MACHINE FOR SORTING, ACCORDING TO COLOR, DIFFERENTLY COLORED BOTTLES AND SIMILAR OBJECTS

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MACHINE FOR SORTING, ACCORDING TO COLOR, DIFFERENTLY COLORED BOTTLES AND SIMILAR OBJECTS

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1 The present invention relates to a machine for sorting, according to color, differently colored bottles and similar articles. Machines of said class are particularly useful in breweries, soft drink factories and canning factories, where containers of different color are used for different kinds of beverages or preserves.

It is a primary object of the invention to provide a sorting machine of the kind set forth which is capable of sorting a greater number of containers or other objects per unit of time than previously known sorting machines.

Another object of the invention is to provide a sorting machine in which abrupt accelerations and decelerations of the objects to be sorted are avoided so that breakage is reduced to a minimum even when the machine is operated at a high speed.

Still another object of the invention is to provide a sorting machine of a very simple and robust design which requires a minimum of supervision and maintenance.

Other objects, together with the foregoing, will be apparent from the following description and the drawings which illustrate an embodiment of the invention, it being understood that the description is for purposes of illustrating and that the invention is to be construed only in view of the prior art and the appended claims.

In the drawings:

Fig. 1 is a sectional elevation through a machine for sorting white and brown beer bottles.

Fig. 2 is a top view of the machine.

Figs. 3 and 4 show on a larger scale a detail as viewed in the direction of the arrows III in Fig. 1.

Fig. 5 is a top view on a larger scale of an electromagnet which forms part of the machine, the top of the housing being removed.

Fig. 6 shows on a larger scale a detail as viewed in the direction of the arrows VI in Fig. 1.

Referring to the drawings, the frame of the machine is formed by a cast base 10 an four vertical posts 11 rising from the base and held together at their upper ends by a rectangular frame member. The cast base 10 forms the lower part of a divisible housing 12 containing a wheel 15 which is keyed to a vertical shaft 14. The latter is journaled at its lower end in a sliding bearing 15 provided in the base 10 and is journaled at its upper end in a sliding bearing 16 provided in a cylindrical extension 17 of the upper part 18 of the housing 12.

The shaft 14 is suspended in an axial antifriction bearing 19 which is positioned between a shoulder 20 on the shaft and the upper surface of the cylindrical extension 17. Rotatably 5 mounted on the freely extending upper end of the shaft 14 is a circular table 21 which rests with its hub 22 on the upper side of the shoulder 20 through the intermediary of a washer 23 of brass or the like. Secured to the upper end of the shaft 14 by means of a screw bolt 24 is a driving plate 25 provided with a number of axially extending holes 26 into which a corresponding number of driving pins 27 enter. Under the action of a number of compression springs 28 the driving plate 25 presses against the upper surface of the hub 22 of the table through the intermediary of a washer 29 of brass or the like, which is put over the driving pins 27, the pressing force being adjustable by turning of the screw bolt 24. The numbers 23 to 28 form together an adjustable friction coupling between the shaft 14 and the table 21. For rotating the shaft 14 there is provided an electric motor 30 which by means of a belt pulley 31 and two cone belts 32 drives a worm, not shown, which is in engagement with the worm wheel 33.

Uniformly distributed around the circumference of the table 21 are a plurality of plungers 34 which are slidable in vertical guides 35 in the table. Each plunger carries at its upper end a supporting shelf 37 for a bottle, not shown. Right opposite each shelf there is provided an outwardly open semi-circular lateral support 38 for the bottle.

At its lower end each plunger 35 is provided with a roller 39 adapted to cooperate with a stationary cam 40 which is supported by the frame post 11 and is held in centered position with respect to the axis of rotation of the table 21 by means of a spider 41 pushed over the cylindrical extension 17 of the housing. The plungers 35 are normally held in their upper limit positions shown to the left in Fig. 1 by means of a stop arm 42 which is turnable about a vertical pin 43. For locking each stop arm 42 either in its arresting position shown to the left in Fig. 1 or in its releasing position shown to the right in the same figure there is provided a spring actuated locking bolt 44. The cam 40 is so shaped that after release of a stop arm 42, during one revolution of the table 21 the corresponding plunger 35 first slowly lowers itself under the action of gravity from its upper limit position to its lower limit position, maintains this position during part of the revolution, thereupon slowly rises back to its upper limit position and maintains the said position during the rest of the revolution.

Adjacent to that side of the table 21 where the cam 40 extends at a constant highest level the
2,627,975

Table is passed by a belt conveyor 45 which extends on a level with the shelves 37 in their upper limit position and moves in the direction of the adjacent arrows. By means of that portion of the belt conveyor 45 which runs onto the table the bottles to be sorted are supplied to the table. For transferring the bottles from the belt conveyor 45 to the shelves 37 in their upper limit position there is provided a star wheel 46 provided with catching arms, said star wheel being secured to a vertical shaft 47 and being adapted to be turned through one arm pitch for each shelf 37 that the magazine on the wheel, the turning being effected by means of a driving wheel 48 positioned on the lower end of the shaft 47 and a number of fingers 49 (Figure 6) which are uniformly spaced around the circumference of the table 21 and engage with the driving wheel.

By means of the conveyor belt 45 the bottles to be sorted are fed one at a time into the spaces between the catching arms of the star wheel 47 and are moved by the star wheel along a circular guide 50 on a stationary guide plate 51 from the conveyor over to that shelf 37 which just passes the star wheel. To prevent more than one bottle at a time into a star wheel space there is provided laterally of the conveyor 45 a blocking wheel 52 which is normally held in blocking position by a ratchet arm 53 on a vertical shaft 54 under the action of a spring 55 which actuates an arm 56 rigidly secured on the shaft 54. The ratchet arm 53 is moved to a position for releasing the blocking wheel 52 each time the arm 56 is moved away by a tooth on the driving wheel 48, thus permitting the blocking wheel 52 to let a bottle pass.

During the continued rotation of the table 21, the bottles transferred to the various shelves 37 pass one at a time through a beam of light which is directed from a lamp 57 radially towards a photo-electric cell positioned in a housing 58. Said cell is included in an electric circuit of a kind known per se in such a manner that the weakening of the light beam, which occurs when a dark bottle passes between the lamp and the photo-electric cell, causes an electromagnet 59 to be actuated. As seen in Fig. 5 the armature of the electromagnet is provided with a radially displaceable, normally inoperative abutment 60. When the passage of a dark bottle drops its armature, the abutment 60 enters the path of a radially extending tooth 61 on the appertaining stop arm 42 (see Figure 3), and causes the ratchet arm 42 to be turned from its locking position shown in Fig. 3 to its releasing position shown in Fig. 4, thereby permitting the plunger 35 to follow the cam 43 during the continued rotation of the table 21 and lower itself to its lower limit position. As soon as the dark bottle has passed through the beam of light, the magnet 59 attracts its armature anew and pulls the abutment 60 back to its inoperative position, where it remains also when a white bottle passes through the beam of light. At that side of the table 21 which is opposite to the conveyor 45 all the white bottles will thus occupy their upper position and all dark bottles their lower position.

In level with the lower limit position of the shelves 37 there is provided on that side of the table 21 which is opposite to the conveyor 45 a second conveyor 65 which moves away from the table. On the same side of the table there is furthermore provided a star wheel 61 on a turnably journaled vertical shaft 66, the said star wheel 67 being similar to the star wheel 46 but being positioned on a so much lower level than the latter that it engages with only those bottles which on the passage past the star wheel occupy a lowered position, thus only with the brown bottles. The brown bottles are transferred by the star wheel 67 from the respective shelf 37 via a guide 68 onto the conveyor 65 which carries them to a delivery station for brown bottles. The white bottles, which are carried by shelves in their upper limit position, are moved onto a third star wheel 70 which transfers the bottles from the shelves to that portion of the first conveyor 45, which moves away from the table 21. By said portion of the conveyor 45 the bottles are transported to a delivery station for white bottles.

After having passed the star wheel 70 those shelves 37, which occupy their lower limit position, are moved back to their upper limit position through cooperation with the cam 40. Hereafter the released locking arm 62 strikes against a stationary abutting plate 71 and is moved by the latter back to its locking position (see Fig. 4), so that all the shelves 37 are kept locked in their lifetime from being moved by the feeding wheel 46 for unsorted bottles.

The invention is not limited to the particular embodiment shown on the drawings and described in detail above but various modifications are conceivable without receding from the inventive idea. The preceding example may readily be modified to permit of sorting objects of more than two different colours, for instance for sorting white, green and brown bottles. When objects of more than two different colours are to be sorted, each shelf is provided, in addition to upper and lower shifting positions with intermediate shifting positions, the photoelectric controlling means being arranged to cause the respective shelves to be shifted to that shifting position, which corresponds to the colour of the object supported by the individual shelf. When sorting objects of more than two colours it may be preferable to provide two or more photoelectric controlling circuits, for instance one for each additional colour, and to allot to each shelf two or more arresting means positioned on different levels and arranged to latch the proper level under control of the photoelectric cells. Also other modifications are conceivable.

We claim:
1. A machine for sorting differently colored bottles, jars and other articles, according to color, which comprises in combination, a movable carrier, a plurality of bottle supporting shelves supported by and individually vertically shiftable in said carrier to different levels, a first conveyor adjacent said carrier for transporting unsorted bottles to said carrier, means associated with said conveyor for transferring the unsorted bottles successively from said first conveyor onto said shelves, means for positioning said shelves at a predetermined level before they receive the bottles from said first conveyor, photo-electric means arranged so as to respond to the color of the bottles passing by on said shelves through a control circuit and operable to bring about gradual shifting movement of the respective shelves during continued movement of the carrier to a level position corresponding to the color of the article supported thereby except when the color of the respective article on a shelf is that pertaining to the said pre-determined level of the shelves, at least two additional
2,627,975

5 conveyors leading away from said carrier at different levels, one of said additional conveyors being arranged for receiving articles of a color different from the color of the articles received by another additional conveyor, and means respectively associated with said additional conveyors and operable successively to engage articles supported by shelves at the corresponding levels when said articles pass by said additional conveyors to thereby remove said articles from said additional conveyors and moving said articles onto the respective additional conveyor, and lock means associated with said shelves in their uppermost position as they approach said first conveyor, said lock means being under the control of said photo-electric means.

3. A sorting machine according to claim 1, characterized in that one of the additional conveyors is arranged at a level corresponding to the lowermost position adapted to be occupied by said shelves.

4. A sorting machine according to claim 1, characterized in that one of said additional conveyors is positioned at a level conforming to the uppermost position adapted to be occupied by said shelves.

5. A sorting machine according to claim 1, characterized by plunger means supporting the shelves and vertically reciprocated mounted in the carrier and having means at its lower end to engage said cam means.

6. A sorting machine according to claim 1, characterized by a friction coupling drivingly connected to the carrier and arranged for driving connection with a motor.

7. A sorting machine according to claim 1, characterized by rotatable star wheels respectively associated with the conveyor and the additional conveyors and provided with a plurality of arms, said star wheels having associated therewith means operable to move each star wheel for each passing shelf an angle corresponding to the angle formed by two adjacent arms.

8. A sorting machine according to claim 1, characterized by semi-circular supporting means respectively associated with each vertically shiftable shelf for laterally supporting the article on the respective shelf.

9. A machine for sorting differently colored bottles, jars and other articles according to color, which comprises in combination, a movable carrier, a plurality of bottle supporting shelves supported by and individually vertically shiftable in said carrier to different levels, a first conveyor adjacent said carrier for transporting unsorted bottles to said carrier, means associated with said conveyor for transferring the unsorted bottles successively from said first conveyor onto said shelves, means for moving said shelves to their uppermost position as they approach said first conveyor and locking means for latching the shelves in their said uppermost position, photo-electric means arranged so as to respond to the color of the bottles passing by on said shelves, means controlled by said photo-electric means and operable to bring about releasing of the locking means of the shelves having thereon articles of a color not pertaining to the uppermost level of the shelves, means operable during continued movement of the carrier to a level position corresponding to the color of the article supported thereby, at least two additional conveyors leading away from said carrier at different levels thereof, one of said additional conveyors being arranged for receiving articles of a color different from the color of the articles received by another additional conveyor, means respectively associated with said additional conveyors and operable successively to engage articles supported by shelves at the corresponding levels when said articles pass by said additional conveyors and moving said articles onto the respective additional conveyor, and lock means associated with said shelves in their uppermost position as they approach said first conveyor, said lock means being under the control of said photo-electric means.

10. A machine for sorting differently colored bottles, jars and other articles according to color, which comprises in combination, a movable carrier, a plurality of bottle supporting shelves supported by and individually vertically shiftable in said carrier to different levels, a first conveyor adjacent said carrier for transporting unsorted bottles to said carrier, means associated with said conveyor for transferring the unsorted bottles successively from said first conveyor onto said shelves, means for moving said shelves to their uppermost position as they approach said first conveyor and locking means for latching the shelves in their said uppermost position, photo-electric means arranged so as to respond to the color of the bottles passing by on said shelves, means controlled by said photo-electric means and operable to bring about releasing of the locking means of the shelves having thereon articles of a color not pertaining to the uppermost level of the shelves, means operable during continued movement of the carrier to a level position corresponding to the color of the article supported thereby, at least two additional conveyors leading away from said carrier at different levels, one of said additional conveyors being arranged for receiving articles of a color different from the color of the articles received by another additional conveyor, and means respectively associated with said additional conveyors and operable successively to engage articles supported by shelves at the corresponding levels when passing by said additional conveyors and removing said articles from said additional conveyors and moving said articles onto the respective additional conveyor, one of said additional conveyors being arranged at a level substantially corresponding to the level of said first conveyor and being in substantial alignment with the latter.

10. A machine for sorting differently colored bottles, jars and other articles according to color, which comprises in combination, a movable carrier, a plurality of bottle supporting shelves supported by and individually vertically shiftable in said carrier to different levels, a first conveyor adjacent said carrier for transporting unsorted bottles to said carrier, means associated with said conveyor for transferring the unsorted bottles successively from said first conveyor onto said shelves, means for shifting said shelves to their uppermost position as they approach said first conveyor, photo-electric means arranged adjacent said first conveyor so as to respond to the color of the bottles passing from said conveyor to said shelves, locking means associated with said shelves for maintaining the same in their uppermost position, means operatively connected with said photo-electric means and adapted in response to the actuation of the latter by any color except that pertaining to the uppermost level of the shelves to release said locking means to thereby permit shifting movement of the respective shelf to a level position corresponding to the color of the article supported thereby, means operable during continued movement of the ca-
2,627,975

rier for gradually causing shifting of the released shelves, at least two additional conveyors leading away from said carrier at different levels, one of said additional conveyors being arranged for receiving articles of a color different from the color of the articles received by another additional conveyor, and means respectively associated with said additional conveyors and operable successively to engage articles supported by shelves at the corresponding levels when said articles pass by said additional conveyors to thereby remove said articles from said additional conveyors and moving said articles onto the respective additional conveyor.

11. A sorting machine according to claim 10, characterized by abutment means having an operative position and a second position where it is operable to release said locking means, said abutment means being under the control of said photo-electric means.

12. A sorting machine according to claim 10, characterized by a fixed abutment engageable with said locking means and operable to return the same successively to locking position as the respective shelves approach said first conveyor.

13. A machine for sorting differently colored bottles, jars and other articles, according to color, which comprises in combination, a movable carrier, a plurality of bottle supporting shelves supported by and individually vertically shiftable in said carrier to different levels, a first conveyor adjacent said carrier for transporting unsorted bottles to said carrier, means associated with said conveyor for transferring the unsorted bottles successively from said first conveyor onto said shelves, a cam means for moving the shelves to their uppermost position as they approach said first conveyor, locking means for each shelf to lock the shelves in their said uppermost positions, photo-electric means arranged so as to respond to the color of the bottles passing by on said shelves, means controlled by said photo-electric means and operable to bring about unlocking of the locking means of the respective shelves corresponding to the color of the article supported thereby, at least two additional conveyors leading away from said carrier at different levels thereof, one of said additional conveyors being arranged for receiving articles of a color different from the color of the articles received by another additional conveyor, means respectively associated with said additional conveyors and operable successively to engage articles supported by shelves at the corresponding levels when said articles pass by said additional conveyors to thereby remove said articles from said additional conveyors and moving said articles onto the respective additional conveyor, and said cam means comprising a gradual fall for slowly lowering the shelves which are unlocked after they are moved beyond the photo-electric means by the carrier.

14. In a sorting machine; a rotatable carrier having a plurality of vertically shiftable shelves circumferentially spaced thereon about the periphery thereof, a feeding station at one point about the periphery of the carrier comprising means for delivering articles to be sorted radially inwardly to said shelves, at least two discharge stations located at other points about the periphery of the carrier spaced from the said one point and located at respectively different levels, a stationary cam engaging said shelves shaped to raise the shelves to their uppermost position as they approach said feeding station, a color-sensitive photo-electric scanning means positioned to scan articles on the shelves as they leave the feeding station, said cam comprising a gradual fall between the scanning means and said discharge stations, a lock for each shelf normally locking the associated shelf in its uppermost position as it leaves the feeding station, means under the control of the scanning means for individually releasing said locks whenever the color of the article on the associated shelf does not pertain to the uppermost position of the shelf, and means at said discharge stations for discharging articles on the shelves at the levels pertaining thereto radially outwardly from the said shelves.

15. A sorting machine according to claim 14 wherein one of the discharge stations is at the same level as the feeding station.

16. A sorting machine according to claim 14 wherein the means for feeding the articles onto the shelves at the feeding station and for discharging them from the shelves at the discharge station are driven by the carrier thereby to effect synchronization of the said means and the carrier.

17. A sorting machine according to claim 14 wherein means are provided for returning the released locks to locking position after the respective shelves have been moved to their uppermost position by the said cam.

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