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(54) DELIVERY AND RETRIEVAL DEVICE FOR **ROAD CONES**

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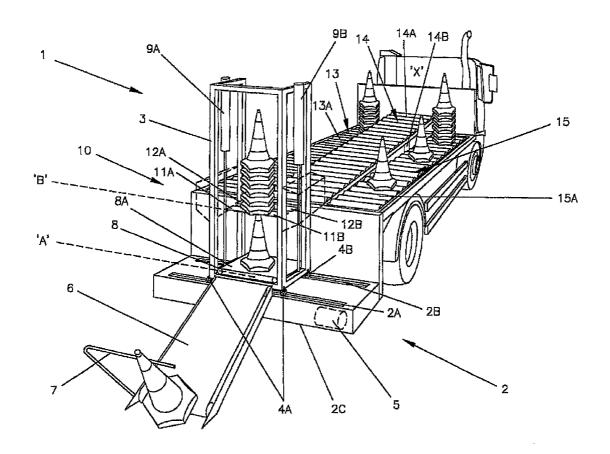
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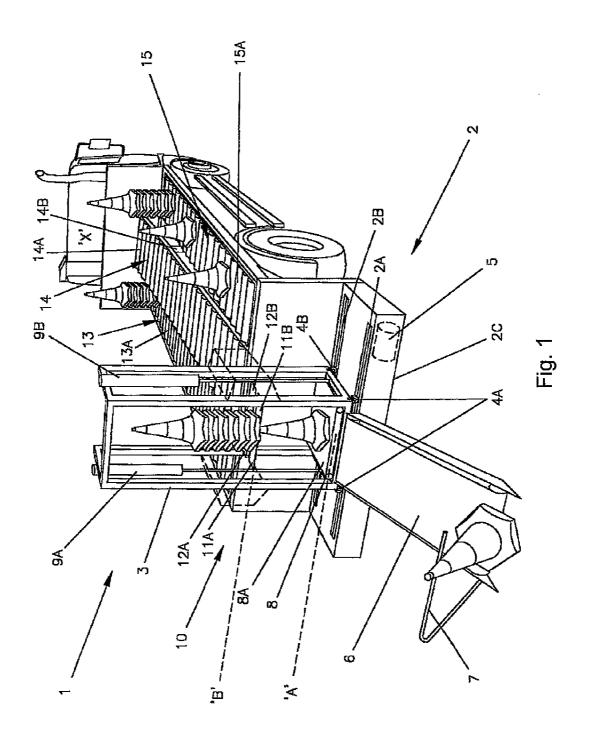
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ABSTRACT

The invention relates to a delivery and retrieval device for road cones. In a preferred embodiment the device comprises a track for mounting across the rear of a vehicle, a tower mounted to slide on the track, means such as motor to move the tower on the track, a conveyor to deliver road cones from a roadway to the base of the tower or to deliver road cones from the base to the roadway, a conveyor platform powered to move from a first height position at the base of the tower and adjacent one end of the conveyor to a second height position up the tower, and a handling mechanism to support a stack of road cones above the platform. In use the device collects and deposits cones from/to the roadway, in such a way as top enable a portion of a carriageway to be selectively closed by forming a 'taper'. The invention thus overcomes problems associated with personnel having to walk behind a vehicle in order to place cones in this arrangement.





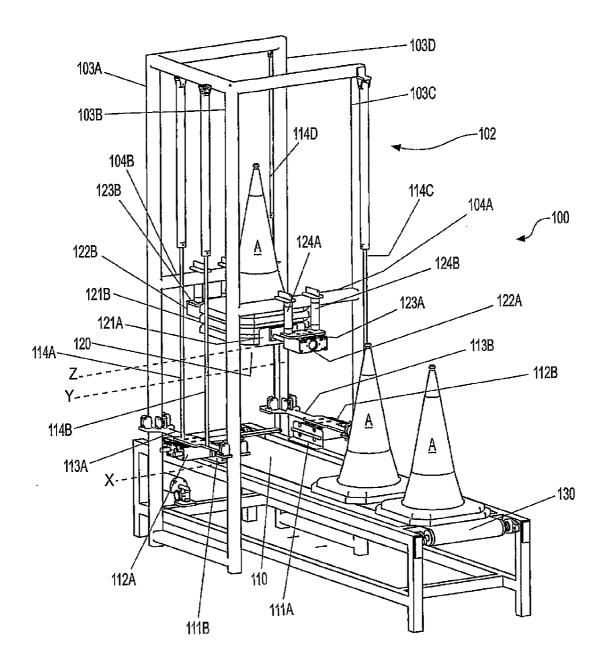


Fig. 2

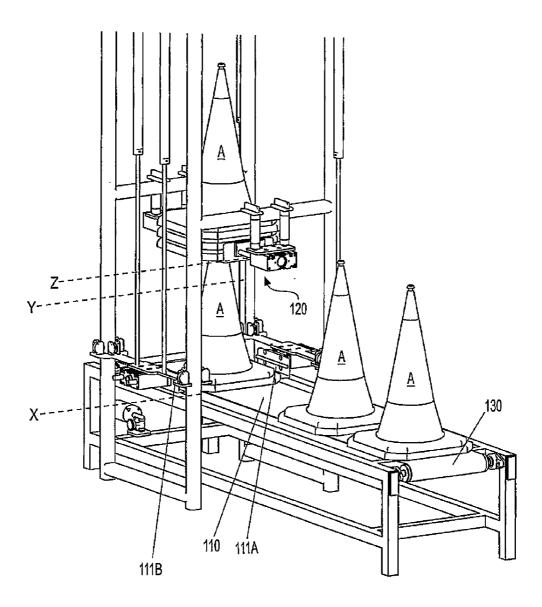


Fig. 3

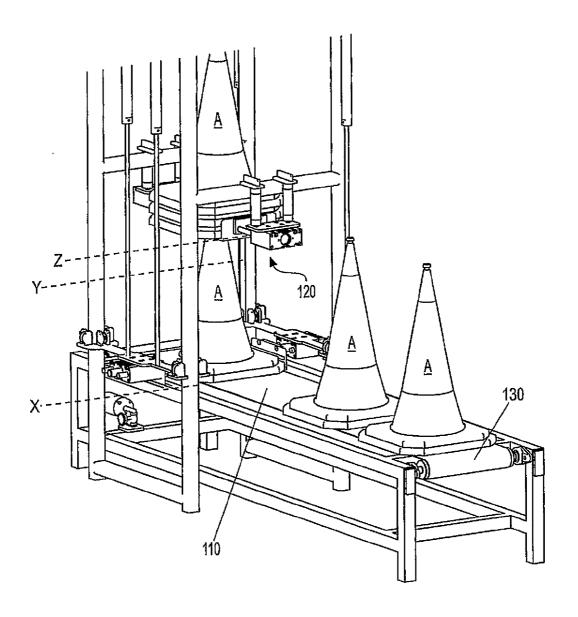


Fig. 4

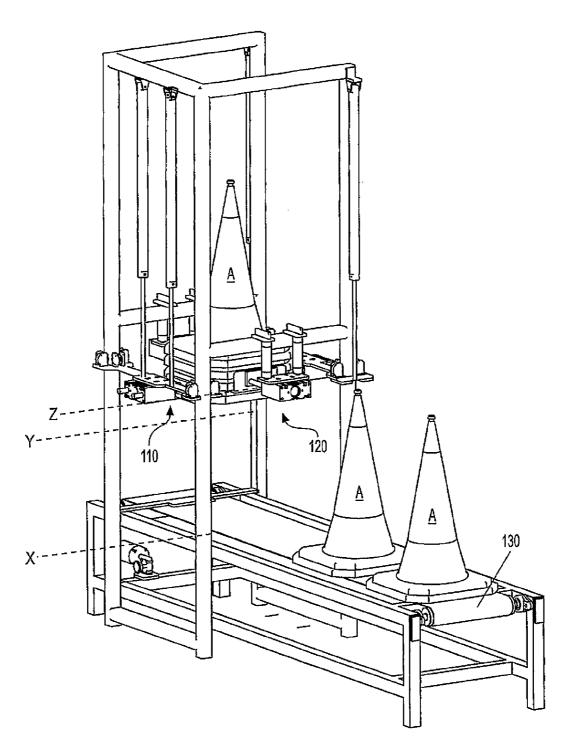


Fig. 5

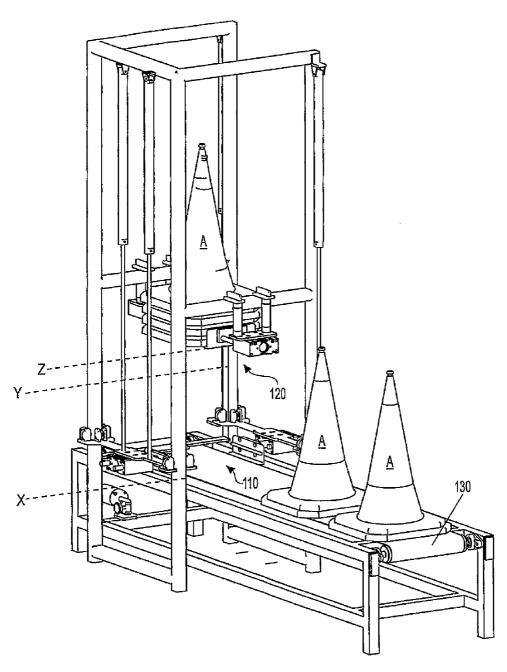
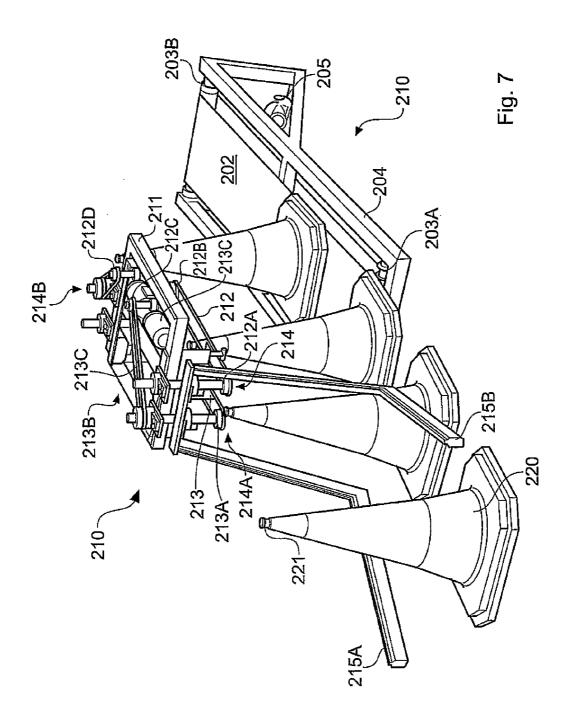


Fig. 6



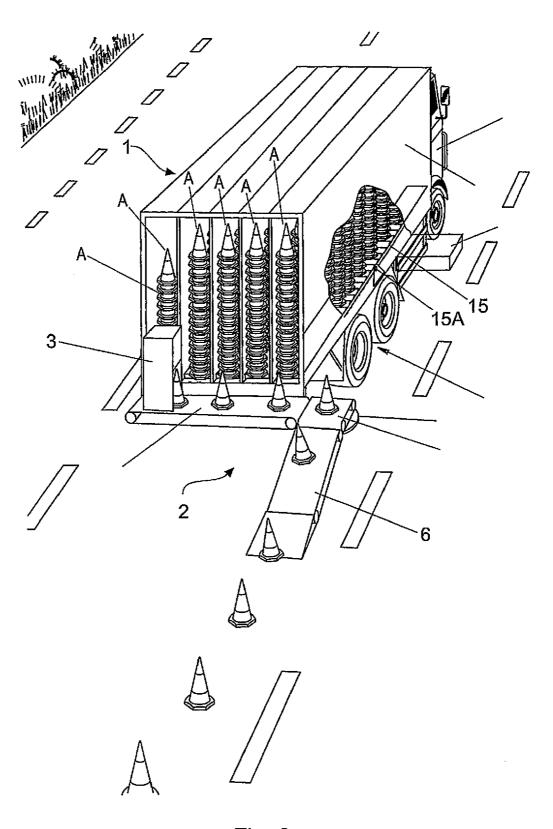


Fig. 8

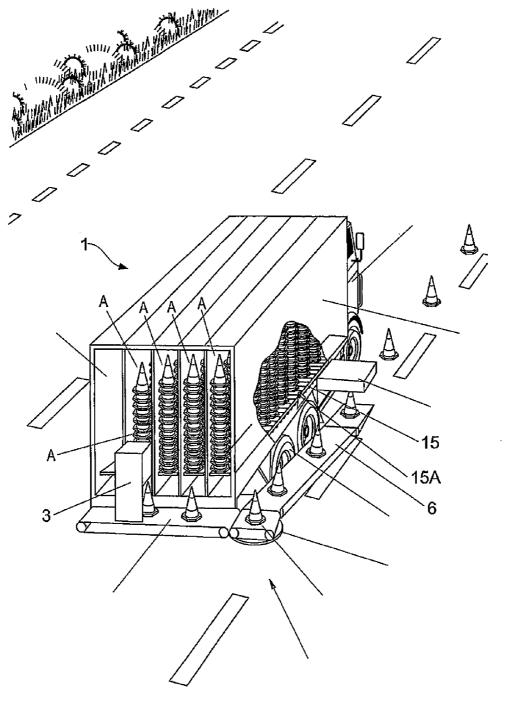


Fig. 9

DELIVERY AND RETRIEVAL DEVICE FOR ROAD CONES

FIELD OF THE INVENTION

[0001] The present invention relates to a delivery and retrieval device for road cones, more particularly but not exclusively, it relates to a vehicle capable of delivering and retrieving road cones to and from a road surface.

BACKGROUND OF THE INVENTION [0002] Road cones are familiar to all motorists. Lines of

spaced apart cones are used on all types of roads to separate lanes, indicate road works in progress and to warn of hazards—such as accidents—on roads. In certain cases, the road cones must be laid in lines in a spaced apart configuration, often with the cones a predetermined distance apart. Furthermore, once the cones are no longer required, the cones must be retrieved and removed from the carriageway concerned [0003] Traditionally, these road cones were laid and retrieved by hand; an operator riding on the back of a vehicle, the vehicle carrying a supply of road cones. To lay the cones, the operator leant over the edge of the vehicle and placed the cones in a desired position and configuration. The arrangement of cones was generally in the form of a taper, so as to gradually close a lane or route traffic from one part of a carriageway to another. In forming the "taper" the operators were often forced to walk on the road surface, it will be appreciated that this was labour intensive, slow and at times

PRIOR ART

dangerous.

[0004] Prior UK Patent Application Numbers GB-A-2 396 650 (Flynn) and GB-A-2 325 683 (Jordan) describe various devices for laying and collecting road cones.

[0005] U.S. Pat. No. 3,750,900 (Piercey) describes a road cone retrieval device for retrieving cones from road surfaces. The device disclosed comprises a scoop and a conveyor for collecting/discharging traffic cones and includes a stacking system for the cones.

[0006] It is an object of the present invention to provide an improved device capable of safely and automatically delivering and retrieving road cones and in particular the invention seeks to provide an improved device capable of safely and automatically delivering and retrieving road cones in the form of a taper to/from a road surface

SUMMARY OF THE INVENTION

[0007] According to a first embodiment of the present invention there is provided a delivery and retrieval device for road cones comprising:

- a) a track for mounting across the rear of a vehicle,
- b) a tower mounted to slide on the track,
- c) means to move the tower on the track,
- d) a conveyor to deliver road cones from a roadway to the base of the tower or to deliver road cones from the base to the roadway,
- e) a conveyor platform powered to move from a first height position at the base of the tower and adjacent one end of the conveyor to a second height position up the tower;
- f) a handling mechanism to support a stack of road cones above the platform second position and to deliver or pick up road cones to or from the conveyor platform when at the second position, and

g) at least one cone storage rack adjacent the platform second position to receive a stack of cones from the conveyor platform or deliver a stack of road cones to the conveyor platform, in use, the device collecting a cone from the roadway being transferred by the conveyor onto the conveyor platform at the first position, the conveyor platform lifting the cone to the second position, whereby, in use, the cone is transferred to the handling mechanism for stacking with other cones.

[0008] Ideally the cones are stacked to a predetermined number of cones, and the stack of cones is transferred by the conveyor platform to a storage rack. In an alternative arrangement the stack of cones is transferred from the storage rack to the conveyor platform and subsequently transferred to the handling mechanism.

[0009] The handling mechanism ideally delivers single cones to the conveyor platform at the second position. The conveyor platform is adapted to take a cone to the first position and transfer it to the conveyor for delivery to a roadway.

[0010] Preferably the device is capable of handling pairs of stacked cones as well as single cones.

[0011] Preferably two or more storage racks are provided, in side-by-side relationship across a vehicle, the storage racks being accessed by movement of the tower on the track.

[0012] Preferably the handling mechanism includes at least one pair of plates adapted to move towards and away from each other, then engage or release from either side of the base of a cone.

[0013] In a particularly advantageous arrangement the, or each, pair of plates moves from a first lower to a second upper position relative to the tower.

[0014] Preferably, movement of the conveyor platform, and handling mechanism, is hydraulically controlled,

[0015] The storage rack ideally includes a roller conveyor which can be inclined towards or away from the conveyor platform to create a gravity feed from the conveyor platform and the storage rack, or vice versa.

[0016] In a particularly advantageous embodiment it will be appreciated that the device may be incorporated in a system which may be enclosed in a van or other covered vehicle.

[0017] According to a second embodiment of the present invention there is provided a delivery and retrieval device for road cones comprising:

- a) a frame for mounting above a conveyor;
- b) a first cone pick up device to engage a road cone on the conveyor at a first level and raise the cone to a second level, or to engage a road cone at said second level and lower the road cone to the first level;
- c) a second cone pick up device to engage a road cone at said second level whilst supported by the first cone pick up device and raise the cone to a third level, or to engage a road cone at the third level and lower it to said second level, the distance between the second and third level being substantially the distance between the bases of two stacked cones;

any cone being supported at said second level by either said first and/or second cone pick up device at any one time;

in use cones can be retrieved to create a stack of cones at said third level, by sequentially taking one cone to said third level, and repeatedly inserting a further cone underneath the previous cone and raising it to the third level; or

cones can be delivered to a conveyor from a stack of cones at said third level, by sequentially lowering a bottom cone in the stack to the first level whilst supporting the remainder of the stack at said third level.

[0018] Preferably, in the second embodiment, the first cone pick up device comprises: a first pair of reciprocating jaws adapted to engage a first pair of opposing sides of a substantially square based cone, said first pair of jaws being supported on a first carriage moveable from the first to the second level. Preferably the jaws are in the form of opposing L-shaped plates. Said jaws could be adapted to handle any shaped base other than square.

[0019] Preferably the jaws are hydraulically operated. Preferably the carriage is moveable by means of hydraulics.

[0020] Preferably, the second cone pick up device comprises a second pair of reciprocating jaws adapted to engage a second pair of opposing sides of a substantially square based cone, said second pair of jaws being supported on a second carriage moveable from the second to the third level. Preferably the jaws are in the form of opposing L-shaped plates. Preferably the jaws are hydraulically operated. Preferably the carriage is moveable by means of hydraulics.

[0021] Preferably, sensors are provided to sense the presence of a cone on the conveyor when the cone is adjacent the first pick up device. The sensors may be proximity sensors, such as infra-red sensors, ultra-sonic sensors or optical sensors.

[0022] Preferably, in the second embodiment, a transfer device is provided to transfer a stack of cones to a storage compartment from the third level adjacent the second pick up device, or to deliver a stack of cones from the storage compartment to the third level adjacent the second pick up device.

[0023] Preferably, in the second embodiment, the device of the invention is computer controlled and the rate of delivery and retrieval of cones to and from the conveyor is adjustable.

[0024] According to a third embodiment of the present invention there is provided a delivery and retrieval device for road cones onto and from a roadway comprising:

- a) a device body,
- b) support means to support the device body above the end of a conveyor adjacent a roadway,

b) a pair of continuous loops of belts or chains rotatable in opposing directions on said device body, said loops defining an inclined elongate delivery channel between a length of each loop, said delivery channel having a first end substantially the height of a road cone when on a roadway with said first end above the roadway, and a second end above said first end with said second end being substantially the height of a road cone above the conveyor, said delivery channel being substantially the width of the top end of a road cone to engage the top of a road cone, in use said device allowing cones travelling down the conveyor to have the tops thereof engaged in the delivery channel to be delivered to a roadway, or allowing cones to travel up the delivery channel with the tops thereof engaged in the delivery channel to be retrieved onto said conveyor.

[0025] Preferably, in the third embodiment, a pair of guides is provided extending from said delivery channel first end away from the second end, said guides guiding road cones towards the delivery channel as said device is moved along a roadway towards cones.

[0026] Preferably, in the third embodiment, the loops are motor driven and each loop is formed from a loop of chain or belt around cogs or wheels.

[0027] Preferably, in the third embodiment, the delivery channel is adapted to engage in an annular recess at the top of a cone.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The embodiments of the invention will now be described with reference to the drawings in which:

[0029] FIG. 1 shows a schematic perspective view of a device for delivering and retrieving road cones in accordance with a first embodiment of the invention, the device being mounted on a vehicle X;

[0030] FIGS. 2 to 6 show a sequence of movements for delivering and retrieving road cones in accordance with a second embodiment of the invention;

[0031] FIG. 7 shows a perspective view of a device for delivering and retrieving road cones in accordance with a third embodiment of the invention, the device being mounted at the end of a conveyor;

[0032] FIG. 8 shows a diagrammatical perspective view of a cone delivery system; and

[0033] FIG. 9 shows a diagrammatical perspective view of a cone collection system.

[0034] Referring firstly to FIG. 1, device 1 has a track 2 for mounting across the rear of a vehicle having pair of rails 2A, 2B on top of a chassis 2C.

[0035] A rectangular tower 3 is mounted on runners 4A, 4B to slide on the track rails 2A, 2B. A motor 5 is provided to move the tower 3 on the track rails 2A, 2B.

[0036] A conveyor 6 is provided to deliver road cones from a roadway to the base of the tower 3 or to deliver road cones from the tower base 3 to the roadway. When delivering road cones to the base of the tower 3, vehicle "X" reverses. A bar 7 engages the top of a cone "Y" to tilt the cone over so that the base of the cone is angled up to engage the conveyor 6.

[0037] A conveyor platform 8 is powered by hydraulic rams 9A, 9B to move from a first height position "A" at the base of the frame and adjacent one end of the conveyor 6 to a second height position "B" up the frame. Platform 8 includes a conveyor belt 8A to transport road cones "on" and "off" the platform 8.

[0038] A handling mechanism 10 is provided to support a stack of road cones above the platform second position "B" and to deliver or receive road cones to or from the conveyor platform 8 when at the second position. Handling mechanism 10 includes two pair of plate's 11A, 11B and 12A, 12B adapted to move towards and away from each other (by means of hydraulic rams not shown) to engage or release from the underside of the base of a cone. Each pair of plates 11A, 11B and 12A, 12B move up and down from a first lower to a second upper position relative to the frame (by means of hydraulic rams not shown). Alternate movement of the pair of plates 11A, 11B and 12A, 12B and each engaging with the underside of adjacent cones or pairs of cones at the bottom of a cone stack allows the handling mechanism to deliver or receive road cones to or from the conveyor platform respectively.

[0039] Three cone storage racks 13, 14, 15 adjacent the platform second position is provided to receive a stack of cones from the conveyor platform or deliver a stack of road cones to the conveyor platform. Each storage rack includes a roller conveyor 13A, 14A, 15A which can be inclined by hydraulic lift 13B, 14B, 15B (13B, 15B not visible) towards or away from the conveyor platform 6 in its second position to create a gravity feed of stacks of cones from the conveyor

platform to the storage rack or vice versa. The storage racks 13, 14, 15 are accessed by sideways movement of the tower 3 on the track 2.

[0040] In use, the device 1 can collect a cone from the roadway-using arm 7 and conveyor 6. The cone is transferred by the conveyor 6 onto the conveyor platform 8 at the first height position "A". The platform conveyor 8A centralises the cone on the platform B. The conveyor platform 8 then lifts the cone to the second height position "B". The cone is then picked up by the handling mechanism 10 to be stored with other cones to create a stack of a maximum predetermined number of cones, e.g. thirty cones. This is repeated until the maximum predetermined number of cones is supported by the handling mechanism 10. The stack of cones is then transferred by the platform conveyor BA to one of the three storage racks. The storage rack conveyor is inclined away from the conveyor platform 8 so that the stack of cones slides into the rack.

[0041] Alternatively, the stack of cones is transferred from a storage rack to the conveyor platform 8 by inclining the storage rack conveyor towards platform B. The stack is centralised by the platform conveyor 8A. The stack of cones is then picked up by the handling mechanism 10. The handling mechanism 10 delivers single cones to the conveyor platform 8 at the second height position "B". The conveyor platform takes the cone to the first height position "A", and transfers the cone to the conveyor 6 for delivery to a roadway.

[0042] The handling mechanism could also handle stacked pairs of cones as well as single cones. For example it may be desirable to layout on a roadway alternate single and stacked pairs of cones.

[0043] The device of the invention is useful in laying road cones and retrieving road cones on roadways. If it is desired to lay a lane of road cones at an angle across a roadway lane, the vehicle can drive down a roadway lane and the tower 3 moved slowly from one side of the track 2 to the other as the cones are being laid.

[0044] Referring now to FIGS. 2 to 6, there is shown a modified delivery and retrieval device 100 for road cones. The modified delivery and retrieval device 100 may be adapted to be mounted at the rear of a vehicle or within a smaller vehicle such as a van or a larger van, such as a pantechnicon.

[0045] Device 100 has a frame 102 formed from four vertical members 103A, 103B, 103C, 103D and horizontal metal members 104A, and 104B. Frame 102 is mounted above a conveyor 130.

[0046] Frame 102 supports a first cone pick up device 110 to engage a road cone "A" on the conveyor at a first level X and raise the cone to a second level Y. First cone pick up device comprises a first pair of reciprocating jaws in the form of opposing L-shaped plates 111A, 111B driven by hydraulic cylinders 112A, 112B respectively adapted to engage a first pair of opposing sides of a substantially square based cone "A". Plates 111A, 111B and cylinders 112A, 112B are mounted on first carriages 113A, 113B with wheel bearings at the ends thereof which ride up and down the vertical members 103A, 103B and 103C, 103D by means of hydraulic rams 114A, 114B and 114C, 114D respectively. Plates 111A, 111B can thus move from the first level X to the second level Y.

[0047] Frame 102 also supports a second cone pick up device 120 to engage a road cone "A" at the second Y level whilst supported by the first cone pick up device 110. Device 120 can then raise the cone "A" to a third level Z.

[0048] Second cone pick up device 120 comprises a second pair of reciprocating jaws in the form of opposing L-shaped plates 121A, 121B driven by hydraulic cylinders 122A, 122B adapted to engage a second pair of opposing sides of the substantially square based cone A. Plates 121A, 121B and cylinders 122A, 122B are supported on second carriages 123A, 123B moveable by means of hydraulic rams 124A, 124B, 124C, 124D (124C, 124D not visible). Plates 121A, 121B can thus move from the second level "Y" to the third level "Z".

[0049] The distance between levels "Y" and "Z" is equal to the distance between the bottoms of two stacked cones.

[0050] In use, when retrieving road cones from a conveyor, cones "A" travel along the conveyor 130 as shown in FIG. 2 to a position in between plates 111A, 111B as shown in FIG. 3. Sensors (not shown) are provided to sense the presence of a cone on the conveyor when the cone is between plates 111A, 111B. Plates 111A, 111B are moved towards each other by cylinders 112A, 112B so they engage opposing sides of square based cone "A" as shown in FIG. 4.

[0051] Carriages 113A, 113B are then raised by rams 114A, 114B and 114C, 114D so that the bottom of a cone "A" is at level "Y" as shown in FIG. 5.

[0052] Carriages 122A, 122B are then lowered by rams 123A, 123B, 123C, 123D so that the plates 121A, 121B are at level "Y", and the plates 121A, 121B are then engaged with the underside of the cone "A" at level "Y", and that cone is then raised to level "Z". Carriages 113A, 113B are then lowered so that plates 111A, 111B are back at the first level "X". It will be appreciated that any cone is supported at said second level by either said first and/or second cone pick up device at any one time.

[0053] Cones can be retrieved to create a stack of cones at said third level, by sequentially taking a cone to the third level "Z", and repeatedly inserting a further cone underneath the previous cone and raising it to the third level "Z". After a predetermined number of cones have been stacked, a transfer device (not shown) may be provided to transfer a stack of cones to a storage compartment from the third level "Z". The transfer device may be adjacent the second pick up device.

[0054] In use, cones can be delivered back to a conveyor by reversing the above process. The transfer device removes a stack of cones from a storage compartment to the plates 121A, 121B at the third level "Y". The plates 111A, 111B can be raised to the second level "Y" and the plates 121A, 121B moved apart at the third level "Z" so allowing the stack of cones to fall onto plates 111A, 111B. Plates 121A, 121B can then be pushed towards each other so that the plates 121A, 121B engage the bottom of the second to bottom cone. The bottom cone in the stack can then be lowered to the first level "X" onto the conveyor 130, and the plates 111A, 111B moved apart so releasing a cone onto a conveyor. By repeating this process a stack of cones can be transferred to a conveyor.

[0055] A third embodiment of the invention will now be described with reference to FIG. 7 of the accompanying drawings.

[0056] Referring to FIG. 7 there is shown a conveyor 201 having a conveyor belt 202 supported for rotation around end rollers 203A, 203B on a frame 204. Roller 203B may be rotated by a motor 205. Conveyor 201 may be part of a vehicle such as that described in the above mentioned prior patent and the above mentioned embodiments and may be used to take road cones from a vehicle compartment onto a roadway, or vice versa. Belt 202 may thus rotate in either direction. Con-

veyor 201, in use, is secured to the vehicle as it moves along a roadway and the end of conveyor 201 adjacent roller 203A moves and is supported just above the roadway. In practice conveyor 201 may be moved along the road towards a line of road cones to pick then up, or moved away from a line of road cones laying more cones in a line.

[0057] A delivery and retrieval device 210 for road cones onto a roadway is provided. Device 210 has a device body in the form of a frame 211. A support means such as a series of struts (not shown) is provided to support the device 210 above the end of the conveyor 201 adjacent a roadway.

[0058] A pair of continuous loops of chain 212 and 213 is provided, the loops being rotatable in opposing directions on frame 211. Loop 212 is supported at either end by a pair of cogs 212A, 212B. Loop 213 is supported at either end by a pair of cogs 213A, 213B (213B not visible). Loops 212 and 213 could alternatively be formed from belts around wheels. Cogs 213A and 212B are driven by motors 212C, 213C through chain linkages 212D, 213D.

[0059] Loops 212 and 213 define an inclined elongate delivery channel 214. Delivery channel 214 has a first end 214A substantially the height of a road cone when on a roadway with the first end 214A above the roadway. Channel 214 has a second end 214B above or higher than said first end 214A, with the second end 214B being substantially the height of a road cone above the conveyor. The delivery channel 214 is substantially the width of the top end of a road cone to engage the top of a road cone. In this respect the delivery channel is adapted to engage in an annular recess 221 at the top of a cone 220.

[0060] A pair of tapered guides 215A, 215B is provided extending from the first end 214A of the delivery channel away from the second end. Guides 215A, 215B guide road cones towards the delivery channel 214 as the device is moved along a road way towards cones.

[0061] In use, the cones travelling down the conveyor 202 have the tops thereof engaged in the second end 214B of the delivery channel and are carried down the delivery channel to the first end to be placed on a roadway. Alternatively when retrieving cones, cones are guided by guides 215A, 215B to the first end of the delivery channel, and they then travel up the delivery channel with the tops thereof engaged in the delivery channel to be retrieved onto the conveyor 202.

[0062] It is also envisaged that the device of the invention may be used just to retrieve road cones, and road cones may be delivered to a roadway, e.g. just by a conveyor.

[0063] In all of the embodiments described above, it is envisaged that the vehicle may be provided with additional features to enable efficient running of the delivery and retrieval devices 1, 101, 201.

[0064] For example, a rear view camera & screen mounted in the cab of the vehicle enables to driver of the vehicle to monitor the operation of the cone delivery and retrieval device. Furthermore, a HMI (human interface) screen in drivers cab allows the driver to interact with a computer controlled version of each of the embodiments of the invention described above. A vehicle carrying any of the devices described above may be provided with an auxiliary engine and fuel tank. Furthermore, the vehicle may be provided with positioning mechanisms in the wheels and storage compartment to monitor the positioning of the vehicle with respect to the cones delivering device.

[0065] The devices 1, 101, 201 described above may be provided with a series of interlocks or sensors to allow for safe

operation of the devices 1, 101, 201. It will be appreciated that in addition to interlocks, emergency stops may be provided to halt the delivery/retrieval operation in the event of an emergency. Additionally safety guarding and safety lighting may be provided on all embodiments of the invention. Guarding on the cone storage compartment may also be provided. It will be appreciated that a cone locking bar may be provided to lock the cones in situ whilst the vehicle is in motion.

[0066] Furthermore, it will be appreciated that the devices 1, 101, 201, may handle cones of different sizes and may be provided with means for switching between cones of different sizes. Moreover, the devices may deliver and/or retrieve varying sizes of cones in any order or sequence, and be capable of delivering or retrieving doubly stacked cones. The devices may also be provided with means for setting the cone delivery distance to predetermined distances. For example, the cones may be delivered to the road surface having a cone spacing (the distance between two consecutive cones) of 1 m, 1.2 m or 0.5 m, said cone spacing being controlled by control means within the device.

[0067] The devices 1, 101, 201 may be fitted to vehicles such that the cones can be delivered or retrieved from either side of the vehicle by suitable dispensing means comprising swivel arms and dispensing arms for extreme sideways positioning. Additionally, the swivel arms and pick up arms may be provided with means to allow the cones to be laid in a "taper" or straight line configuration on either side of the vehicle. The device may also be provided with guide bars in the storage compartment to assist in cone handling and storage.

[0068] The devices of the embodiments described above may be provided with cone washers for cleaning the cones on delivery or retrieval, or both. Furthermore, a mechanism for placing or removing lights on top of the cones may be included. However, lamps may be placed inside the cones, the lamps being battery or solar powered.

[0069] Whilst the embodiments described above are designed to be used with current 'known' shapes and configurations, modification of the shape of the cone to assist use with the devices described above may improve operation of the devices. For example, modification of the apex or the base of the cones will assist in handling by the devices.

[0070] It will additionally be appreciated that the cone storage compartment may be a floating or roller driven storage compartment and driven rollers may be provided in each bay of flat storage compartment. The storage compartment may be operational at a plurality of positions, for example at the first or second position in the first embodiment of the invention

[0071] It will be appreciated that the power source for the device may be hydraulic, pneumatic, or electric or any variation.

[0072] The pick up conveyors of the devices 1, 101 and 201 may be provided with centralising means, such as cylinders, for locating the cones, as they are collected. Furthermore, the pick up conveyor may be split. Additionally the pick up conveyor may be provided with lifting motors. The pick up conveyor may also be provided with supports in the form of gas springs, although it will be appreciated that the support need not be limited to that of gas springs and any other suitable form of support may be used.

[0073] A flexible support mechanism, such as an IGUS (Trade Mark) chain may be provided for transporting electric and hydraulic cables in various positions in all of the above mentioned devices.

[0074] All of the devices described above may be retro fitted to existing vehicles whilst also being capable of being designed as part of purpose built vehicles.

[0075] All of the features described above may be implemented by microprocessor means and computer controlled accordingly.

[0076] Other variations to the embodiments described include: the inclusion of a pick up and/or trip bar. There may also be provided a magazine for receiving/dispensing and storing cones. Examples of vehicles on which devices may be supported are shown in FIGS. 8 and 9.

[0077] The inventions may take a form different to the forms specifically described above.

[0078] Further modifications will be apparent to those skilled in the art without departing from the scope of the present invention.

- A delivery and retrieval device for road cones comprising:
 - a) a track for mounting across the rear of a vehicle,
 - b) a tower mounted to slide on the track,
 - c) means to move the tower on the track,
 - d) a conveyor to deliver road cones from a roadway to the base of the tower or to deliver road cones from the base to the roadway,
 - e) a conveyor platform powered to move from a first height position at the base of the tower and adjacent one end of the conveyor to a second height position up the tower 3, and
 - f) a handling mechanism to support a stack of road cones above the platform second position and to deliver or pick up road cones to or from the conveyor platform when at the second position, and
 - g) at least one cone storage rack adjacent the platform second position to receive a stack of cones from the conveyor platform or deliver a stack of road cones to the conveyor platform, in use the device collecting a cone from the roadway, said cone being transferred by the conveyor onto the conveyor platform at the first position, the conveyor platform lifting the cone to the second position, the cone then being transferred to the handling mechanism to be stored with other cones to create a stack of a predetermined number of cones, and the stack of cones being transferred by the conveyor platform to a storage rack; or the stack of cones being transferred from the storage rack to the conveyor platform and transferred to the handling mechanism, the handling mechanism delivering single cones to the conveyor platform at the second position, the conveyor platform taking a cone to the first position and transferring the cone to the conveyor for delivery to a roadway.
- 2. A device according to claim 1, wherein the device handles pairs of stacked cones as well as single cones.
- 3. A device according to claim 1 or 2, wherein two or more storage racks are provided in side by side relationship across a vehicle, the storage racks being accessed by movement of the tower on the track.
- **4**. A device according to any preceding claim, wherein the handling mechanism includes at least one pair of plates adapted to move towards and away from each other to engage or release from either side of the base of a cone.

- 5. A device according to claim 4, wherein the or each pair of plates moves from a first lower to a second upper position relative to the tower.
- **6**. A device according to any preceding claim, wherein movement of the conveyor platform and handling mechanism is hydraulically controlled.
- 7. A device according to any preceding claim, wherein the storage rack includes a roller conveyor.
- **8**. A device according to claim **7**, wherein the roller conveyor can be inclined towards or away from the conveyor platform to create a gravity feed from the conveyor platform and the storage rack or vice versa.
- 9. A device according to any preceding claim, wherein the tower is adapted to be moved on the track as cones are being laid by the conveyor to lay a lane of road cones at an angle across a roadway lane, and/or the tower is adapted to be moved on the track as cones are being retrieved by the conveyor to retrieve a lane of road cones at an angle across a roadway lane.
- 10. A delivery and retrieval device for road cones comprising:
 - a) A frame for mounting above a conveyor,
- b) a first cone pick up device to engage a road cone on the conveyor at a first level and raise the cone to a second level, or to engage a road cone at said second level and lower the road cone to the first level,
- c) a second cone pick up device to engage a road cone at said second level whilst supported by the first cone pick up device and raise the cone to a third level, or to engage a road cone at the third level and lower it to said second level, the distance between the second and third level being substantially the distance between the bases of two stacked cones,
- any cone being supported at said second level by either said first and/or second cone pick up device at any one time, in use cones can be retrieved to create a stack of cones at said third level, by sequentially taking one cone to said third level, and repeatedly inserting a further cone underneath the previous cone and raising it to the third level, or cones can be delivered to a conveyor from a stack of cones at said third level, by sequentially lowering a bottom cone in the stack to the first level whilst supporting the remainder of the stack at said third level.
- 11. A delivery and retrieval device for road cones according to claim 10, wherein the first cone pick up device comprises a first pair of reciprocating jaws adapted to engage a first pair of opposing sides of a substantially square based cone or other shape, said first pair of jaws being supported on a first carriage moveable from the first to the second level.
- 12. A delivery and retrieval device for road cones according to claim 11, wherein the first pair of jaws are in the form of opposing L-shaped plates.
- 13. A delivery and retrieval device for road cones according to claim 11 or 12, wherein the jaws are hydraulically operated.
- 14. A delivery and retrieval device for road cones according to claim 11, 12 or 13, wherein the first carriage is moveable by means of hydraulics.
- 15. A delivery and retrieval device for road cones according to any one of claims 10 to 14, wherein the second cone pick up device comprises a second pair of reciprocating jaws adapted to engage a second pair of opposing sides of a substantially

square based cone, said second pair of jaws being supported on a second carriage moveable from the second to the third level.

- **16**. A delivery and retrieval device for road cones according to claim **15**, wherein second pair of jaws are in the form of opposing L-shaped plates.
- 17. A delivery and retrieval device for road cones according to claim 15 or 16, wherein the jaws are hydraulically operated
- 18. A delivery and retrieval device for road cones according to claim 15, 16 or 17 wherein the second carriage is moveable by means of hydraulics.
- 19. A delivery and retrieval device for road cones according to any one of claims 10 to 18, wherein sensors are provided to sense the presence of a cone on the conveyor when the cone is adjacent the first pick up device.
- 20. A delivery and retrieval device for road cones according to any one of claims 10 to 19, wherein a transfer device is provided to transfer a stack of cones to a storage compartment from the third level adjacent the second pick up device, or to deliver a stack of cones from the storage compartment to the third level adjacent the second pick up device.
- 21. A delivery and retrieval device for road cones onto and from a roadway comprising:
 - a) a device body,
 - b) support means to support the device body above the end of a conveyor adjacent a roadway,
 - c) a pair of continuous loops of belts or chains rotatable in opposing directions on said device body, said loops defining an inclined elongate delivery channel between a length of each loop, said delivery channel having a first end substantially the height of a road cone when on a roadway with said first end above the roadway, and a second end above said first end with said second end being substantially the height of a road cone above the

- conveyor, said delivery channel being substantially the width of the top end of a road cone to engage the top of a road cone,
- in use said device allowing cones travelling down the conveyor to have the tops thereof engaged in the delivery channel to be delivered to a roadway, or allowing cones to travel up the delivery channel with the tops thereof engaged in the delivery channel to be retrieved onto said conveyor.
- 22. A delivery and retrieval device for road cones according to claim 21, wherein a pair of guides are provided extending from said delivery channel first end away from the second end, said guides guiding road cones towards the delivery channel as said device is moved along a roadway towards cones.
- 23. A delivery and retrieval device for road cones according to claim 21 or 22, wherein the loops are motor driven.
- 24. A delivery and retrieval device for road cones according to any one of claims 21, 22 or 23, wherein each loop is formed from a loop of chain or belt around cogs or wheels.
- 25. A delivery and retrieval device for road cones according to any one of claims 21 to 24, wherein the delivery channel is adapted to engage in an annular recess at the top of a cone.
- 26. A delivery and retrieval device for road cones according to any preceding claim, wherein the device is computer controlled.
- 27. A delivery and retrieval device for road cones according to any preceding claim, wherein the rate of delivery and retrieval of cones to and from the conveyor is adjustable.
- 28. A device for delivering and retrieving road cones as herein before described with reference to FIG. 1 or FIGS. 2 to 6 or FIG. 7 of the accompanying drawings.
- 29. A system including the device of any preceding claim when mounted on or in a vehicle.

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