

TITLE OF INVENTION

METHOD AND ASSEMBLY FOR SORTING DINNERWARE AND DINNERWARE TRAY

BACKGROUND OF THE INVENTION

1. Field of the Invention

- 5 This invention relates generally to apparatus and method for automatic sorting dinnerware and dinnerware tray or serving tray, and in particular, an assembly to automatically sort plates, bowls, etc. on a serving tray by directing various dinnerware to a dish basket and the serving tray to a tray rack.

2. Description of the Prior Art

- 10 Heretofore, dinnerware and serving tray in food courts, hawker centres, school canteen, coffee shop and factory sites, or the like are not sorted but are placed into huge containers for cleaning and workers have to be employed to sort manually the dinnerware from the tray. It is such a common practice to have all the dinnerware be cleaned, dried, and sorted for use again. Owing to increasing volume of dinnerware used in food courts, there is a need for a
- 15 more efficient method and apparatus for automatic sorting, conveying the dinnerware to for cleaning, and the serving tray or dinnerware tray be shelved on a tray rack.

- Accordingly, there is a need for an apparatus or assembly that will perform the function of conveying dinnerware on a serving tray for cleaning with a greater speed. Additionally, there is a need for such an apparatus or assembly that does not require manual sorting step in order
- 20 to perform subsequent cleaning of the dinnerware.

U.S. Pat. Nos. 3,653,507 and 3,675,770, respectively, describe means for sorting silverware as an operation apart from the sorting of other items of tableware. U.S. Pat. No. 3,882,443, entitled "Silverware Feeder Construction", discloses mechanisms which work well under regulated conditions, often do not operate efficiently when peak conditions develop.

- 25 China Utility Patent No. CN 203539285 U, entitled "Sorting mechanism of bowl washing machine" relates to a sorting mechanism of a bowl washing machine. The sorting mechanism achieves full-automatic sorting of chopsticks, dishes, cups and bowls and comprises a machine frame, sorting plates, a baffle, a separator and a stirring device, wherein the sorting plates, the baffle, the separator and the stirring device are installed on the machine frame.
- 30 US Patent No. 3956109, entitled "Automatic silverware sorting construction" relates to an apparatus for sorting silverware including a hopper for collecting the silverware in bulk

amounts and a vibrating bed for gradually discharging the silverware and conveying it to a sorting stage for dividing the different types of silverware.

One problem existing with respect to sorting trays and dinnerware that used in food court or hawker centre is that the tray and dining wear are mixed and additional labours are needed to sorting dinnerware for cleaning. In some cases, the tray and dinnerware are being left on the tables in food court and few workers are needed to sort out before the dinnerware are ready for use. Depending on man power, the cleaning and sorting dinnerware can be very laborious, complicated and thus, these processes increase expense and are inefficient.

SUMMARY OF THE INVENTION

It is a general object of this invention to provide an automatic sorting assembly for use in food court, wherein the tray to hold the dinnerware are separated from dinnerware.

Another main object of the present invention is to provide an assembly (100) for sorting dinnerware from a dinnerware tray, said assembly (100) comprising:

(a) a conveyor belt (10) on a platform (11) having a tray entrance (12) and a tray exit (64) , for transporting the dinnerware tray with dinnerware thereon, wherein the dinnerware tray is embedded with a RFID chip containing information such as the status of the tray;

(b) a control cabinet (18) mounted on the top of the platform (11) having a touchscreen computer (30) and a plurality of slots (20', 20'', 20''') for coin or cash refund, an antenna (40) and a warning light (50) to control the sorting of the dinnerware, and a heat ventilation fan (90), and an emergency stop button (94) to cut off the operation of the assembly (100);

(c) a tray turnover means including a pair of turnover fork (55), a turnover axle (57), a turnover motor (46), and a turnover reducer (47) for flipping the dinnerware tray from a horizontal position to an inclined position to drop the dinnerware from the dinnerware tray, wherein the flipping is done when the tray is transported to a position at the turnover fork (55) located along the lateral side of the conveyor belt (10) in between the control cabinet (18) and the tray exit point (64) at the other end of the conveyor belt (10), wherein the flipping turnover fork (55) flips the tray to dispose off the dinnerware from the tray;

(d) a tray rack (60) removably mounted at the tray exit (64) of the platform (11) allowing the tray to be inserted orderly for cleaning and re-use; and

(e) a dinnerware basket cart (70) for collecting dinnerware that dispose off when the dinnerware tray is flipped by the flipping turnover fork (55) of the tray turnover mean, thereby when the dinnerware tray with a plurality of dinnerware are being placed onto the conveyor

belt (10), and the conveyor belt (10) is triggered to move and transported until the tray is aligned with the turnover fork (55), the tray is flipped and the dinnerware is collected in the dinnerware basket cart (70), and the tray is shelved in the tray rack (60) to be pushed away.

An object of the present invention is to provide a method for sorting dinnerware from a dinnerware tray using the assembly depicted above, comprising the steps of

(a) placing a dinnerware tray onto the conveyor belt (12) of the assembly (100), wherein the movement of the conveyor belt (12) is activated when the photoelectric detection switches a RFID reader on the assembly (100) sense the dinnerware tray;

(b) flipping the dinnerware tray when the conveyor belt (12) is moved to the position of the turnover fork (55) of the platform (11) of the assembly, and reading the information embedded in the built-in RF chip in the dinnerware tray by the RFID sensor located the turnover fork (55);

(c) transmitting the information of the built in RF chip to the computer of the assembly to proceed with coin refund or the like via the coin return slots (20', 20'', 20'''); and

(d) sliding the tray into the tray rack (60) automatically after the dinnerware drops into the dinnerware basket cart (70) for cleaning; and

(e) returning the turnover fork (55) automatically to the original position thereof and awaiting another new dinnerware tray for shelving onto the tray rack (60).

Yet still another objection of the present invention is to provide an automatic sorting assembly, wherein the dinnerware is dropped from the dinnerware tray into the dinnerware basket cart (70) to be washed, cleaned and dried for subsequent use.

Still a further object of the present invention is to provide an assembly for sorting dinnerware from a dinnerware tray, further comprising a tray detection photoelectric switch (45) mounted at the tray exit (64) of the assembly (100) to sense the sliding of the tray into the tray rack (60).

Yet a further object of the present invention is to provide an assembly for sorting dinnerware from a dinnerware tray, further comprising a pair of position detection switches (89, 99) located along the side of the conveyor belt (12) at the tray exit (64) of the platform (11).

Still yet another object of the present invention is to provide an assembly for sorting dinnerware from a dinnerware tray, wherein the dinnerware basket cart (70) is moveable.

A further object of the present invention is to provide a method for sorting dinnerware from a dinnerware tray, wherein the conveyor belt (12) is temporarily stopped from conveying a new

tray in step (b) when the dinnerware tray is being flipped, and the dinnerware tray is placed in such a way that the long side and the short side of the dinnerware tray is accurately arranged onto the conveyor belt.

5 An object of the present invention is to provide a method for sorting dinnerware from a dinnerware tray, wherein the dinnerware drops from the dinnerware tray as a result of gravitational force, and the dinnerware tray is conveyed by the conveyor belt (12) until the tray reaches the position of the turnover fork (55) of the assembly.

10 A further object of the present invention is to provide an automatic sorting assembly, wherein a pair of photo sensors are mounted at the edge of the platform and are used to trigger the movement of the conveyor means when the tray is being placed onto the conveyor means.

Still a further object of the present invention is to provide an automatic sorting assembly, further comprising a payment device being linked to the RFID on the tray and the photo sensors positioned at the edges of the conveyor means, wherein a cash or the like is being delivered when the conveyor means receives a tray.

15 Yet still another object of the present invention is to provide an automatic sorting assembly, wherein an alarm is triggered when the tray on the trolley is fully loaded or the dinning wear in the collecting churn is fully loaded.

20 Another object of the present invention is to provide an automatic sorting assembly, wherein the collecting chute is positioned beneath the platform at the discharge end thereof, allowing the dinning wear to be conveniently dropped off if the tray is being flapped over by the grabbing means.

Still another object of the present invention is to provide an automatic sorting assembly, wherein the conveyor means is maintained in a substantially horizontal position with the dinnerware being initially placed in a horizontal position on the tray.

25 It is a further object of this invention to provide an automatic sorting assembly, wherein the operation of sorting of tray and dinnerware is carried out in a highly efficient manner.

These and other objects of this invention will appear hereinafter and for purposes of illustration, but not of limitation, specific embodiments of the invention are shown in the accompanying drawings in which:

30 **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a perspective view of an apparatus for sorting dinnerware of a preferred embodiment in accordance with the present invention.

FIG. 1A is a schematic exploded view of the apparatus for sorting dinnerware in accordance with the present invention.

5 FIG. 1B is an enlarged perspective view of the position detection switch of the apparatus in accordance with the present invention.

FIG. 1C is another exploded view of the apparatus for sorting dinnerware in accordance with the present invention.

10 FIG. 2 is a side elevation view of the apparatus for sorting dinnerware in accordance with the present invention.

FIG. 3 is the top view of the apparatus for sorting dinnerware in accordance with the present invention.

FIG. 4 is the front view of the apparatus for sorting dinnerware in accordance with the present invention.

15 FIG. 5 is the rear view of the apparatus for sorting dinnerware in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE PRESENT INVENTION

20 The present invention generally relates to an apparatus for sorting out the dinnerware from dinnerware tray used to hold dinnerware such as bowl, plate, forks and spoons, cup, dish and chopstick, etc in food court, hawker centres, school canteen, coffee shop and factory sites.

As shown in FIG.1, there is shown a perspective view of a preferred embodiment of an apparatus for sorting dinnerware in accordance with the present invention. The assembly (100) comprises:

25 (a) a conveyor belt (10) on a platform (11); (b) a control cabinet (18) mounted on the top of the platform (11); (c) a tray turnover means including a pair of turnover fork (55), a turnover axle (57), a turnover motor (46), and a turnover reducer (47) for flipping the dinnerware tray from a horizontal position to an inclined position to drop the dinnerware from the dinnerware tray; (d) a tray rack (60) removably mounted at the tray exit (64) of the platform (11) allowing
30 the tray to be inserted orderly for cleaning and re-use; and (e) a dinnerware basket cart (70) for collecting dinnerware.

In accordance with the present invention, the platform (11) is substantially horizontal and has a tray entrance (12) and a tray exit (64), and the conveyor belt (10) is mounted on the platform (11) for transporting the dinnerware tray (not shown) with dinnerware thereon from the tray entrance (12) to the tray exit (64). The dinnerware tray is embedded with a RFID chip containing information the status of the tray. The control cabinet (18) is mounted on to the top of the platform (11) and the cabinet (18) a touchscreen computer (30) and a plurality of slots (20', 20'', 20''') for coin or cash refund. On the top of the control cabinet (18) there is provided an antenna (40) and a warning light (50). These components are function to control the sorting of the dinnerware and the returning of money who brings the dinnerware trays for sorting and cleaning. A heat ventilation fan (90) and an emergency stop button (94) are provided on the control cabinet (18) for use to cut off the operation of the assembly (100).

The tray turnover means is used for flipping the dinnerware tray from a horizontal position to an inclined position to drop the dinnerware from the dinnerware tray, wherein the flipping is done when the tray is transported to a position at the turnover fork (55) located along the lateral side of the conveyor belt (10) in between the control cabinet (18) and the tray exit point (64) at the other end of the conveyor belt (10), wherein the flipping turnover fork (55) flips the tray to dispose off the dinnerware from the tray.

The tray rack (60) is removably mounted at the tray exit (64) of the platform (11) allowing the tray to be inserted orderly for cleaning and re-use automatically after the dinnerware tray is flipped over.

The dinnerware basket cart (70) is provided near to the turnover fork (55) for collecting dinnerware that dispose off when the dinnerware tray is flipped by the flipping turnover fork (55) of the tray turnover mean, thereby when the dinnerware tray with a plurality of dinnerware are being placed onto the conveyor belt (10), and the conveyor belt (10) is triggered to move and transported until the tray is aligned with the turnover fork (55), the tray is flipped and the dinnerware is collected in the dinnerware basket cart (70). After that the tray is shelved in the tray rack (60) to be pushed away for cleaning and reused.

The touch screen computer (30) is linked to the sorting assembly (100) where the computer (30) can be functioned as an advertising display and also a touch screen control for payment or refund of cash through coin or card slots (20', 20'', 20''') on the control cabinet (18) upon the dinnerware tray is returned onto the conveyor belt (10).

In accordance with the present invention, the refund payment can be made by three modes, cash payment by means of coin, cashless payment by bank into a bank account or to a credit card account. Three options are available to the user of the sorting assembly (100). The

blinking of the warning light (50) indicates the maximum number or volume of the tray rack (60) has reached, and that the tray rack (60) has to be transferred for cleaning or reuse.

FIG. 1A is a schematic exploded view of the apparatus for sorting dinnerware in accordance with the present invention. FIG. 1B is an enlarged perspective view of the position detection switch of the apparatus in accordance with the present invention. In FIG. 1A, the main components of the assembly (100) are shown, wherein a dinnerware pickup point cover plate (65) is provided on the top of the basket cart (70). A pair of protective cover (62) is used to cover the turnover means (49, 44, 46). A pair of channel baffle (51) located at the edge of the platform (11), beneath the control cabinet (18) is provided as guard for the transporting of the conveyor belt (10). A lock (92) is provided on the control cabinet (18) to lock the access of the control cabinet (18) as a plurality of coins are kept therein.

As shown in FIG. 1B, a conveyor motor (48) is provided along the platform (11) to enable the movement of the conveyor belt (10). A turnover axle (57) is mounted within the turnover mean to enable the dinnerware tray be turned over.

FIG. 1C is an enlarged view of the detection switch (89, 99) of the assembly for sorting dinnerware from a dinnerware tray in accordance with the present invention. When the conveyor belt (10) reaches this position, the turnover means start to operate to flip the dinnerware tray.

The dinnerware is dropped from the dinnerware tray into the dinnerware basket cart (70) at a position where the flipping of the dinnerware tray is falling directly to the basket cart (70) for cleaning and drying for subsequent use. In the present invention, there is a tray detection photoelectric switch (45) mounted at the tray exit (64) of the assembly (100) to sense the sliding of the tray into the tray rack (60). The position detection switches (89, 99) are located along the side of the conveyor belt (12) at the tray exit (64) of the platform (11), as shown in FIG. 1B. The dinnerware basket cart (70) is moveably mounted to the assembly (100) such that the dinnerware inside the basket cart (70) can be pushed away for subsequent cleaning.

The alarm indicator or light (50) on the control cabinet (18) is lighted when the tray rack (60) is fully loaded with dinnerware trays. As this point of time, the conveyor belt (12) stops to operate when the alarm light (50) turns on.

In the preferred embodiment of the present invention, a RFID card reader (98) is positioned at a position in alignment with the turnover fork (55), and the reader (98) reads the information of the RFID chip embedded in the dinnerware tray. The protective cover (62) is used to cover

the turnover means comprises a conveyor reducer (49), a turnover reducer (47) and a turnover motor (46).

The conveyor belt (12) is activated when the photoelectric detection switches a RFID reader on the assembly and senses the dinnerware tray is positioned on the top of the conveyor belt (12).

FIG. 2 is a side elevation view of the apparatus for sorting dinnerware in accordance with the present invention. FIG. 3 is the top view of the apparatus for sorting dinnerware in accordance with the present invention. FIG. 4 is the front view of the apparatus for sorting dinnerware in accordance with the present invention. FIG. 5 is the rear view of the apparatus for sorting dinnerware in accordance with the present invention.

The touch screen computer (30) has a payment device being linked to the RFID on the tray wherein a cash or the like is delivered when the conveyor means receives a tray. The mode of payment is optional to the person who uses such sorting assembly. If a cash selection is made, a coin will drop from one of the slot (20', 20'', 20''') to the user.

The conveyor means is maintained in a substantially horizontal position with the dinnerware being initially placed in a horizontal position on the tray.

The control cabinet (18) is provided with an emergency stop button (94) for stop the movement of the conveyor belt (12) of the assembly (100).

In accordance with the present invention, the tray turnover means includes a pair of turnover fork (55), a turnover axle (57), a turnover motor (46), a turnover reducer (47), and a turnover axle working together to flip the dinnerware tray from a horizontal position to an inclined position to drop the dinnerware from the dinnerware tray.

In operation, the dinnerware tray with dinnerware such as plate, bowl, cup, spoon etc is placed horizontally onto the conveyor belt (10) positioned on the platform (11). The photo sensors (???) placed at the side of the conveyor belt (10) are triggered when a dinner tray is detected and the conveyor belt (10) will move horizontally. At the end of the platform (11) near to the tray exit (64), the turnover fork (55) will flip the dinnerware tray such that all the dinnerware like spoon, fork, cup, bowl and plate etc on the dinnerware tray will be collected at the basket cart (70).

The turnover mean will flip the dinnerware tray to 180 degree and the tray will be dropped to the tray rack (60) for collection. The operation of the conveyor belt (10) , the handling of the

dinnerware tray on the tray rack (60) is done automatically when the photo sensors is triggered.

The present invention also relates to a method for sorting dinnerware from a dinnerware tray using the assembly mentioned above. The method comprises the following steps:

- 5 (a) placing a dinnerware tray onto the conveyor belt (12) of the assembly (100), wherein the movement of the conveyor belt (12) is activated when the photoelectric detection switches on the assembly (100) sense the dinnerware tray;
- (b) flipping the dinnerware tray when the conveyor belt (12) is moved to the position of the turnover fork (55) of the platform (11) of the assembly, and reading the information embedded
10 in the built-in RF chip in the dinnerware tray by the RFID sensor located the turnover fork (55);
- (c) transmitting the information of the built in RF chip to the computer of the assembly to proceed with coin refund or the like via the coin return slots (20', 20'', 20'''); and
- (d) sliding the tray into the tray rack (60) automatically after the dinnerware drops into the dinnerware basket cart (70) for cleaning; and
- 15 (e) returning the turnover fork (55) automatically to the original position thereof and awaiting another new dinnerware tray for shelving onto the tray rack (60).

The conveyor belt (12) is temporarily stopped from conveying a new tray in step (b) when the dinnerware tray is being flipped, and the dinnerware tray has to be placed in such a way that the long side and the short side of the dinnerware tray is accurately arranged onto the
20 conveyor belt (12), and the dinnerware drops from the dinnerware tray as a result of gravitational force.

The dinnerware tray is conveyed by the conveyor belt (12) until the tray reaches the position of the turnover fork (55) of the assembly (100). A sensor provided at the turnover fork (55) triggers the turnover fork (55) to flip the dinnerware tray when the dinnerware tray reaches the
25 position of the turnover fork (55).

Many components of the sorting assembly are made from stainless steel which could be lasted for an extended period.

It will be understood that various changes and modifications may be made in the above described construction which provide the characteristics of the invention without departing
30 from the spirit thereof.

CLAIMS:

I. An assembly (100) for sorting dinnerware from a dinnerware tray, said assembly (100) comprising:

(a) a conveyor belt (10) on a platform (11) having a tray entrance (12) and a tray exit (64) , for
5 transporting the dinnerware tray with dinnerware thereon, wherein the dinnerware tray is embedded with a RFID chip containing information such as the status of the tray;

(b) a control cabinet (18) mounted on the top of the platform (11) having a touchscreen computer (30) and a plurality of slots (20', 20'', 20''') for coin or cash refund, an antenna (40) and a warning light (50) to control the sorting of the dinnerware, and a heat ventilation fan
10 (90), and an emergency stop button (94) to cut off the operation of the assembly (100);

(c) a tray turnover means including a pair of turnover fork (55), a turnover axle (57), a turnover motor (46), and a turnover reducer (47) for flipping the dinnerware tray from a horizontal position to an inclined position to drop the dinnerware from the dinnerware tray, wherein the flipping is done when the tray is transported to a position at the turnover fork (55) located along
15 the lateral side of the conveyor belt (10) in between the control cabinet (18) and the tray exit point (64) at the other end of the conveyor belt (10), wherein the flipping turnover fork (55) flips the tray to dispose off the dinnerware from the tray;

(d) a tray rack (60) removably mounted at the tray exit (64) of the platform (11) allowing the tray to be inserted orderly for cleaning and re-use; and

(e) a dinnerware basket cart (70) for collecting dinnerware that dispose off when the dinnerware tray is flipped by the flipping turnover fork (55) of the tray turnover mean, thereby when the dinnerware tray with a plurality of dinnerware are being placed onto the conveyor belt (10), and the conveyor belt (10) is triggered to move and transported until the tray is aligned with the turnover fork (55), the tray is flipped and the dinnerware is collected in the
25 dinnerware basket cart (70), and the tray is shelved in the tray rack (60) to be pushed away.

2. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein the dinnerware is dropped from the dinnerware tray into the dinnerware basket cart (70) to be washed, cleaned and dried for subsequent use.

3. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1,
30 further comprising a tray detection photoelectric switch (45) mounted at the tray exit (64) of the assembly (100) to sense the sliding of the tray into the tray rack (60).

4. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, further comprising a pair of position detection switches (89, 99) located along the side of the conveyor belt (12) at the tray exit (64) of the platform (11).
5. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein the dinnerware basket cart (70) is moveable.
6. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein the control cabinet (18) is provided with an alarm light (50) to indicate that the tray rack (60) is fully loaded with dinnerware trays.
7. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 6, wherein the conveyor belt (12) stops to operate when the alarm light (50) turns on.
8. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein a RFID card reader (98) is positioned at a position in alignment with the turnover fork (55).
9. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein the assembly is provided with a conveyor reducer (49) , a turnover reducer (47) and a turnover motor (46) and are covered with a pair of a protective cover (62).
10. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein the conveyor belt (12) is activated when the photoelectric detection switches sense the dinnerware tray is positioned on the top of the conveyor belt (12).
11. The assembly for sorting dinnerware from a dinnerware tray as set forth in Claim 1, wherein the RFID sensor (98) located under the conveyor belt (12) reads the information of the built-in RF chip in the tray (12).
12. A method for sorting dinnerware from a dinnerware tray using the assembly as set forth in Claim 1, comprising the steps of
 - (a) placing a dinnerware tray onto the conveyor belt (12) of the assembly (100), wherein the movement of the conveyor belt (12) is activated when the photoelectric detection switches on the assembly (100) sense the dinnerware tray;
 - (b) flipping the dinnerware tray when the conveyor belt (12) is moved to the position of the turnover fork (55) of the platform (11) of the assembly, and reading the information embedded in the built-in RF chip in the dinnerware tray by the RFID sensor located the turnover fork (55);

(c) transmitting the information of the built in RF chip to the computer of the assembly to proceed with coin refund or the like via the coin return slots (20', 20'', 20''');;

(d) sliding the tray into the tray rack (60) automatically after the dinnerware drops into the dinnerware basket cart (70) for cleaning; and

5 (e) returning the turnover fork (55) automatically to the original position thereof and awaiting another new dinnerware tray for shelving onto the tray rack (60).

13. The method as set forth in Claim 11, wherein the conveyor belt (12) is temporarily stopped from conveying a new tray in step (b) when the dinnerware tray is being flipped.

10 14. The method as set forth in Claim 11, wherein the dinnerware tray is placed in such a way that the long side and the short side of the dinnerware tray is accurately arranged onto the conveyor belt.

15. The method as set forth in Claim 11, wherein the dinnerware drops from the dinnerware tray as a result of gravitational force.

15 16. The method as set forth in Claim 11, wherein the dinnerware tray is conveyed by the conveyor belt (12) until the tray reaches the position of the turnover fork (55) of the assembly.

17. The method as set forth in Claim 11, wherein a sensor provided at the turnover fork (55) triggers the turnover fork (55) to flip the dinnerware tray when the dinnerware tray reaches the position of the turnover fork (55).

20 18. The assembly as set forth in Claim 1, wherein the control cabinet (18) is provided with an emergency stop button (94) for stop the movement of the conveyor belt (12) of the assembly (100).

25 19. The assembly as set forth in Claim 1, further comprising a tray turnover means including a pair of turnover fork (55), a turnover axle (57), a turnover motor (46), a turnover reducer (47), and a turnover axle working together to flip the dinnerware tray from a horizontal position to an inclined position to drop the dinnerware from the dinnerware tray.