E 04 H 6/14
Y,D	US-A-4 493 414 (NEVO-HACOHEN) * Column 4, line 60 - column 5, line 16; column 5, lines 24-30; figures *	1,2,4-7,9-15	
A	DE-A-1 431 590 (BAJULAZ) * Page 23, line 4 - page 27, line 24; figures *	9,17	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 04 H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 06-08-1987	Examiner LAUE F.M.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	