Dec. 1, 1959 S. ALIMANESTIANO 2,915,204

TRANSFER DEVICE

Filed Dec. 24, 1956 3 Sheets-Sheet 1

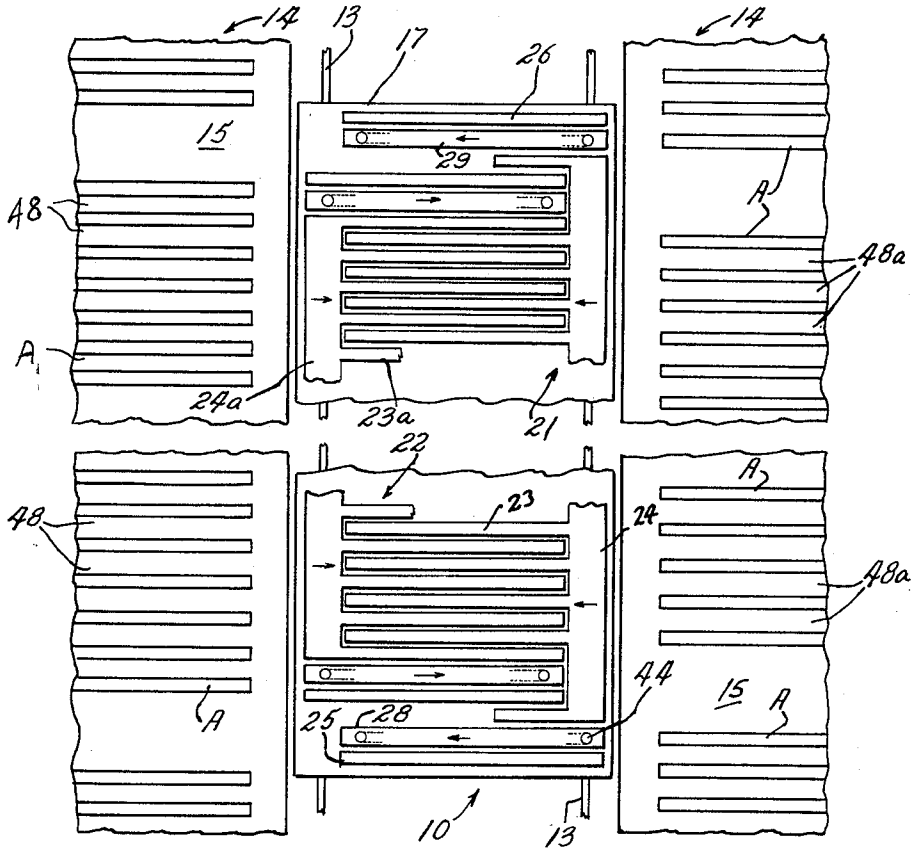


FIG. 1

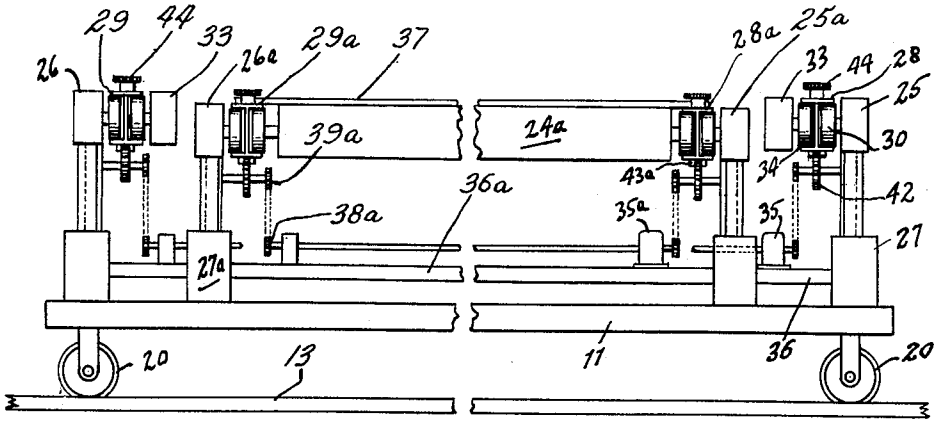


FIG. 4

INVENTOR
SERBAN ALIMANESTIANO
BY Philip B. Albert
ATTORNEY

Dec. 1, 1959 S. ALIMANESTIANO 2,915,204

TRANSFER DEVICE

Filed Dec. 24, 1956 3 Sheets-Sheet 2

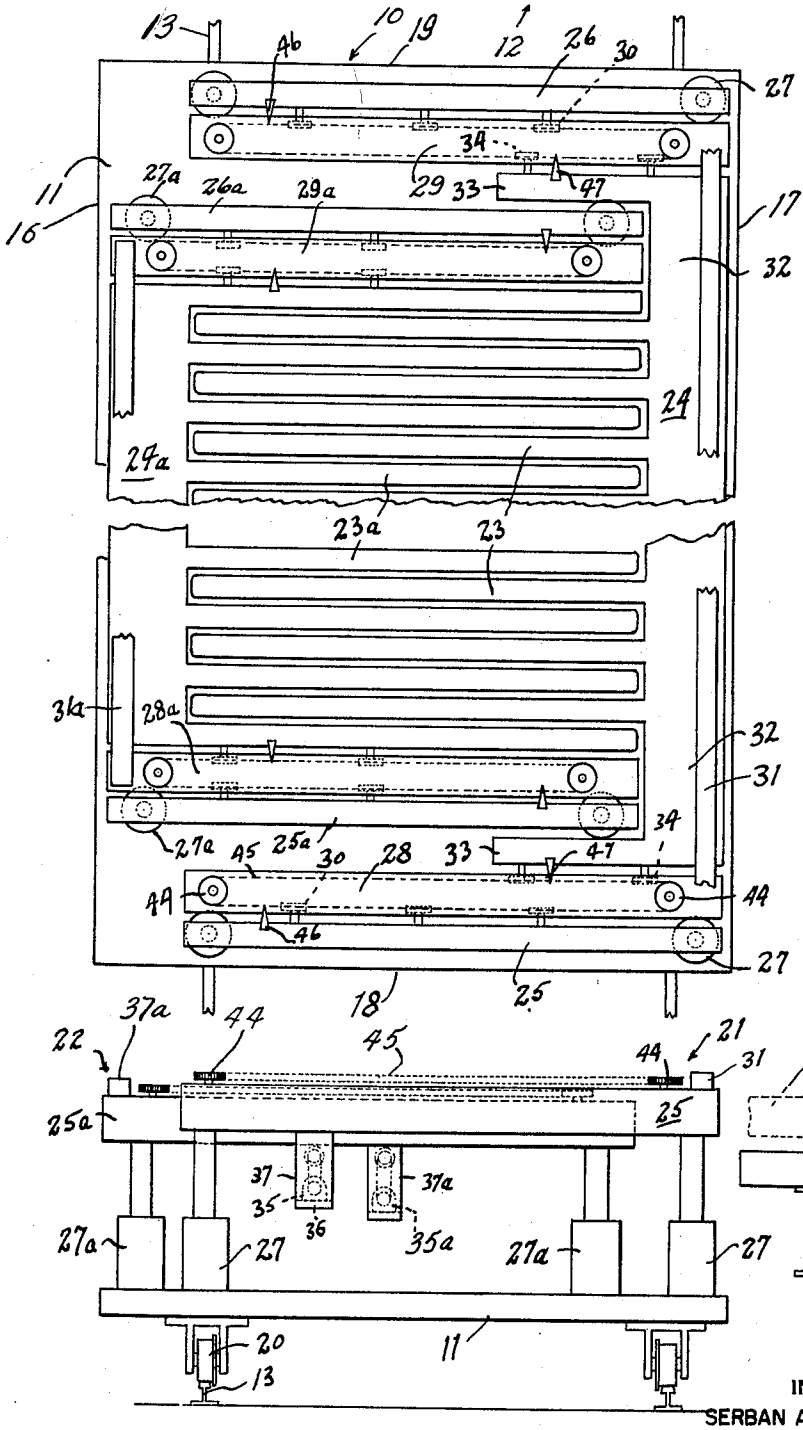


FIG. 2

FIG. 3

INVENTOR
SERBAN ALIMANESTIANO
BY Philip B. Hilbert
ATTORNEY

Dec. 1, 1959 S. ALIMANESTIANO 2,915,204

TRANSFER DEVICE

Filed Dec. 24, 1956 3 Sheets-Sheet 3

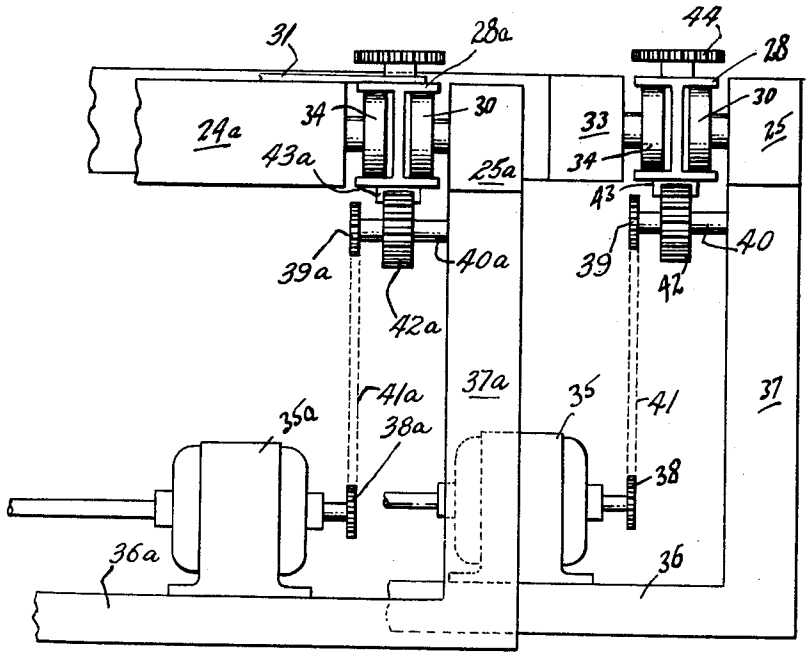


FIG. 5

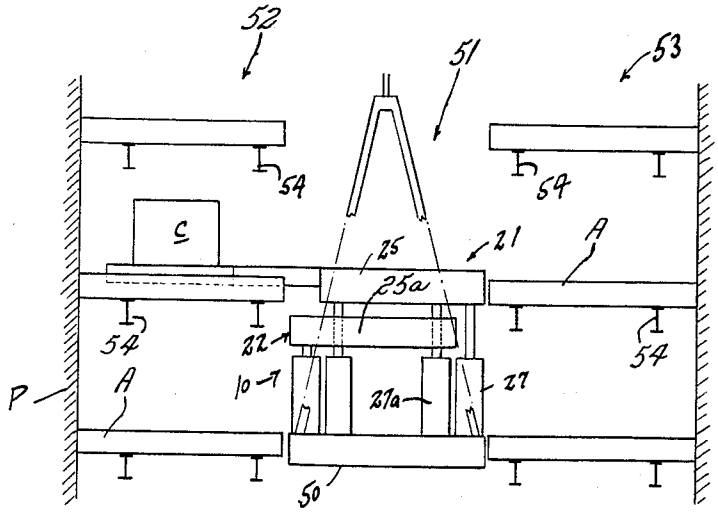


FIG. 6

INVENTOR
SERBAN ALIMANESTIANO
BY Philip S. Hilbert
ATTORNEY

United States Patent Office 2,915,204 Patented Dec. 1, 1959

2,915,204

TRANSFER DEVICE

Serban Alimanestiano, Upper Nyack, N.Y., assignor to Speed-Park, Inc., a corporation of New York

Application December 24, 1956, Serial No. 630,219

15 Claims. (Cl. 214—16.4)

This invention relates to a transfer device; and more particularly, concerns a device for supporting and transferring objects from one location to another location.

An object of this invention is to provide a transfer device movable in a given path or paths and operative to effect the transfer of objects on either side of such paths to fixed supports, such device being compact and cooperative with said fixed supports in an improved manner.

A further object of this invention is to provide a device of the character described, which comprises a minimum number of parts and simple operating mechanism therefor.

Another object of this invention is to provide an improved device of the character described, which includes a pair of independently operable transfer members movable in opposite directions whereby an object may be selectively transferred to positions on either side of the device.

Still another object of this invention is to provide a transfer device of the character described which may be mounted on an elevator movable in a shaftway between vertically spaced shelves on either side thereof, the transfer device including transfer members movable into projected lateral position in operative relation to said shelves and of such construction as to substantially eliminate the need for space between shelves to accommodate such transfer members in their projected positions.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

In the drawings,

Fig. 1 is a plan view of a transfer device embodying the invention, in schematic form, in relation to load receiving zones located on opposite sides thereof;

Fig. 2 is a plan view of said transfer device;

Fig. 3 is an end view thereof;

Fig. 4 is a side view thereof;

Fig. 5 is a side view of a detailed portion thereof;

Fig. 6 is a side view of another form of the transfer device, in association with an elevator moving between vertically spaced shelves on either side thereof; the shelves including load receiving members.

The transfer device of the instant invention comprises a base movable in horizontal or vertical paths, with a pair of transfer members mounted thereon for relative movement. The transfer members take the form of comb-like structures with the fingers of one member aligned with the spaces between the fingers of the other member; means being provided for effecting relative vertical displacement of the members; means being further provided for moving each of the transfer members in horizontal planes and in opposite directions to project the free ends of the fingers thereof respectively beyond opposite sides of the base and to retract the same from their projected positions.

Referring to the drawings and particularly to Fig. 1, 10 designates one form of the transfer device embodying the invention, which is mounted on a base 11. Base 11

may move in a horizontal path 12 over rails 13, with load receiving zones 14 located on opposite sides of path 12. Zones 14 may comprise suitable flat supporting means 15 such as a floor structure or the like, with spaced, parallel, elongated members A disposed on floor 15 and extending transversely of path 12. The spaces between members A are open at the outer ends thereof and from the top thereof.

As shown in Figs. 2, 3 and 4, the base or platform 11 may be rectangular in shape, with side edges 16, 17, and ends 18, 19. Wheels 20 are mounted on the underside or base 11 for guiding the movement of device 10 over rails 13.

On base 11 there is provided a pair of transfer members generally indicated at 21, 22, which are arranged for relative movement. Transfer member 21 comprises a set of spaced, parallel, transversely extending fingers 23 which may be formed of structural beams of suitable section and weight; fingers 23 being interconnected only at one end thereof by a longitudinally extending member 24. Similarly, transfer member 22 comprises a set of fingers 23*a* interconnected at one end by a member 24*a* extending parallel to member 24.

In one position of transfer members 21, 22, shown in Fig. 2, the fingers 23 of the one member may be in interdigitated relation to the fingers 23*a* of the other member, with all fingers located in a common horizontal plane, the member 24 being located on the right side of base 11 adjacent edge 17 thereof, and member 24*a* being located on the left side of said base adjacent edge 16 thereof.

Means is provided on base 11 for supporting the transfer members 21, 22 at the opposite ends thereof and independently of each other, while allowing for vertical and horizontal movement of each of the said transfer members independently of each other.

Accordingly, a pair of transversely disposed, parallel structural beams 25, 26 are respectively disposed at the opposite ends of base 11 adjacent ends 18, 19 thereof, for association with transfer member 21. Hydraulic jacks 27 are mounted on base 11 for raising beams 25, 26 relative thereto, said jacks being arranged for synchronized operation, by suitable hydraulic means, not shown. A second set of beams 25*a*, 26*a*, similar to beams 25, 26, is also located on base 11, being disposed inwardly of beams 25, 26, for association with transfer member 22 and being raised and lowered by hydraulic jacks 27*a*.

Transfer member 21 is operatively connected to beams 25, 26 by a second set of beams 28, 29 respectively disposed adjacent and inwardly of beams 25, 26. Beach 28, 29 are of I section and are movably related to beams 25, 26 by means of rollers 30 mounted on the inner sides of said last mentioned beams in longitudinally spaced arrangement and received in the outer channels of beams 28, 29. Longitudinally extending tie rod 31 interconnects beams 28, 29, being secured to the top flanges thereof and located adjacent side edge 17 of base 11.

Member 24 of transfer member 21 is extended at the opposite ends thereof beyond the outermost fingers 23, as at 32, with short finger portions 33 extending transversely from the ends of member portion 32, said finger portions being located adjacent the inner sides of beams 28, 29, with rollers 34 mounted on the outer sides of finger portions 33 and receivable in the inner channels of beams 28, 29. In this manner, transfer member 21 is movably supported at the opposite ends thereof on beams 28, 29, which in turn, are movably supported on beams 25, 26.

Transfer member 22 is similarly supported for suitable movement on beams 25*a*, 26*a* by beams 28*a*, 29*a* which are interconnected by tie rod 31*a*; except that rollers 34 are directly mounted on the end fingers 23*a* for recep-

tion in the inner channels of beams 28*a*, 29*a*. The extension 32 of member 24 of transfer member 21 provides spaces at the opposite ends of said transfer member for receiving the end portions of beams 25*a*, 28*a*; 26*a*, 29*a*, to allow for compact relation of the transfer members 21, 22 in their normally retracted positions on base 11, the fingers 23, 23*a* of said transfer members extending substantially the full width of base 11.

Means is provided for imparting suitable movement to transfer member 21 relative to beams 25, 26 so as to project fingers 23 thereof, beyond side edge 16 of base 11. To this end, a motor 35 is mounted on a longitudinally extending member 36 suspended at the opposite ends thereof beneath beams 25, 26 by end drop brackets 37. The shaft of motor 35 has a sprocket wheel 38 fixed thereto and connected to a sprocket wheel 39 fixed to a stub shaft 40 journalled in bracket 37, by a chain 41. A pinion gear 42 fixed to shaft 40 meshes with a rack 43 fixed to the underside of the bottom flange of beam 28. Similarly, a rack on beam 29 is in mesh with a second gear 42 rotated by the shaft of motor 35 through the sprocket wheel and chain arrangement previously described. Thus upon energization of motor 35, pinion gears 42 will be effective through racks 43 to impart forward movement to beams 28, 29.

The forward movement of beams 28, 29 is translated to similar movement of transfer member 21. To this end, sprocket wheels 44 are rotatably mounted on the opposite ends of the top flange of beams 28, 29, with an endless sprocket chain 45 engaging said wheels 44. An anchor member 46 is fixed to the upper surface of beams 25, 26 adjacent one end thereof, said anchor members being attached to outer run portions of chains 45. Similarly, an anchor member 47 is fixed to the upper surface of finger portions 33 of transfer member 21, said anchor members being attached to an inner run portion of chains 45, the anchor members 46, 47 being longitudinally displaced, with the transfer member 21 in its normal position as shown in Fig. 2.

Transfer member 22 is provided with similar means for effecting forward movement thereto, including a motor 35*a*; motor support 36*a*; drop brackets 37*a*; sprocket wheels 38*a*, 39*a*; stub shaft 40*a*; sprocket chains 41*a*; pinion gear 42*a* and racks 43*a*. Also, a sprocket wheel and chain, together with anchor means, on beams 28*a*, 29*a*, as previously described in connection with beams 28, 29, provides for suitable movement of transfer member 22 in a direction opposite to that of transfer member 21.

It will be apparent, that upon operation of motor 35, and assuming that transfer members 21, 22 have been vertically displaced by suitable operation of jacks 27 or 27*a*, beams 28, 29 will be advanced toward edge 16 of base 11 through action of racks 43 and gears 42. As chains 45 are anchored at a point on their outer runs by members 46, the forward movement of beams 28, 29 will cause chain portions to move about sprocket wheels 44 on said beams, thereby causing slidable movement of the transfer member 21 relative to beams 28, 29, through the connection of members 47 on said transfer member, to the inner runs of chains 45. Accordingly, transfer fingers 23 on member 21 will be projected beyond the base edge 16.

If jacks 27, or 27*a*, are operated so as to leave transfer member 22 uppermost, operation of motor 35*a* will cause movement of said transfer member, as above described but in the opposite direction, to project fingers 23*a* thereof beyond base edge 17.

In operating device 10, objects may be transferred to load receiving zones on either side of path 12. Such object, not shown, is initially deposited on the interdigitated fingers 23, 23*a* of transfer members 21, 22 in their position as shown in Fig. 2, the upper surfaces of said fingers being substantially coplanar. The base 11 is then moved over rails 13 to a position aligned with the selected loading zone 14 and suitably locked in said position to align the fingers 23 with spaces 48 between load receiving members A on the left side of path 12, or to align fingers 23*a* with spaces 48*a* between the members A on the right side of path 12.

At this time, jacks 27 or 27*a* are operated to effect vertical displacement of transfer members 21, 22. If the object carried by transfer device 10 is to be deposited on the left hand side of path 12, transfer member 21 must be in the uppermost position. This can be attained by lowering transfer member 22 or raising transfer member 21 in relation to the original coplanar level of said transfer members. For transferring the object to the right of path 12, transfer member 22 must be in the uppermost position, through appropriate operation of jacks 27 or 27*a*, as indicated.

Assuming that the required transfer member 21, or 22 has been left in the uppermost position, forward movement is imparted thereto, by operation of motor 35 or 35*a*, to thereby move fingers 23 or 23*a* into interdigitating relation with load receiving members A, in spaces 48 or 48*a* thereof. Preferably, the selected transfer member 21 or 22 is at a level which brings the fingers thereof in relation to members A wherein the upper surfaces of the former are somewhat above the upper surfaces of the latter. The jacks 27 or 27*a* may then be operated to lower the projected transfer member whereby the object carried by the fingers thereof is transferred to load receiving member A, and the fingers depressed below the level of the upper surfaces of said members A, to allow retraction of the transfer member upon reversal of motor 35 or 35*a*.

It is understood that one of the transfer members 21, 22 may be held in a fixed horizontal plane, the other transfer member being moved vertically to horizontal positions above or below the first mentioned transfer member, in accordance with the desired left or right hand forward movement of said transfer members.

The transfer device of the instant invention is particularly useful in automobile parking garages, inasmuch as the compactness of said device and its operating parts allows the overall volume of the garage to be reduced to a minimum with a substantial saving in building costs.

Thus, as shown in Fig. 6, the transfer device 10 may be carried on an elevator 50, which is hoisted and lowered by conventional means, not shown, the elevator moving in a shaftway 51 between vertically spaced shelves 52, 53 respectively located on either side of said shaftway. Each of the shelves 52, 53 comprises spaced, parallel load receiving members A supported on the underside thereof by longitudinally extending girders 54 which form a part of the structure of the parking garage indicated at P. The members A have their free outer ends extending to shaftway 51. It will be apparent that the spaces between said members A are fully accessible from the top and the outer ends thereof; the underside of said members being inaccessible because of supporting girders 54.

The transfer members 21, 22 of device 10 are mounted on elevator 50, and preferably, one of said members is fixed against vertical movement as by locking its jacks in a given position, or by other suitable means. Thus the one transfer member has no vertical movement relative to elevator 50 while the other transfer member may be moved to positions above or below the vertically fixed transfer member. However, both transfer members have horizontal movement in opposite directions, as previously described.

In one preferred mode of operation, the vertically fixed transfer member may be used to pick up the load such as car C, at the ground level of garage P where car C may be driven on a load receiving zone made up of load receiving members A. The elevator 50 is manipulated by suitable control means, not shown, to bring the fingers of the vertically fixed transfer member in alignment with the spaces between members A and said fingers

may be laterally projected to engage the load and upon retraction thereof, to bring the load into the elevator. Under these circumstances, the vertically movable transfer member is depressed to a position below the vertically fixed transfer member.

The elevator **50** is then raised in shaftway **51** to the proper level, and assuming that transfer member **21**, as shown in Fig. 6, is vertically fixed and is carrying car C, the elevator is manipulated to bring the fingers of member **21** slightly above the load receiving members A of shelf **52**, as said fingers are projected laterally to the left. The elevator **50** is then lowered slightly to effect the transfer of car C to the shelf **52** and the fingers are then retracted.

However, if the car C is to be transferred to a shelf **53** on the right, transfer member **22** is raised during the upward movement of the elevator **50**, to pick up the car C from transfer member **21**. The elevator **50** is again manipulated to bring the fingers of transfer member **22** into proper aligned relation with the load receiving members A of shelf **53** and the fingers are projected laterally to the right, in a manner similar to that previously described.

If desired, the manipulation of elevator **50** to bring transfer member **22** into proper alignment with the load receiving members A of a selected shelf **53** may be replaced by appropriate operation of jacks **27***a* associated with transfer member **22**.

It will be apparent that with the instant transfer device, the vertical spacing between successive shelves **52**, **53** within garage P may be kept at a minimum, since the transfer members **21**, **22** operate within the space above supporting girders **54**. Furthermore, the load receiving members A forming shelves **52**, **53**, do not have to be cantilevered as in known automobile parking arrangements, nor does extra vertical spacing between successive shelves, have to be provided to accommodate the projected transferring means of such arrangements.

It will thus be seen that there has been provided an improved transfer device and combinations thereof with structural load receiving means, in which the several objects of the invention are attained, and which is well adapted to the conditions of practical use thereof.

As various changes might be made in the embodiments of the invention herein shown, without departing from the spirit thereof, it is understood that all matter shown or described herein shall be deemed illustrative and not by way of limitation, except as set forth in the appended claims.

Having thus disclosed my invention, I claim as new and desire to protect by Letters Patent:

1. A transfer device comprising a base, a pair of transfer members mounted for relative movement on said base, each member comprising a set of transversely extending, spaced, parallel fingers and a longitudinally extending member interconnecting said fingers at one end thereof leaving the other end of said fingers open, said longitudinally extending members being respectively disposed on opposite sides of said base and the fingers of each transfer member being aligned with the spaces between the fingers of the other transfer member, means for raising and lowering at least one of said transfer members to locate said transfer members in vertically displaced horizontal planes allowing independent movement of said transfer members in their respective horizontal planes, and means for selectively moving said transfer members in said horizontal planes to project the open ends of the sets of fingers thereof respectively beyond the opposite sides of said base.

2. A transfer device as in claim 1 wherein each transfer member is provided with means for moving that member horizontally and wherein each transfer member provided with raising and lowering means has its horizontal moving means associated with that raising and lowering means to be raised and lowered therewith.

3. A transfer device as in claim 1 wherein said raising and lowering means comprise jacks operatively associated with each of said transfer members for which said raising and lowering means is provided.

4. A transfer device as in claim 1 wherein for each transfer member there are provided a pair of transversely extending beams, one at each end of that transfer member, wherein said raising and lowering means for each transfer member provided therewith comprise said transversely extending beams for that transfer member, and wherein said moving means comprise for each transfer member a second pair of transversely extending beams, one at each end of that transfer member and disposed respectively between one of said first mentioned pair of beams and the adjacent end of the transfer member associated therewith, means mounting that transfer member at its ends on said second mentioned beams for transverse horizontal movement with respect thereto, means for effecting said transverse horizontal movement of said second mentioned beams, and means connected to that transfer member and said second mentioned beams for causing in response to said movement of said second mentioned beams relative movement of the transfer member with respect to said second mentioned beams and in forwardly projected relation thereto.

5. A transfer device comprising a base, a pair of transfer members mounted for relative movement on said base, each transfer member comprising a set of transversely extending, spaced, parallel fingers and a longitudinally extending member interconnecting said fingers at one end thereof, said transfer members being arranged in one position thereof with the open ends of their respective sets of fingers in interdigitated relation to form a horizontal supporting surface, means for vertically displacing said transfer members from said one position thereof to relative positions permitting horizontal movement of said transfer members, and means for moving the uppermost of said displaced transfer members horizontally to one side of said base with the set of fingers thereof projecting beyond said one side of the base.

6. A transfer device comprising a base, a pair of transfer members mounted for relative movement on said base, each of said transfer members comprising a set of transversely extending spaced, parallel fingers and an elongated longitudinally extending member interconnecting said fingers at one end thereof, said transfer members being arranged with the elongated members thereof respectively located adjacent opposite sides of said base and with the fingers of each transfer member aligned with the spaces between the fingers of the other transfer member, means for vertically displacing one of said transfer members to a position relative to the other member to allow projected and retracted horizontal movement of said one transfer member, said means comprising a pair of transversely extending beams respectively located at opposite ends of that transfer member and means on said base for raising and lowering said beams, a second pair of transversely extending beams respectively located inwardly of said first mentioned beams and adjacent opposite ends of that transfer member, means for movably supporting each of said second pair of beams on the adjacent first mentioned beam, means for movably supporting opposite end portions of that transfer member on the adjacent second mentioned beams, means for moving said second mentioned beams to project one end of each in the direction of the open ends of the fingers associated with that transfer member beyond the corresponding ends of the adjacent first mentioned beams, and means on said second mentioned beams operatively connected to adjacent portions of that transfer member to impart movement to that transfer member relative to said second mentioned beams to project the open ends of the fingers thereof beyond the said one end of each of the second mentioned beams.

7. In combination, a pair of opposed, spaced load re-

ceiving shelves, each shelf comprising a set of spaced, parallel, elongated members extending perpendicular to and opening on said space between shelves, transfer means movable in said space between shelves and comprising a base and a pair of transfer members mounted for opposite relative movement on said base, each transfer member having a set of spaced, parallel fingers parallel with said shelf members and means interconnecting said fingers at one side of said base with the other end of said fingers extending toward the members of said shelf adjacent to the other side of said base, said finger interconnecting means being disposed on opposite sides of said base, means for vertically displacing said transfer members from a normally coplanar relation of said transfer members, means for horizontally moving the uppermost transfer member to project the fingers thereof into aligned relation with the spaces between the members of the shelf adjacent the open ends of said fingers, said vertically displacing means being operative to move the uppermost transfer member from a position wherein the fingers thereof have their upper surfaces somewhat above the upper surfaces of the members of said last mentioned shelf, to a position wherein said fingers have their upper surfaces somewhat below the upper surfaces of the members of said last mentioned shelf.

8. In combination, an elevator movable in a vertical shaftway, a set of vertically spaced shelves on each side of said shaftway, each shelf comprising a set of spaced, parallel load receiving members extending toward and opening on said shaftway, and means for supporting said load receiving members leaving the spaces therebetween open from above and at the inner ends thereof, and transfer means on said elevator comprising a pair of transfer members arranged for relative movement, each transfer member comprising a set of spaced, parallel fingers aligned with the spaces between the fingers of the other transfer member, each set of fingers being interconnected only at one end thereof, said transfer members being arranged with the interconnected portions thereof disposed respectively on opposite sides of said elevator and with the fingers thereof aligned with spaces between said load receiving members of the shelves on the side of the shaftway adjacent the open ends of said fingers, means for vertically displacing one of said transfer members relative to the other member, and means for moving uppermost transfer member in horizontal planes and in opposite directions across the shaftway, whereby with said elevator moved to a position in said shaftway to bring one of said transfer members opposite a shelf on the side of the shaftway adjacent the open ends of the fingers of that transfer member and with that transfer member uppermost and the upper surface of the fingers thereof somewhat above the load receiving members of that shelf, the fingers of that transfer member may be horizontally projected into the spaces between said last mentioned load receiving members upon horizontal movement of that transfer member toward that shelf.

9. The combination as in claim 8 wherein the horizontal moving means for each transfer member provided with vertical displacing means, is mounted on that vertical displacing means.

10. The combination as in claim 8 wherein means are provided for supporting each of said transfer members, wherein the vertically displacing means for each transfer member provided therewith acts on said supporting means for that transfer member, and wherein the horizontal moving means for each transfer member includes means movable on the supporting means for that transfer member.

11. A transfer device comprising a base, a pair of transfer members mounted for relative movement on said base, each member comprising a set of transversely extending, spaced, parallel fingers interconnected at one end only thereof, said transfer members being arranged with the interconnected ends thereof respectively located adjacent opposite sides of said base and with the fingers of each transfer member aligned with the spaces between the fingers of the other transfer member, means for raising and lowering one of said members relative to the other member comprising a pair of beams respectively located adjacent opposite ends of said one member and means on said base for raising and lowering each of said beams, a second pair of beams respectively located between said first mentioned beams and the adjacent end portions of said one member, means movably supporting the end portions of said one member on said second pair of beams, means movably supporting each of said second pair of beams on the adjacent first mentioned beam, motor means mounted on said first mentioned beams to be raised and lowered therewith, gear means operatively connecting said motor means and each of said second mentioned beams for moving said second mentioned beams in horizontal planes, and means on each of said second mentioned beams operatively connected to adjacent end portions of said one transfer member for causing relative movement of said one transfer member with respect to said second mentioned beams in response to movement of said second mentioned beams.

12. A transfer device as in claim 11 wherein each of said transfer members includes a longitudinally extending member for interconnecting the set of fingers thereof at one end thereof, said longitudinally extending members respectively being located at opposite sides of said base, the longitudinally extending member of one transfer member projecting at the opposite ends thereof beyond the outermost fingers thereof, and short finger portions extending transversely from the projected end portions of said longitudinally extending member, wherein said means movably supporting the end portions of said one transfer member on said second pair of beams supports said short finger portions on said second mentioned beams and wherein the other transfer member is also provided with such first and second mentioned beams and end portions of such first and second mentioned beams are received in the spaces between the short finger portions and the outermost fingers of said one transfer member.

13. In combination, an elevator movable in a vertical shaftway, transfer means on said elevator comprising a pair of transfer members arranged for relative movement, each transfer member comprising a set of spaced, parallel fingers interconnected only at one end thereof, the fingers of one transfer member being aligned with the spaces between the fingers of the other transfer member, the open ends of the fingers of one transfer member extending toward the connected ends of the fingers of the other transfer member, means for fixing the vertical position of one transfer member with respect to the elevator, means for vertically displacing the other transfer member with respect to said one transfer member, and means for independently moving said transfer members horizontally and in opposite directions to project and retract the fingers thereof with respect to the sides of said elevator.

14. The combination as in claim 13 wherein said vertically displacing means is operable to selectively move the fingers of said other transfer member to positions above and below the fingers of said one transfer member.

15. In combination, a pair of opposed load receiving zones, each zone comprising a set of parallel elongated load receiving members and means for supporting said members on the underside thereof leaving the spaces between said members freely accessible only from the top and outer ends thereof, transfer means comprising a base and a pair of transfer members mounted for horizontal and relative vertical movement on said base, each transfer member comprising a set of parallel fingers interconnected at one end thereof and open at the other end thereof, said transfer members in one position thereof relative to said base having their respective fingers in interdigitated coplanar relation leaving their intercon-

nected portions respectively located on opposite sides of said base, means for vertically displacing said transfer members relative to each other to vertically spaced positions leaving the uppermost transfer member clear of the lowermost transfer member, means for moving one of said transfer members while in its uppermost position horizontally in the direction of the open ends of the fingers thereof to one side of said base to interdigitate said fingers with the load receiving members of the zone on said one side of the base, and means for moving the other of said transfer members while in its uppermost position horizontally in the direction of the open ends of the fingers thereof to the other side of said base to interdigitate said fingers with the load receiving members of the zone on the other side of said base.

References Cited in the file of this patent

UNITED STATES PATENTS

493,542	Bessing et al.	Mar. 14, 1893
743,040	Scott	Nov. 3, 1903
2,324,817	Bratley	July 20, 1943
2,647,647	Alimanestiano	Aug. 4, 1953
2,752,051	Strahm et al.	June 26, 1956

FOREIGN PATENTS

728,493	Germany	Nov. 27, 1942
170,954	Austria	Apr. 10, 1952