Dec. 14, 1943. R. A. A. WILLENS 2,336,582

APPARATUS FOR SORTING OF ARTICLES ACCORDING TO SIZE

Filed April 15, 1941

Fig.1a.

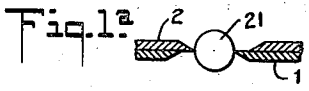


Fig.1b.

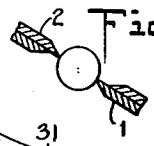


Fig.1.

Fig.1c.

Fig.1d.

Fig.1e.

Fig.1f.



Fig.1g.

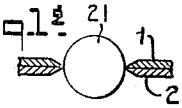


Fig.2.

Fig.3.

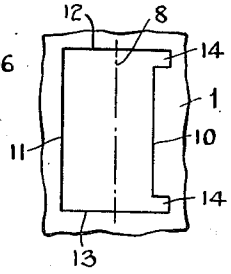
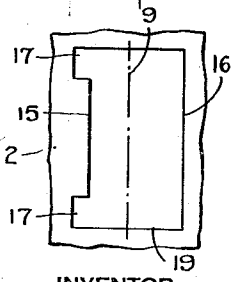


Fig.4.



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APPARATUS FOR SORTING OF ARTICLES ACCORDING TO SIZE

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In Great Britain May 8, 1940

5 Claims. (Cl. 209—87)

This invention relates to the sorting of articles according to size, and is particularly concerned with the sorting of yarn packages in accordance with the amount of yarn contained therein.

According to the present invention an apparatus for sorting articles according to size comprises a pair of superposed sheet-like elements each having at least one aperture therein, each aperture overlapping an aperture in the other member and having a gauging edge cooperating with a gauging edge in the other member to form a compound aperture, and means for sliding said elements relatively to one another so as to increase the distance between said gauging edges and to allow an article resting in said compound aperture to pass through it at a stage depending on the size of the article. Preferably the apertures are formed in a pair of plates, the sliding motion being effected by rotating the superposed plates at the same speed about slightly different axes. In this way, the relative motion of the two plates is accompanied by a motion of both of them together relative to a series of chutes or containers into which the articles fall at different points along the path followed by the compound apertures, so that any particular degree of enlargement of the opening is associated with a particular point of said path, and with a particular chute or container by which, in consequence, articles of a particular size are collected. The invention, though applicable to the sorting of articles generally, is particularly applicable to the sorting of yarn packages, since the mere resting in an aperture of increasing size is not liable to injure the yarn or the surface of the package. The invention will be described hereafter, in this particular connection.

The mechanism required for sorting yarn packages or other articles in this manner is very simple in character involving very few separate moving parts. Thus, it may consist essentially of a pair of circular plates adapted to be driven at equal angular speeds about axes offset from one another by a slight amount preferably equal to or slightly exceeding half the range of diameters of the packages to be sorted. A number of apertures are provided in each plate, each overlapping with a corresponding aperture in the other, so that each pair of overlapping apertures forms a smaller compound aperture whose size depends on the position of the two apertures around the plates, and changes as the plates rotate. The aperture in each plate provides, in the compound aperture, a gauging edge parallel to another gauging edge provided by the aperture in the other plate, and it is the moving apart of these gauging edges, on account of the fact that the plates rotate eccentrically with respect to each other, that causes the enlargement of the compound aperture as the plates rotate. In addition to the gauging edges, the compound aperture has edges at right angles thereto, by which the package is longitudinally positioned in the aperture; preferably both these edges are provided in the same plate, the other plate being cut away so as not to interfere with these edges at any stage in the rotation of the plates at which gauging is taking place. Where the packages to be sorted are in the form of flanged bobbins, the plates must also be cut away at the ends of the gauging edges so as to accommodate freely the flanges of a partly filled package.

The invention is particularly applicable to the sorting of bobbins or similar packages that are to be employed for the making of warps. The invention is especially convenient where the packages contain artificial yarns and more particularly artificial yarns produced by the dry spinning or evaporative method that is frequently employed in the production of yarns of cellulose acetate or other organic derivative of cellulose. In the production of artificial yarns the yarns may be wound as they are produced upon bobbins or like packages for which purpose a machine may be employed on which a large number of bobbins are wound simultaneously. It is convenient to run the bobbins for a predetermined time so that a predetermined amount of yarn is wound thereon, the bobbins on a given machine being systematically changed when they are full so that they all run for the same time. Where a breakdown occurs, however, so that one or more bobbins on the machine have not been running for the full predetermined time, it is not convenient to leave such bobbins after the rest have been changed and consequently some bobbins may be produced which do not carry the full quantity of yarn. When such bobbins are employed for warping they do not run for the same number of warps as the other bobbins which contain the full quantity of yarn and this leads to inconvenience and delay in the warping operation. Consequently it is desirable that these bobbins should be segregated from the rest and used separately, and further that they should be sorted whereby in a single warping operation there may be employed a number of incomplete bobbins all containing substantially the same quantity of

yarn. The present invention is, therefore, useful for sorting out the incomplete bobbins for this purpose.

By way of example one form of machine according to the invention suitable for sorting flanged bobbins will now be described in greater detail with reference to the accompanying drawing, in which

Figure 1 is a plan of the machine;

Figures 1*a* to 1*g* are diagrams indicating the distances between the gauging edges at different stages;

Figure 2 is a side elevation of the machine with the guards omitted for greater clarity, and

Figures 3 and 4 are detail views showing the form of the gauging apertures in the two plates respectively.

The essential parts of the machine are two horizontal contacting circular plates 1, 2 of about 3 feet in diameter, the lower plate 1 being rotatable about a hub 3 while the upper plate 2 is rotatable about a vertical shaft 4 extending upwards from the hub 3 and having its centre displaced from the centre of the hub. The plates 1, 2 are driven at exactly equal angular speeds by providing gear teeth 5 round the edge of each plate, and a worm 6 engaging both sets of gear teeth 5 at one of the two points where the edges of the plates 1, 2 intersect.

Each of the plates contains twelve apertures 7 formed on radii (indicated at 8 and 9 in Figs. 3 and 4 respectively) that are evenly spaced about the centre of the plate. In the lower plate 1 the apertures have a shape, shown in Fig. 3, that is generally rectangular, the longer sides 10, 11 being parallel to the radius 8 on which the plate is formed and the shorter sides 12, 13 at right angles to that radius. The shorter sides 12, 13 are spaced apart by a distance equal to the length of the bobbins to be gauged, the outer side 12 being close to the edge of the plate 1. The right-hand longer side 10 of the aperture as shown in Fig. 3, parallel to the radial line 8 and constituting the gauging edge, is spaced from the line 8 by a distance equal to the radius of a half-filled bobbin and at the ends of the side 10 recesses 14 are made of sufficient width and depth to accommodate freely the flanges of an empty bobbin. The left-hand side 11 of the aperture is spaced from the right-hand side 10 by a distance slightly exceeding the diameter of a full bobbin. It will be seen that the centre line of each aperture is thus offset from the radial line 8 parallel to its longer edges 10, 11, a greater part of the aperture being to the left than to the right. The apertures in the upper plate 2 as shown in Fig. 4 are generally similar in form to those in the lower plate 1, except that the sides 15, 16 are longer (radially) than the sides 10, 11 by an amount slightly exceeding the eccentricity between the plates, and the allowances 17 for the flanges at the ends of the gauging edge 15, which are in this case on the left-hand side of the apertures, exceed the thickness of the flanges by an amount also slightly exceeding the eccentricity between the plates. The outer edge 18 of each aperture in the upper plate 2 is at the same distance from the edge of the plate as the outer edges 12 of the apertures of the lower plate 1. The edges 11, 16, 18, 19 of the two apertures, shown in Figs. 3 and 4 as backed by dotted lines, do not come in contact with the bobbins, and may, if desired, be cut back considerably, for example to save weight without affecting the form of the compound aperture.

The plates 1 and 2 are arranged one over the other, so that the gauging edges 15 of the apertures of the upper plate 2 are parallel to the gauging edges 10 of the corresponding apertures of the lower plate 1, and since the plates rotate with exactly equal angular speeds, this condition is always maintained. In the compound apertures thus formed, the gauging edges 11, 15 when closest together, as shown in Fig. 1*a* are spaced apart by a distance equal to the mean bobbin diameter minus the eccentricity of the plates, and when furthest apart, as shown in Fig. 1*g*, by a distance equal to the mean bobbin diameter plus the eccentricity. The eccentricity is therefore arranged to be equal to half the difference between the diameter of an empty bobbin and that of a full one, so that the spacing between the edges 10, 15 ranges from the diameter of an empty bobbin to that of a full one. The sides of the apertures forming the gauging edges are bevelled, (as shown in Figs. 1*a* to 1*g*), so that the gauging edges 10, 15 are formed at the contacting faces of the two plates 1, 2.

Above the two plates 1, 2 is a sloping chute 20 of a width sufficient to accommodate the length of a series of bobbins 21 rolling down it, the chute 20 being carried on rods 48 projecting from a collar 49 on the shaft 4. On each side of the bottom of the chute 20 is a vertical spindle 22 having two hooked levers 23, 24 and a cam 25 mounted thereon. The cams 25 are adapted to be engaged by projections 26 on the upper side of the upper plate 2, which thereby rotate the spindles 22 and the hooked levers 23, 24. The rotation of the levers 23 releases a bobbin 21 held by the levers at the bottom of the chute while at the same time the levers 24 project over the side walls of the chute and prevent the remaining bobbins 21 from rolling down to take the place of the one released. When the projections 26 have passed the cams 25, the spindles 22 return to their original position under the influence of springs 27, so allowing the remaining bobbins to roll down, the lowest remaining bobbin being arrested by the hooked ends of the levers 23. In this way, the chute 20 delivers the bobbins 21 to the compound apertures 7 one at a time as the apertures in the superposed plates 1, 2 pass below the bottom of the chute.

Extending in a clockwise direction from the bottom of the chute 20 to a point diametrically opposite is the gauging half of the machine, in which sorting takes place. Seven apertures marked *a*–*g*, are shown in Fig. 1 as occupying this half of the machine and the seven corresponding Figures 1*a* to 1*g* show how the gauging edges 10, 15 are at different distances apart at the different positions, so that each pair of edges move steadily apart as the aperture bounded by them moves round the gauging half of the machine. The remaining half of the machine is covered by means of a guard 28 while a further guard at 29 covers the gear teeth round the gauging half of the machine, and the worm 6. These guards are omitted in Fig. 2. Beneath the two plates 1, 2 round the gauging half of the machine are disposed a series of chutes 30 to 40 made of sheet metal, fabric or other sheet material, and mounted on rods 41 extending, as shown in Fig. 2, from a flange 42 at the top of the pedestal 43 forming the base of the machine. Of the eleven chutes 30 to 40, the first chute, 30, receives bobbins which have substantially no yarn on them (say up to 1% of the full capacity of the bobbin) and fall through the opening as soon as they are delivered to it from the bottom of the chute 20. The remaining ten chutes 31 to 40 are arranged

to receive bobbins having successively greater amounts of yarn by increments of 10% of the full capacity of a bobbin, the chute 31 taking bobbins having from, say 1%, up to 10% of the amount of yarn on a full bobbin, the chute 32 receiving bobbins containing from 10 to 20% and so on, up to the chute 40 which receives bobbins containing from 90 to 100%. It will be noted that the angles subtended at the centre of the machine by the several chutes are not equal. This is because, firstly, the increase in width of the apertures, though steady, is not uniform, and secondly because equal increments of weight do not imply equal increments of bobbin diameter. The sizes and positions of the chutes 30–40 are calculated with these points in mind, and by any suitable different arrangement of the chutes the bobbins may be sorted into any other desired groups.

In the operation of the device, the bobbins 21 are fed into the chute 20 by hand and the machine is driven by means of the worm 6 engaging the gear teeth 5 at the edges of the plates, the worm 6 being mounted on a shaft 45 driven by a motor 46 on a platform 47 projecting from the pedestal 43. The bobbins 21 are delivered one by one to the apertures as the apertures pass beneath the lower end of the chute 20. Any bobbin having insufficient yarn on it drops immediately through the aperture at its smallest size into the chute 30, and is rejected. Any other bobbin at first rests in the aperture, being held between the gauging edges 10, 15 thereof. As the aperture passes round the machine, the gauging edges 10, 15, move apart by reason of the eccentricity of the plates, as shown in Figs. 1*a* to 1*g*, and after a portion of a revolution depending on the amount of yarn on the bobbin, the edges are spaced apart by an amount equal to the diameter of the yarn surface of the bobbin. At this stage the bobbin falls through, is received by one of the chutes 31–40 and is delivered to a container disposed below the chute. A full bobbin will be retained between the gauging edges 10, 15 for nearly half a revolution of the machine, but ultimately the gauging edges will separate sufficiently to allow even a full bobbin to fall through into the chute 40. In this way the bobbins are sorted into different containers, fed from different points round the gauging half of the machine, each container receiving bobbins of a given range of size, corresponding to the position round the machine at which the bobbin was delivered.

Having described my invention, what I desire to secure by Letters Patent is:

1. Apparatus for sorting articles according to size, said apparatus comprising a pair of eccentrically superposed circular plates, each of said plates having at least one aperture therein, each aperture overlapping an aperture in the other plate and having a gauging edge co-operating with a gauging edge in the other plate to form a compound aperture, gear teeth on the edge of each plate, a gear engaging the gear teeth of both plates at a point where the edges of said plates intersect and means for rotating said gear so as to rotate said plates with the same angular speed about their different centers whereby, over part of the path of said compound aperture, the distance between said gauging edges increases to allow an article resting in said gauging aperture to pass through it at a position in said path depending on the size of the article.

2. Apparatus for sorting flanged bobbins according to size, said apparatus comprising a pair of eccentrically superposed plates, each of said plates having at least one aperture therein, each aperture overlapping an aperture in the other plate, said apertures being bounded by radial edges, including gauging edges, and transverse edges, the radial edges of each aperture in one plate being of different length than the radial edges of the cooperating aperture in the other plate and the gauging edge of the aperture in one plate being parallel to and cooperating with a gauging edge in the other plate to form a compound aperture and means for rotating said plates with the same angular speed about different centers so that said gauging edges remain parallel to one another throughout their motion relative to one another and, over part of the path of said compound aperture, the distance between said gauging edges increases to allow a bobbin resting in said gauging aperture to pass through it at a position in said path depending on the size of the bobbin, the ends of said gauging edges being cut back to different extents to accommodate the bobbin flanges.

3. Apparatus for sorting articles according to size, said apparatus comprising a pair of eccentrically superposed plates, each of said plates having at least one aperture therein, each aperture overlapping an aperture in the other plate, said apertures being bounded by radial edges, including gauging edges, and transverse edges, the radial edges of each aperture in one plate being of different length than the radial edges of the cooperating aperture in the other plate and the gauging edge of the aperture in one plate being parallel to and co-operating with a gauging edge in the other plate to form a compound aperture, each of said gauging edges being bevelled so that said edges are disposed on the plane of contact between said plates and means for rotating said plates with the same angular speed about different centers so that, over part of the path of said compound aperture, the distance between said gauging edges increases to allow an article resting in said gauging aperture to pass through it at a position in said path depending on the size of the article.

4. Apparatus for sorting flanged bobbins according to size, said apparatus comprising a pair of eccentrically superposed plates, each of said plates having at least one aperture therein, each aperture overlapping an aperture in the other plate, said apertures being bounded by radial edges, inluding gauging edges, and transverse edges, the radial edges of each aperture in one plate being of different length than the radial edges of the cooperating aperture in the other plate and the gauging edge of the aperture in one plate being parallel to and cooperating with a gauging edge in the other plate to form a compound aperture, each of said gauging edges being bevelled so that said edges are disposed on the plane of contact between said plates and means for rotating said plates with the same angular speed about different centers so that said gauging edges remain parallel to one another throughout their motion relative to one another and, over part of the path of said compound aperture, the distance between said gauging edges increases to allow a bobbin resting in said gauging aperture to pass through it at a position in said path depending on the size of the bobbin, the ends of said gauging edges being cut back to different extents to accommodate the bobbin flanges.

5. Apparatus for sorting flanged bobbins ac-

cording to size, said apparatus comprising a pair of eccentrically superposed circular plates, each of said plates having at least one aperture therein, each aperture overlapping an aperture in the other plate and having a gauging edge co-operating with a gauging edge in the other plate to form a compound aperture, each of said gauging edges being bevelled so that said edges are disposed on the plane of contact between said plates, gear teeth on the edge of each plate, a gear engaging the gear teeth of both plates at a point where the edges of said plates intersect and means for rotating said gear so as to rotate said plates with the same angular speed about their different centers whereby, over part of the path of said compound aperture, the distance between said gauging edges increases to allow a bobbin resting in said gauging aperture to pass through it at a position in said path depending on the size of the bobbin, the ends of said gauging edges being cut back to accommodate the bobbin flanges.

ROBERT ALFRED ARCHIBALD WILLENS.