# United States Patent [19]

**Ettlinger, Jr. et al.**

[11] **3,883,422**

[45] **May 13, 1975**


[54] **SILVERWARE FEEDER CONSTRUCTION**


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[73] Assignee: **Avant Industries, Inc.**, Wheeling, Ill.



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[52] **U.S. Cl.** ..... **209/75**; 209/97

[51] **Int. Cl.** ..... **B07c 1/10**

[58] **Field of Search** ..... 209/75, 97, 99, 107



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 3,653,507 | 4/1972 | Ettlinger et al. | 209/97 |
| 3,675,770 | 7/1972 | Ettlinger et al. | 209/97 |



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[57] **ABSTRACT**

An apparatus for feeding silverware including a hopper for collecting the silverware in bulk amounts and means for gradually discharging the silverware from the hopper. The silverware is then conveyed to a sorting stage for dividing the different types of silverware, the sorter defining openings which selectively separate the silverware including spoons of different bowl sizes. Means are provided for then automatically collecting the different types of silverware. The sorter and some other portions of the apparatus are manufactured from extrusions which provide an efficient and versatile mechanism for building beds used for holding, transporting and sorting silverware.


**13 Claims, 8 Drawing Figures**

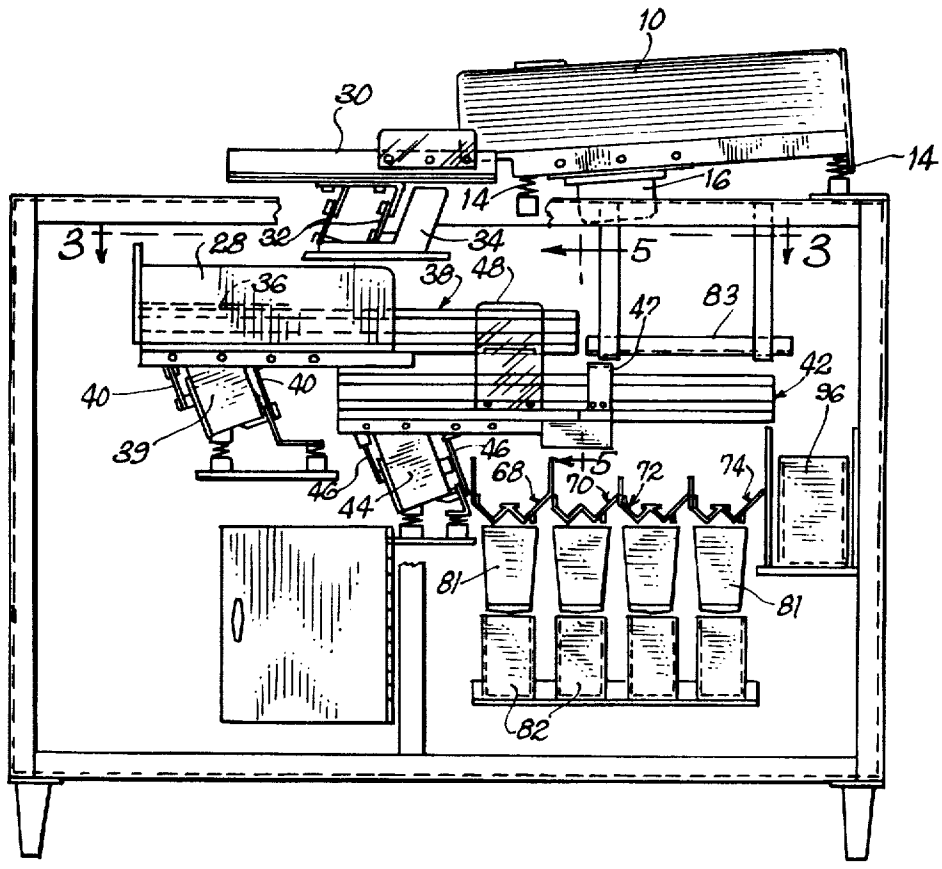


FIG. 1

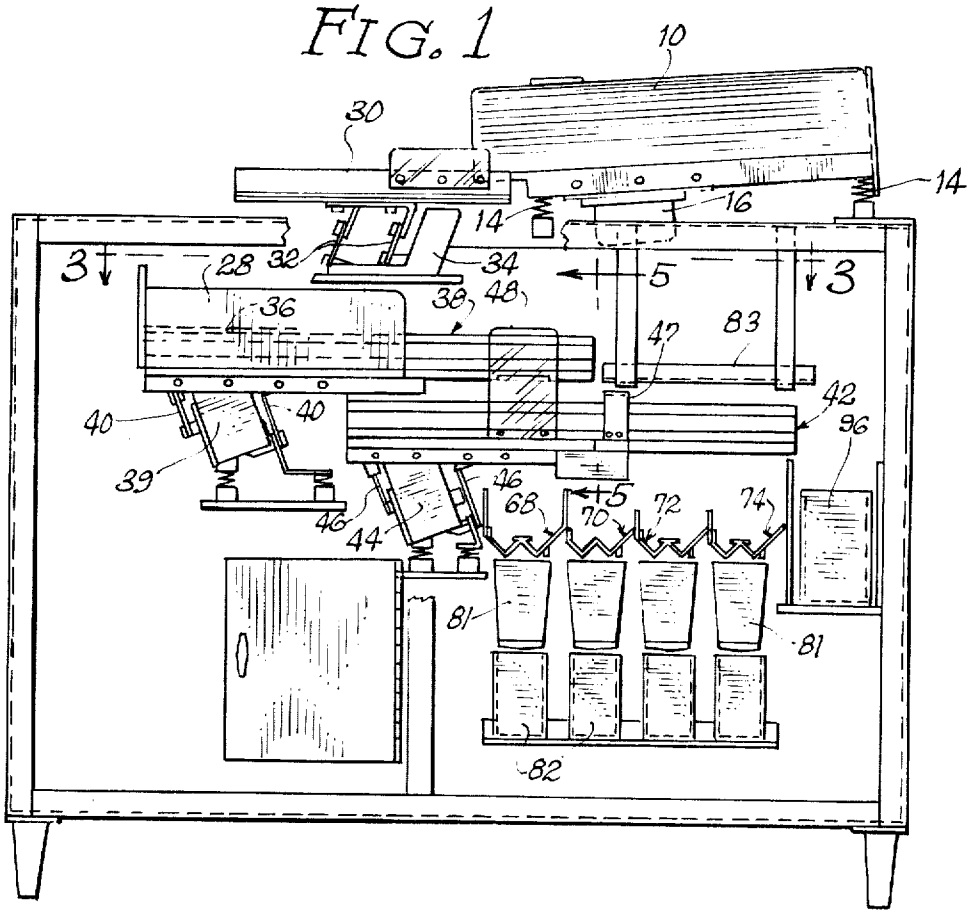



FIG. 2

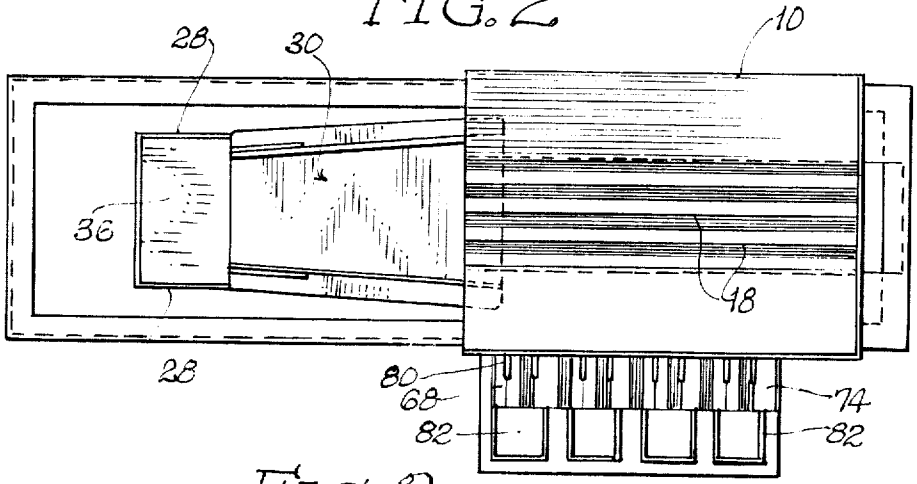



FIG. 3

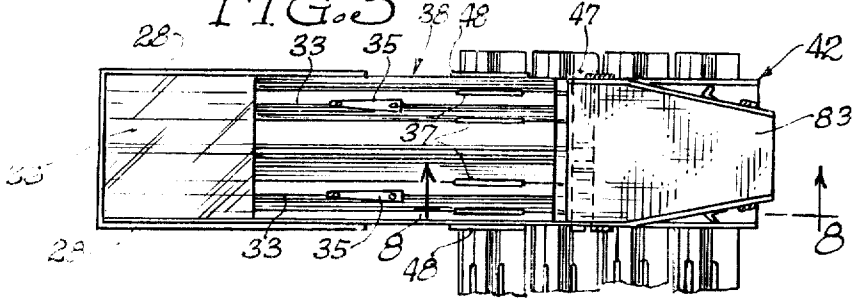


FIG. 4

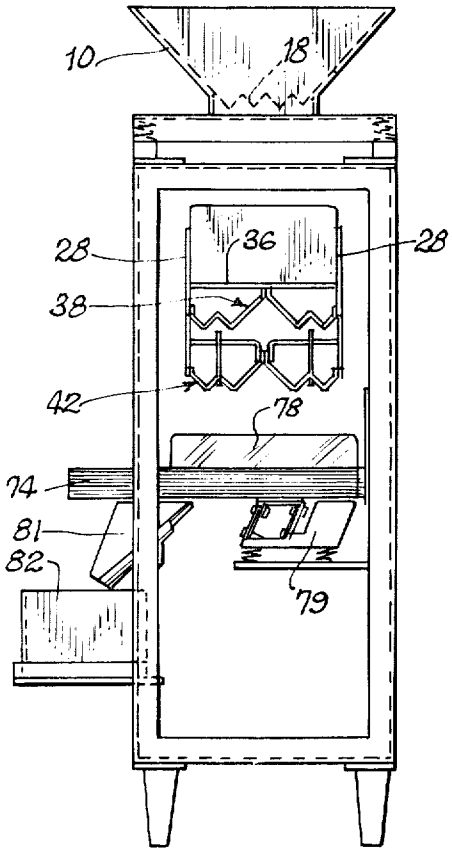



FIG. 5

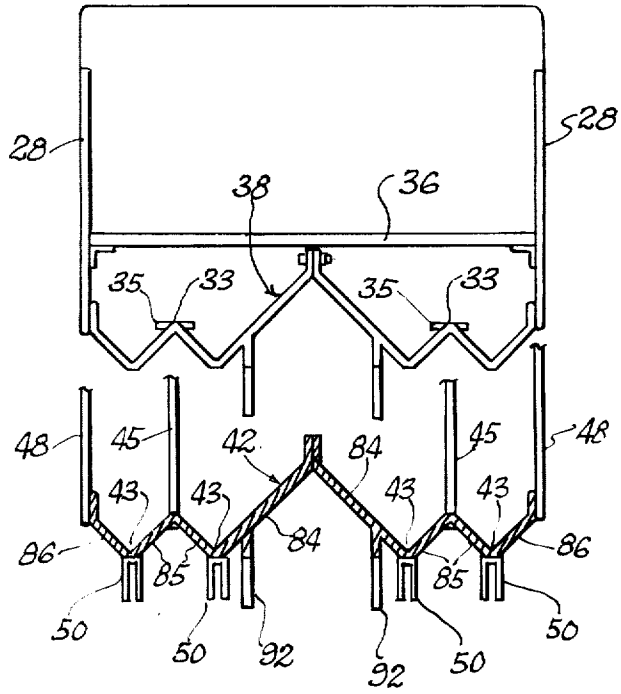



FIG. 6

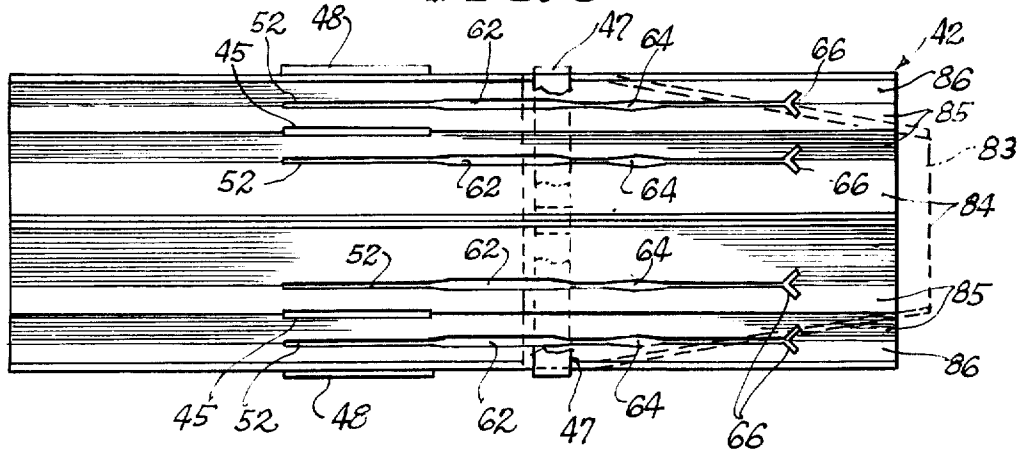


FIG. 7

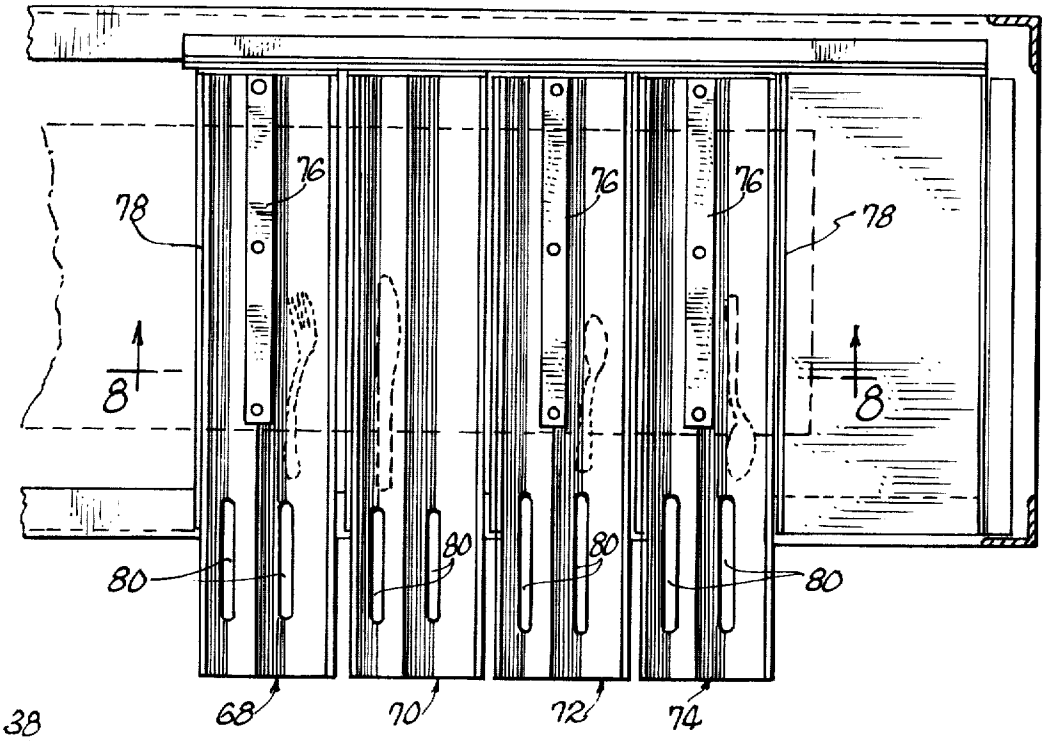
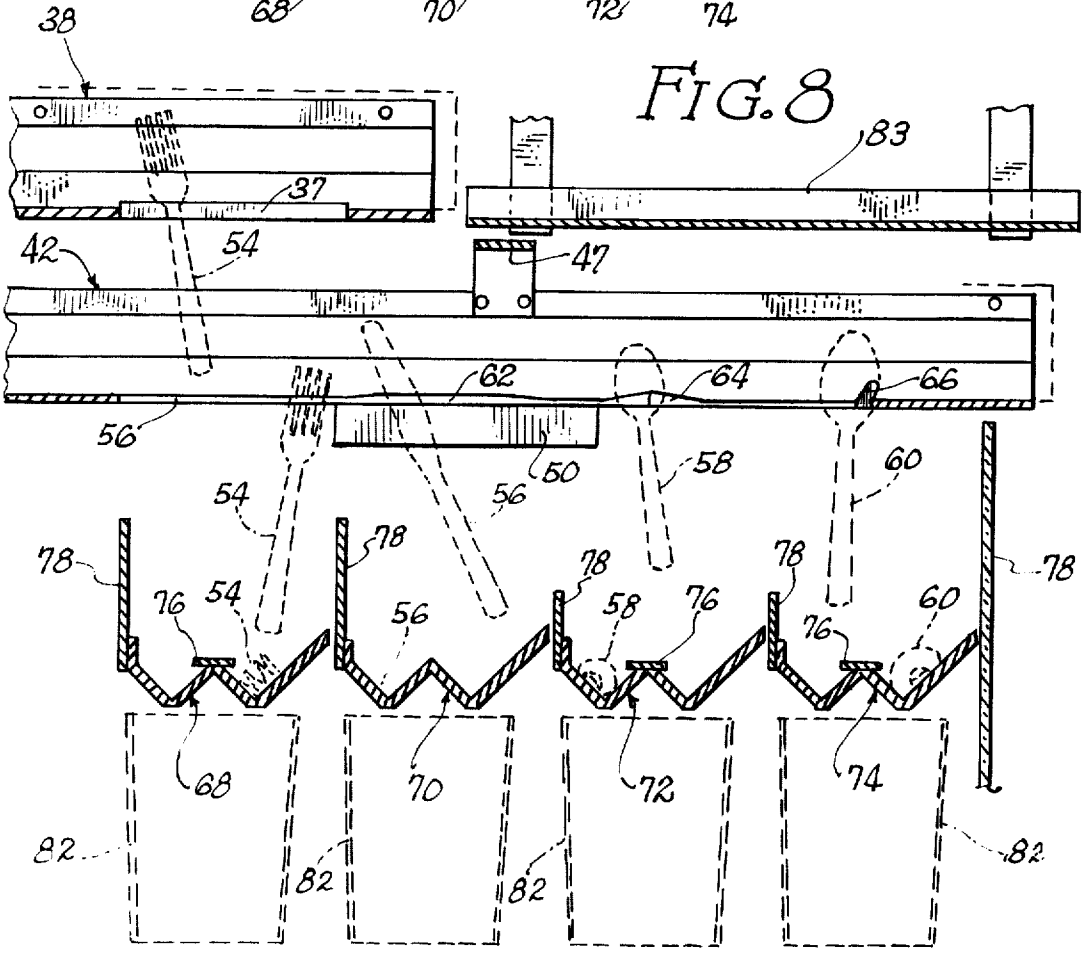

76
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FIG. 8


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# SILVERWARE FEEDER CONSTRUCTION

This invention relates to a feeding, transporting and sorting mechanism for the handling of silverware. The invention will be described with reference to the handling and sorting of silverware in dishwashing operations, and it will be apparent that various features of the invention are applicable to different aspects of these and other similar operations.

The apparatus of the invention is primarily concerned with the sorting and handling of a variety of different types of silverware. The invention is particularly applicable to institutions such as schools, restaurants and industrial cafeterias which handle large volumes of silverware to provide efficient service.

In the case of many operations, sorting of tableware is undertaken manually. Attempts have been made to develop structures which will accomplish automatic separation of knives forks and spoons; however, this has proven to be a difficult task since the applicants have found that work done by others has resulted in prohibitively expensive or primarily inefficient automatic sorting systems.

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 tableware. As outlined in these patents, constructions developed for the sorting of general items of tableware are generally not satisfactory from the standpoint of sorting silverware. The instant invention is primarily concerned with providing improvements in the structures described in these patents.

It has been found that mechanisms which work well under regulated conditions, often do not operate efficiently when peak conditions develop. This is of particular concern in silverware sorting constructions since there are inherently peak hours of activity in restaurants and the like and, therefore, efficient sorting during such peak hours is quite important.

The automatic sorting of silverware is desirable for other reasons. Pieces of silverware represent a proportionally higher number when the total amount of all tableware used in a particular institution is considered. Accordingly, efficient handling of the silverware is extremely important from the standpoint of minimizing labor costs, and the expense of maintaining a large supply of silverware.

As pointed out in the aforementioned patents, it is also particularly necessary in the case of silverware sorting means to provide a reliable and efficient construction. Thus, silverware pieces are relatively small, and could lead to significant maintenance problems if any of these pieces become jammed. This can lead to lost operating time, and significant increases in expense for the owner of the sorting construction.

One of the problems which develops during peak load periods is the inability of various sorters to handle heavy loads of silverware. In many instances, it is necessary to feed silverware sorters in manually controlled lots since the sorters cannot function properly when fed large amounts of silverware in a relatively short period.

It is a general object of this invention to provide an improved silverware sorting apparatus.

It is a more particular object of this invention to provide a silverware sorting apparatus which is particularly useful during peak periods since the sorter can be fed silverware in large amounts while the sorting operation is quite efficiently carried out.



It is a still further object of this invention to provide a silverware sorter which includes means for automatically regulating the feeding of silverware to other sections of the apparatus.

It is a still further object of this invention to provide a silverware sorter of the type described which includes means designed specifically for the separation of spoons having both larger bowl sizes (e.g. soup spoons) and smaller bowl sizes (e.g. teaspoons).

It is a still further object of this invention to provide a sorter construction which includes vibrating beds for supporting and moving silverware, said beds being assembled from extruded or otherwise formed members whereby the construction of the sorting apparatus can be 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:

FIG. 1 is a side elevation of a silverware feeding and sorting construction characterized by the features of this invention;

FIG. 2 is a plan view of the construction;

FIG. 3 is a plan view of internal mechanisms taken about the line 3—3 of FIG. 1;

FIG. 4 is an end elevation of the construction taken from the right-hand side of FIG. 1;

FIG. 5 is an enlarged cross-sectional view taken about the line 5—5 of FIG. 1;

FIG. 6 is an enlarged plan view of the sorting bed utilized in the construction;

FIG. 7 is an enlarged fragmentary plan view illustrating transfer conveyors interposed between the sorting bed and collection chutes of the construction; and,

FIG. 8 is a cross-sectional view taken about the line 8—8 of FIG. 7.

This invention generally relates to an apparatus for handling silverware. The apparatus includes means for feeding silverware which is initially collected in bulk. Conveyor mechanisms, preferably having vibrating mounts for achieving the conveying movement, are utilized for delivering the silverware to a sorting mechanism. The conveyors include an impact plate which operates to "splash" the silverware thereby increasing the spreading of the silverware over the surface to achieve more uniform distrubution with respect to the sorter.

The sorting structure employed with the described feeding mechanisms preferably comprises a structure of the type described in the aforementioned U.S. Pat. No. 3,675,770. This structure, in accordance with this invention, may be modified to include an improved means for separating the silverware, specifically spoons of different sizes. These improved means comprise slots designed to selectively accommodate spoon bowls whereby smaller spoons will pass through the sorting structure at one stage with the larger spoons passing through at a later stage. The slots are also designed so that other silverware, particularly knives and forks will discharge at different positions.

The construction also includes transfer conveyor means located beyond the sorting bed for collecting the individual types of silverware and for conveying these types independently toward a collection area. The transfer mechanisms are designed so that the silverware will drop from this bed through openings which always maintain the working end of the silverware in the upper position. Collection chutes and receptacles, therefore,

receive the silverware with the working ends in the upper position so that the silverware can be conveniently transferred to a washing apparatus. Thus, the silverware in the washing apparatus will have the working ends exposed for maximum washing efficiency. If clean silverware is being handled, then it can be returned to the serving area.

The structure of the invention also includes improved means for constructing conveyor and sorting beds. Particularly, extrusions have been designed which permit the highly efficient and economical assembly of the beds. The extrusions are of a versatile design so that intermediate beds and sorting and conveyor beds can be made with the same extrusions depending upon the particular manner in which the extrusions are assembled. The "extruded" effect could also be achieved by other methods such as molding, forming and the like.

The construction illustrated in the accompanying drawings comprises a main storage hopper **10** designed to collect silverware in bulk amounts. A wash rack, washing basket or other means may be utilized for collecting silverware which is then dumped into the storage hopper. This hopper is mounted on resilient supports **14** and has a bin vibrator **16** mounted on the underside so that silverware dumped into the hopper will be directed toward the discharge end of the hopper.

The hopper may include a bed portion defining V-shaped grooves **18** as shown in FIG. **4.** With this arrangement, the silverware tends to spread in a relatively uniform fashion over the width of the hopper and to align itself parallel with the hopper grooves. If desired, the grooved arrangement may be confined to an area adjacent the end of the hopper.

Beyond the hopper, silverware is conveyed by means of vibrating trough conveyor **30.** This trough comprises a flat pan and is mounted on flexible members **32** and vibrator **34** whereby silverware is conveyed to the discharge end of the trough. Silverware drops from the trough **30** onto an impact surface **36.** The end of the trough is spaced from this impact surface so that a "splashing" effect occurs. The use of the impact surface is particularly desirable since the silverware is effectively spread out across the width of the impact surface.

A grooved conveyor bed **38** includes side panels **28** which provide support for the impact surface, and this bed is in turn supported by vibrator **39** and flexible members **40.** Accordingly, silverware on the impact surface is delivered onto bed **38,** and discharged through slots **37** defined by the bed. The vibrator operates to move the silverware over this bed whereby all of the silverware eventually reaches a slot. The slots are dimensioned so that the silverware will preferably fall through handles-first.

The bed **38** may include deflector members **35** which are attached to the ridges **33** of the grooved bed. These deflector members are of triangular shape, and if any silverware located on the bed is overhanging a ridge, the deflector members will serve to encourage the silverware to align longitudinally in a trough as the silverware progresses along the bed.

Silverware discharged from the bed **38** is passed onto a sorting bed **42.** This sorting bed also comprises a grooved bed which is supported on a vibrator **44** having flexible members **46** associated therewith. Silverware deposited on the bed is transported by the vibrating support. Upright shields **48** and **45** are positioned so that silverware dropping from the bed **38** will not bounce over the sides of the bed **42** but will instead be confined within one of the grooves or troughs defined by the bed.

The taller shields **48** may extend upwardly over the sides of the bed **38** thereby maintaining the beds in alignment with the other shields **45** extending to a position adjacent the bed **38.** Transversely extending braces **47** may be used for rigidity.

Located immediately above the bed **42** is a pan **83** supported on the frame of the construction. This pan receives any overflow from the bed **38** which could occur whenever silverware piles up on the bed to the extent that some pieces do not fall through slots **37.** This silverware on the bed **83** can be readily transferred manually by an attendant into the hopper **10** for recycling.

As an alternative, the pan **83** could be supported on the braces **47** in which case the pan would vibrate with the bed **42** so that the overflow would move along the pan **83** and then be discharged into an overflow collection container **96.** This collection container is, as indicated, also in position to receive any overflow from the bed **42.**

The sorting bed **42** defines elongated slots along the bottom of the troughs defined by the bed. As best shown in FIGS. **6** and **8,** these slots comprise a first narrow section **52** through which forks **54** will immediately pass upon being dropped from the bed **38.** Thus, forks of the type used in restaurant operations and other facilities feeding large numbers of persons are thin throughout their entire length and will readily slide through the narrow section **52.** Due to the thickness of the handles of knives **56,** and also due to the weight of the handles, the knives will lie in a horizontal position over the slot section **52.** The handles of spoons **58** and **60** will pass through slot sections **52;** however, the spoon bowls define an effective cross section such that the spoons will be suspended in this slot area.

The adjacent slot section **62** is wider, and the knife handles will then pass through. The bowls of spoons **58** are, however, sufficiently wide so that the spoons will remain suspended in the area of slot sections **62** especially in the area of the walls of rails **50.** In this connection, reference is made to U.S. Pat. No. 3,675,770 where a description of means for maintaining the spoons in an upright position is provided. Basically, the spoons are confined by a wall extending beneath the bed and when in engagement with the wall, the spoons are held upright and thus prevented from dropping through the bed.

A succeeding slot section **64** is dimensioned to be wide enough so that the smaller spoons **58** (normally teaspoons) will pass through. Larger bowled spoons **60** remain suspended, however, and these spoons are gradually transported to the end of the slot at which point the larger bowled spoons encounter a V-shaped slot section **66.** The V-shaped slot section is such that the bowls of the larger spoons **60** quickly accommodate to the slot section. Thus, the concave nature of a bowl tends toward a cross section corresponding with the shape of the slot section **66** so that the larger bowled spoons readily pass through the slot section.

The construction includes an additional bed or group of beds **68, 70, 72** and **74.** One of these beds is located directly beneath each discharge location provided by the slot sections. Accordingly, the bed **68** positioned

beneath the bed **56** will collect only forks. Bed **70** is provided for collecting knives, and beds **72** and **74** collect smaller and larger bowled spoons, respectively. Deflector members **76** may be provided on the beds, these deflector members functioning in the manner of the deflector members **35**. It has been found that it is not necessary to provide a deflector member for knives due to the fact that the straight edges thereof preclude any hang-up on the bed ridges. Shields **78** to prevent bouncing of silverware off the beds may be utilized. One or more vibrators **79** may be associated with the beds **68–74.**

As best shown in FIG. **7**, the beds **68** through **74** define short slots **80**, and these slots are defined so that the silverware will be deposited in a container such as shown at **82** with the "business end" of the silverware in the upright position. By controlling the position of the silverware, a great deal of operating efficiency is provided from the standpoint of commercial dishwashing operations. Thus, such equipment depends on the force of liquids applied to the articles being washed and by exposing the working ends of the silverware in the dishwashing operation, the chances of providing clean silverware are greatly increased. At the present time, a great deal of manual labor is involved just in the loading of silverware in containers for passage of the silverware through a dishwashing machine. The containers **82** may comprise baskets which are directly insertable into a dishwashing construction so that no handling of the silverware for any reason is required.

As best illustrated in FIGS. **1** and **4**, a chute **81** is positioned at the end of each of the beds **68** through **74** for delivering silverware discharged from the beds to the containers **82.** These chutes tend to further confine the movement of the silverware to insure delivery of the silverware into the containers. As illustrated in FIG. **4**, the containers **82** may be designed to collect silverware in a horizontal position as might be preferred where the silverware is sorted subsequent to washing.

In a preferred form of the invention, a separate container **96** may be positioned at the end of the bed **42** for collecting any silverware which does not pass through the bed. In some instances, the silverware collected in the container **96** may comprise odd-shaped or bent pieces. In other instances, the sorter may deliver a separate type of silverware, for example knives having thick handles, usually hollow-handled knives.

As indicated, the bed structures are preferably made from extrusions defining grooves for carrying the silverware in separate paths. The extrusions define a cross section whereby two or more extrusions can be secured together to form a bed for conveying silverware. Each extrusion section comprises an elongated wall **84**, a shorter opposite wall **86**, and intermediate walls **85**, the grooves **43** being defined between these walls.

FIG. **5** illustrates assemblies of two extrusions joined together to provide beds **38** and **42.** The beds are assembled with the elongated wall **84** connected, and with the shorter walls **86** forming the outside edges of the conveyor bed. The elongated walls provide a sufficient span for receiving the vibrator mounting means. This arrangement also provides a high central barrier wall which is effective from the standpoint of spreading the silverware since equal amounts of the pieces tend to collect on opposite sides of the high central wall. Thus, the sorting operation can be more effectively carried out if the silverware is evenly divided between the respective grooves of a conveyor bed.

The extrusions define downwardly extending ribs including elongated ribs **92** associated with the longer walls **84** and previously described shorter ribs **50** which are provided in pairs beneath each groove. The ribs **92** are particularly useful as mounting means for the vibrators associated with the several beds. All of the ribs serve as strengthening means for the extrusions, and the ribs **50** as described, also function during spoon separation.

Individual extruded members are used for forming the bed sections **68–74**, and these members may be of the same design or modified, as shown, to exclude the rib portions. The use of the extruded members for forming the conveyor beds is highly economical in that these members can be produced on a production basis, and the same extruded cross sections are used for all types of conveyor beds. This reduces inventory problems and thus provides a further saving.

The use of vibrators for achieving movement of silverware along the respective beds represents a preferred form of the invention. The vibrators are a relatively inexpensive and highly efficient means for achieving conveyor movement. Furthermore, these vibrators are virtually maintenance-free when compared with other conveyor structures which require moving parts. The speed of conveyor movement achieved with the vibrators can be controlled depending upon the particular function being undertaken. In the case of the conveyor bed **42**, it is preferred to move the silverware at a higher rate of speed since this does not disrupt the sorting function while it minimizes the possibility of silverware stacking up within the system. In addition to providing a higher speed for the bed **42** relative to the bed **38**, it is also desirable to move the bed **38** at a faster rate than the bed **30.** With this arrangement, silverware discharged onto the beds **38** and **42** gradually spreads relative to the spacing on bed **30** so that the silverware on the bed **42** will be spaced apart sufficiently to achieve a proper sorting operation.

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

That which is claimed is:

**1.** In a construction for sorting spoons wherein the bowls of the spoons are of different sizes, the improvement comprising a sorter bed, said sorter bed defining a plurality of spaced parallel grooves, loading means for depositing spoons on said bed, means associated with the bed for moving spoons along the bed and including at least one opening defined at the bottom of one of said grooves whereby said spoons can pass through said sorter bed, said opening being dimensioned so that the handles of the spoons will pass through the sorter bed with the spoon bowls suspending the spoons on the bed, a first portion of said opening dimensioned to permit the passage of smaller bowl spoons through the opening, and including a second portion of said opening, said second portion defining wing sections adapted to receive bowl edges of larger bowl spoons whereby the larger bowl spoons drop through said sorter bed at said second portion.

**2.** An apparatus in accordance with claim **1** wherein said second portion comprises two wing sections in the

form of narrow slots radiating angularly outwardly from a center point on each side of said opening.

3. An apparatus in accordance with claim 2 wherein said slots define a V-shaped configuration.

4. An apparatus in accordance with claim 1 wherein said opening defines a third portion preceding said first portion, said third portion being dimensioned to receive the wide handle portions of knives whereby knife handles situated over said third portion tilt downwardly and pass through said opening, and including a fourth portion of said opening preceding said third portion, said fourth portion being dimensioned for the passage of forks through said opening.

5. A sorting apparatus for silverware including a conveyor bed for transporting the silverware from one location to another, the improvement wherein said conveyor bed comprises at least two sections, each of said sections comprising an extrusion including at least two integrally formed V-shaped troughs extending side-by-side between the side edges of the extrusion, one of said side edges including an elongated portion extending substantially above the remainder of the associated section to thereby form a barrier wall, said sections being secured together at side edges thereof, securing of the sections at the side edges defining said barrier walls providing a high wall at the center of the bed, rib portions extending downwardly from the underside of said bed, at least some of said rib portions providing means for mounting of the bed, and openings defined by said bed for the passage of silverware, pairs of said ribs being positioned beneath said openings in closely spaced apart relationship to define a channel for engaging silverware extending through the openings.

6. An apparatus in accordance with claim 5 including a vibrator associated with the mounting means for the bed to provide for movement of silverware along the bed.

7. In a method for handling silverware comprising a first bed for supporting the silverware, vibrator means for moving the silverware along the length of the bed, and a discharge position on the bed whereby the silverware drops from the bed, and at least one additional bed and associated vibrator means positioned beneath the first bed, the improvement comprising the steps of operating the vibrator means for said second bed to move silverware along the length of said second bed at a rate faster than the movement of silverware along said first bed whereby the silverware on said second bed is spread more thinly over the bed surface than the silverware on the first bed, and including the step of providing means on said second bed for dividing the silverware into different types, and collecting the respective types at separate locations.

8. In an apparatus for feeding and sorting silverware wherein the silverware is delivered in bulk amounts to a collecting hopper, and a sorting bed for receiving the silverware, said sorting bed including a plurality of parallel grooves spaced apart over the width of the bed, the improvement comprising a plate defining an impact surface interposed in the path of movement of the silverware from the hopper to the sorting bed, said silverware falling onto said surface and spreading substantially evenly over said surface, a conveyor bed supporting said plate, and vibrator means connected to said conveyor bed for moving the silverware off said plate and onto said conveyor bed, said conveyor bed extending to said sorting bed whereby said vibrator means delivers silverware from said conveyor bed to said sorting bed, said plate, conveyor bed and sorting bed being of substantially coextensive width whereby silverware is delivered in substantially even amounts to the grooves of said sorting bed.

9. An apparatus in accordance with claim 8 wherein said conveyor bed defines spaced, parallel grooves substantially aligned with the grooves of said sorting bed whereby the silverware is passed between respective aligned grooves of said sorting bed and said conveyor bed.

10. An apparatus in accordance with claim 8 wherein said sorting bed includes means for sorting spoons when the bowls of spoons on the sorting bed are of different sizes, said sorting means including at least one opening defined at the bottom of one of said grooves whereby said spoons can pass through said sorting bed, said opening being dimensioned so that the handles of the spoons will pass through the sorting bed with the spoon bowls suspending the spoons on the bed, a first portion of said opening being dimensioned to permit the passage of smaller bowl spoons through the opening, and including a second portion of said opening, said second portion defining wing sections adapted to receive bowl edges of larger bowl spoons whereby the larger bowl spoons drop through said sorting bed at said second portion.

11. An apparatus in accordance with claim 10 wherein said second portion comprises two wing sections in the form of narrow slots radiating angularly outwardly from a center point on each side of said opening.

12. An apparatus in accordance witn claim 11 wherein said slots define a V-shaped configuration.

13. An apparatus in accordance with claim 10 wherein said opening defines a third portion preceding said first portion, said third portion being dimensioned to receive the wide handle portions of knives whereby knife handles situated over said third portion tilt downwardly and pass through said opening, and including a fourth portion of said opening preceding said third portion, said fourth portion being dimensioned for the passage of forks through said opening.

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