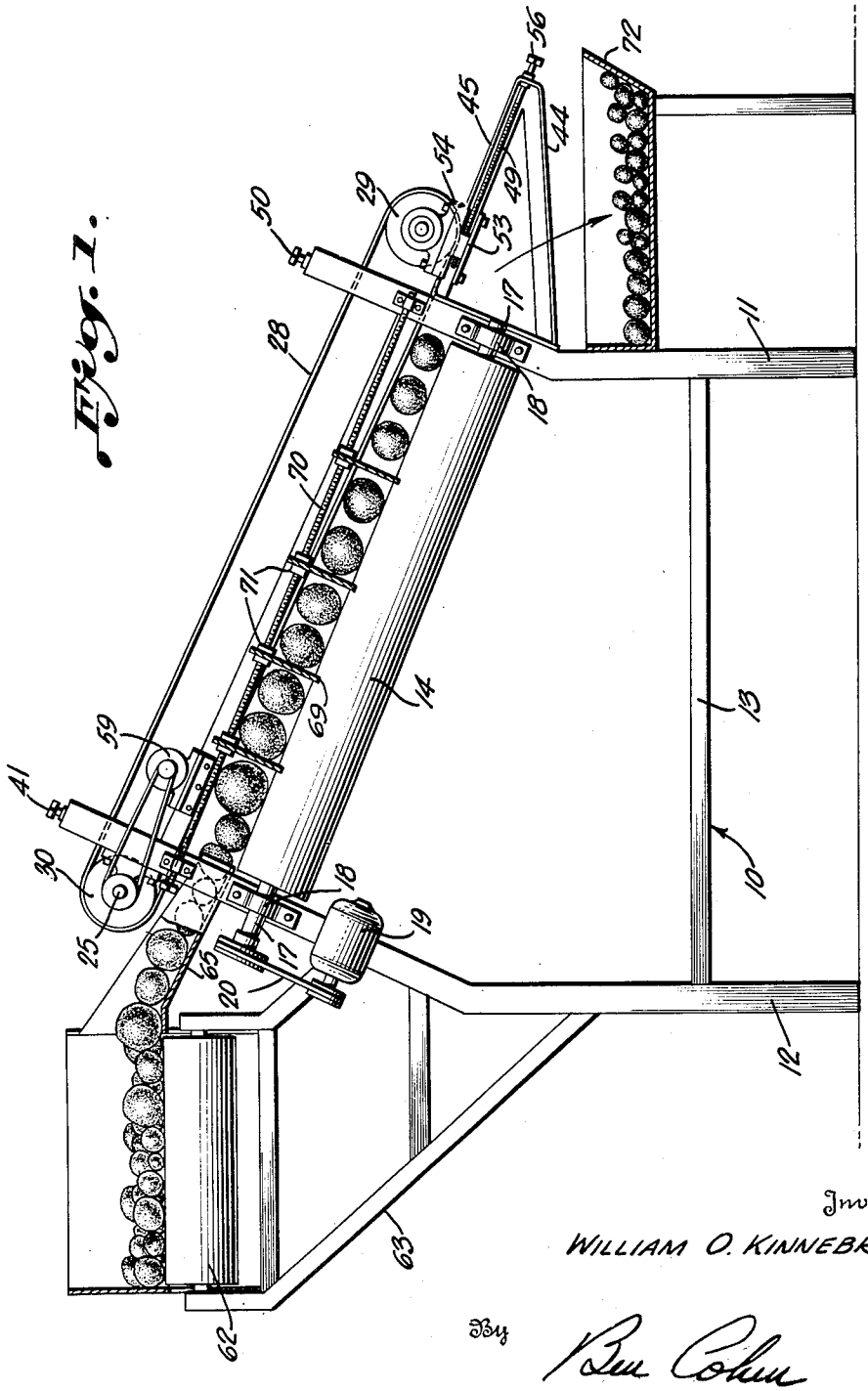
March 3, 1953 W. O. KINNEBREW 2,630,224

SIZING APPARATUS

Filed Aug. 23, 1948 4 Sheets-Sheet 1

Fig. 1.



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SIZING APPARATUS

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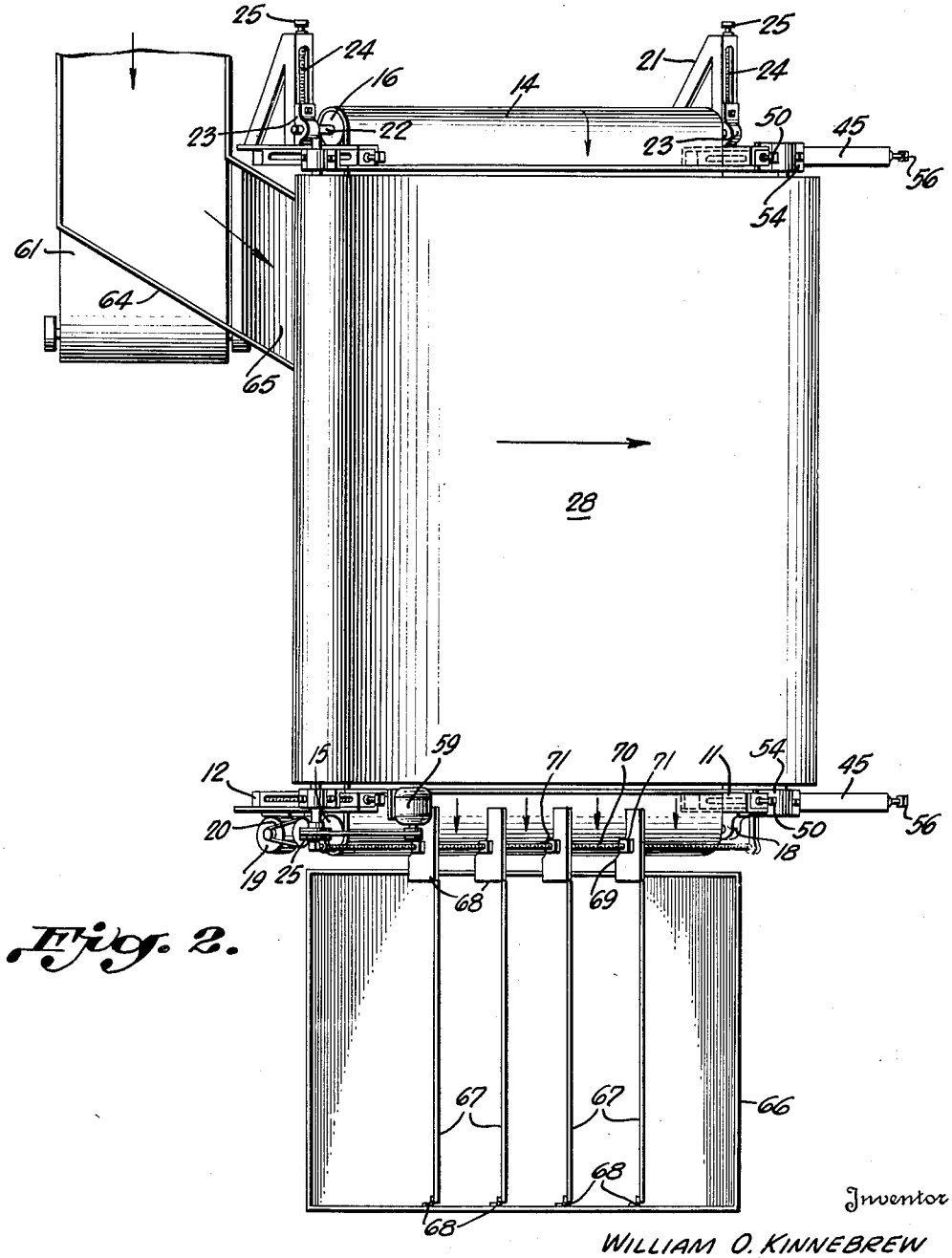

Fig. 2.

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Fig. 3.

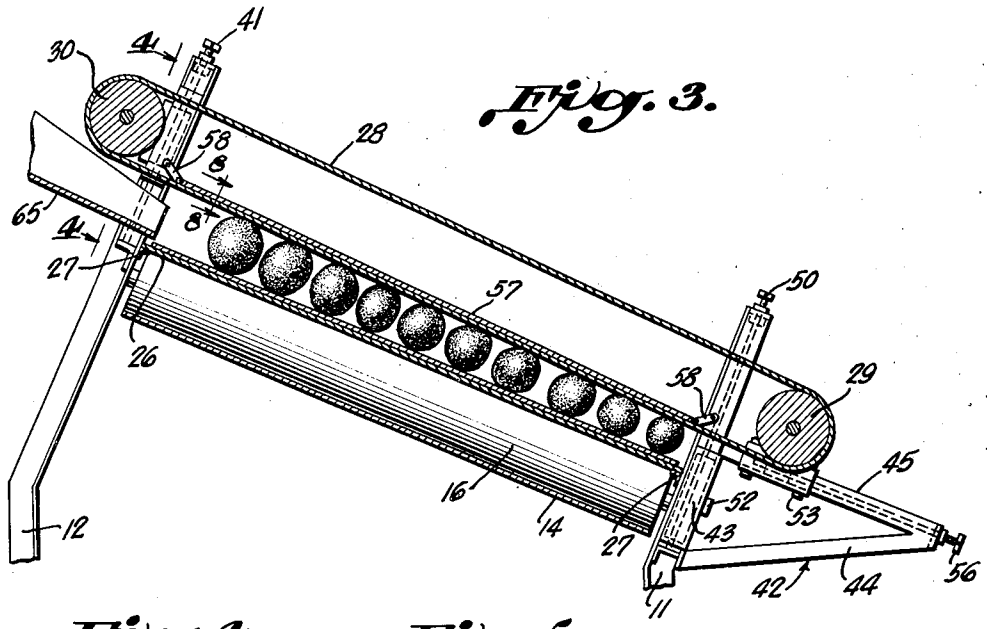


Fig. 4.

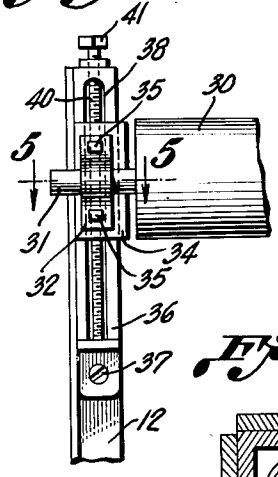


Fig. 5.

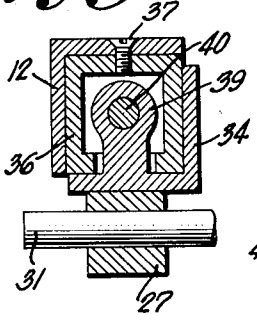


Fig. 6.

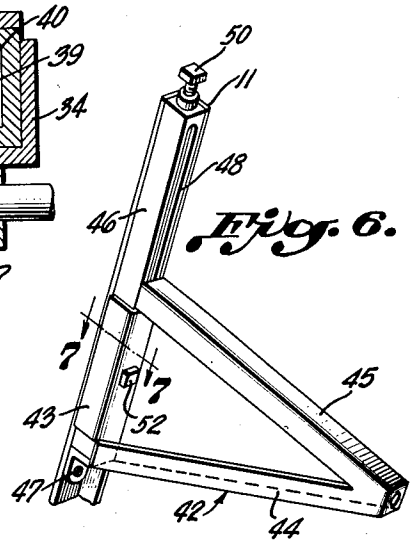


Fig. 7.

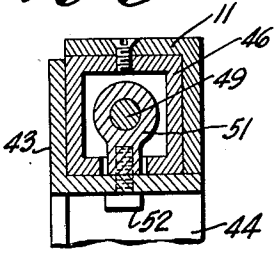
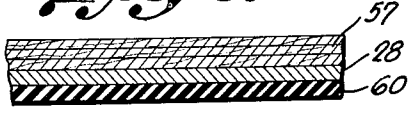


Fig. 8.



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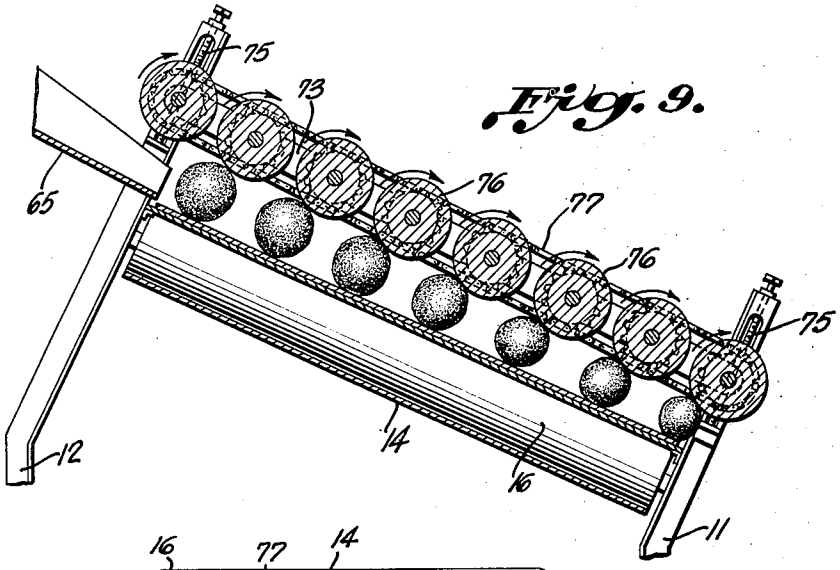

Fig. 9.

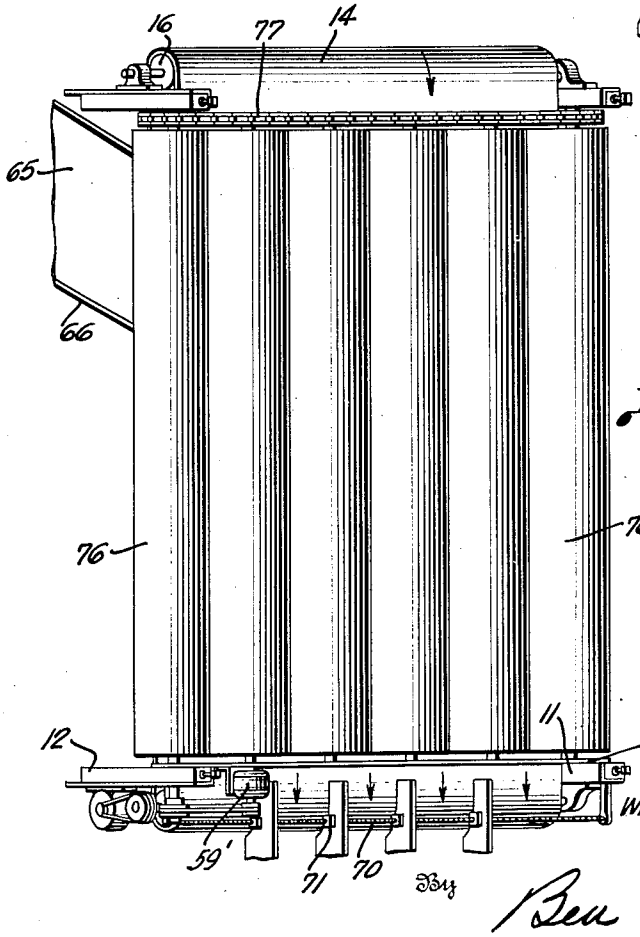

Fig. 10.

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UNITED STATES PATENT OFFICE

2,630,224

SIZING APPARATUS

William O. Kinnebrew, Winter Haven, Fla.

Application August 23, 1948, Serial No. 45,691

8 Claims. (Cl. 209—91)

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This invention relates to apparatus for grading, sizing and sorting rollable objects and is particularly adapted to the sizing and sorting of fresh whole citrus fruit, tomatoes, peaches and the like prior to packing or canning.

In the handling of the above commodities, it is desirable to eliminate the ones which are too large or too small to pack and ship and to pack and ship substantially like sizes in one container. It is also highly desirable in the extraction of juice from citrus fruit, to feed the extracting machines with fruit that is sized or sorted to fit the pockets within the range of a particular extractor in order to prevent excessive peel oil in the juice and in order to attain the greatest possible yield of juice.

Sizers for automatically grading and sorting commodities for the purpose outlined above have not been satisfactory for the reason that on objects that were oval or having flattened portions, the sizing has been accomplished on the smallest or largest diameter without taking into consideration the odd shape and average diameter.

The sizing or sorting device forming the subject matter of the present invention acts upon the object to be sized in two directions at once, the forces acting on the object at a substantially 90-degree angle to each other, the resultant rotation causing the object to be sized on its median or average diameter or on its largest diameter, a result that has long been desired. The action on the fruit or object while passing through the apparatus may be explained in its simplest form as comparable and similar to the action of the human hands when a lump of clay is rolled between them to shape the clay into spherical form.

The grading or sizing apparatus forming the subject matter of the present application consists essentially of two endless belts of sufficient width for the capacity intended. The two belts are positioned substantially transverse to each other, the lower belt traveling transversely of the machine but sloping laterally sufficiently to overcome the inertia of the object to be sized permitting the object to roll down the slope thus formed. The upper belt is so positioned with respect to the lower belt as to form a V-shaped crevice between the two belts with the larger opening of the crevice at the upper end of the apparatus. The bottom side of the upper belt travels upwardly in a direction transverse to the direction of travel of the lower belt. The opposed belt surfaces form the two sides of the V-shaped crevice wherein the sizing takes place. A platform or backing is provided for each of these opposed belt surfaces to prevent the belts from being forced out of or sagging from a line tangent to their respective rollers. If desired, the belt surfaces may be covered with a soft substance such as sponge rubber to prevent possibility of damage to very ripe or soft oval-shaped fruit. Suitable means is provided for varying the distance and the angle formed between the two opposed belt surfaces which form the V-shaped crevice and suitable means is provided for rotating the endless belts.

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When the fruit or objects to be sized are dumped or delivered into the top edge of the V-shaped crevice, gravity will cause them to roll or slide downwardly. When the objects reach that point of the crevice commensurate with its size, the lower belt will rotate the objects in the direction it is traveling, causing the object to be conveyed to the discharge end of the lower belt where adjustable partitions are provided to keep like sizes within certain plus or minus tolerances together for packing or other purposes. The bottom of the upper belt which travels upwardly, will tend to rotate the objects upward and thus prevent the objects from wedging or pinching.

If desired, in place of the upper belt, a plurality of rollers lying adjacent each other, could be used to prevent the wedging or pinching action mentioned above. The operation and function of these rollers will be more fully explained as the description proceeds.

It is therefore a principal object of the present invention to provide a sizing apparatus having spaced opposed surfaces for separating objects of differing size.

A further object of the invention is to provide an apparatus for sizing objects wherein the sizing is done automatically by two opposed traveling surfaces.

A still further object of the invention is to provide an apparatus for sizing objects, the sizing being done by two opposed traveling surfaces and wherein means are provided for varying the distance between the opposed surfaces.

It is also an object of this invention to provide a grading and sizing apparatus which is of relatively simple and sturdy construction, simple to operate, and which accomplishes the above described objects and advantages with a minimum amount of time and effort.

Other objects and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment of the invention taken in connection with the accompanying drawings, wherein

Figure 1 is a side elevation of the apparatus forming the subject matter of the present invention, showing the discharge end of the apparatus.

Figure 2 is a top plan view thereof.

Figure 3 is a longitudinal sectional view of the upper part of the machine.

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a transverse sectional view taken on the line 5—5 of Figure 4.

Figure 6 is a perspective view of the bracket mounting the lower roller carrying the upper belt.

Figure 7 is a transverse sectional view taken on the line 7—7 of Figure 6.

Figure 8 is a vertical sectional view taken on the line 8—8 of Figure 3.

Figure 9 is a longitudinal sectional view of the upper part of the machine showing a modification of the upper traveling means.

Figure 10 is a plan view of the modification shown in Figure 9.

Referring to the drawings in detail, wherein like reference numerals denote like parts throughout the several views, numeral 10 designates the supporting framework consisting of rear legs 11, front legs 12 and reinforcing cross bars 13. The legs are formed of angle irons and are bent backwardly substantially midway of their length to provide the sloping characteristic of the apparatus.

The lower endless belt is indicated by numeral 14 and is carried by the rollers 15, 16. As seen in Figure 1, the roller axle 17 is mounted for rotation in bearings 18 rigidly mounted to legs 11 and 12. The roller axle 17, adjacent the leg 12, extends a slight distance beyond the leg and is geared to a motor 19, through a belt 20, said motor being suitably supported on the leg 12. On the opposite side of the apparatus, the roller 16 is mounted for rotation in a pair of take-up brackets 21 secured to each of the legs 11 and 12. The roller axle 22 is carried by bearings 23, threaded on an adjustable screw 24 operated by the adjusting head 25. This arrangement permits adjustment of the roller 16 to or from the apparatus thereby enabling adjustment of the tension on belt 14. As seen in Figure 2, the belt 14 is mounted to move in a direction transverse of the machine. A rigid plate member 26, formed of plywood or the like is connected to the frame member 27, below the upper surface of the belt 14 to prevent the belt from sagging, as clearly seen in Figure 3.

The upper belt 28 is carried by a pair of rollers 29 and 30, said rollers being mounted at right angles to the rollers 15 and 16. Thus roller 29 is carried by the rear pair of legs 11 and roller 30 carried by the front pair of legs 12. Both of the upper rollers are mounted for vertical adjustment and the roller 29 mounted for adjustment towards and away from roller 30.

Referring to Figures 4 and 5, which show one of the brackets for mounting the axle 31 of the upper roller 30, the bracket 32 has a bearing portion 33 for receiving the axle 31. The bracket 32 is secured to an angle iron 34 by means of bolts 35. A housing member 36, open at its top is secured within the angle portion of the upper end of the leg member 12 by means of a screw 37. The rear face of the housing member is slotted at 38 to receive a threaded extension 39 carried by the member 34. An adjusting screw 40 is mounted within the housing 36 and is threaded through the threaded extension 39. By turning the upper end 41 of the screw 40, bracket member 32 may be raised or lowered thereby raising or lowering the roller 30. It will be understood that a similar arrangement is provided on both legs 12 in order to adjust both ends of the roller 30. If desired, any suitable mechanism may be provided for operating both adjusting screws simultaneously.

The roller 29, as previously stated is mounted for both vertical adjustment and for longitudinal adjustment with respect to the roller 30. A bracket member, indicated by numeral 42, is mounted in the angle formed at the upper end of each rear leg 11. This bracket comprises an angle iron plate 43 forming the base of a triangle and the two converging legs 44 and 45. A screw housing 46, similar to housing 30 is secured to the leg 11 by means of a screw 47. The housing is slotted at 48 and carries an adjusting screw 49 formed with an adjusting nut 50 at its upper end. The adjusting screw 49 is threaded through a threaded extension 51 secured to plate member 43 by a bolt 52. It will be readily apparent that rotation of the adjusting nut 50 will raise or lower the bracket member 42 for vertical adjustment.

The roller 29 has its axle mounted on a supporting base 53 which encloses the bracket arm 45 and which is adapted to slide on said arm. The base 53 is provided with a threaded extension 54 to which an adjusting screw 55 is threaded. The outer end of the screw is provided with an adjusting head 56. It will be clear, as seen in Figure 1, that rotation of adjusting head 56 will adjust the roller support towards or away from the roller 30.

As seen in Figure 3, a backing plate 57, similar to backing plate 26, is provided for the upper belt 28. The backing plate 57 is positioned above the lower belt portion of the upper belt and is connected to 42 and 34 by links 58 so that backing plate 57 moves in unison with rollers 29 and 30 during adjustment.

The roller 30 is operated by a motor 59 suitably connected to the frame member. Although I have shown separate motors for operating the rollers 15 and 30, a single motor with suitable gearing may be substituted for the two motors.

As seen in Figure 8, the belt 28 and similarly the belt 14 may be laminated and provided with a sponge rubber layer 60 to protect the fruit being sized.

The fruit or other objects being sized is fed to the upper end of the crevice by means of any suitable conveyor mechanism, shown here as comprising an endless belt 61, mounted on roller 62 suitably supported on a frame member 63 connected at the front of the frame 10. A deflecting plate 64, terminating in a chute 65, directs the objects being sized to the crevice formed by the opposed belts.

Referring to Figures 1 and 2, means are provided for receiving the objects being sized as they are directed off the belt 14. This means consists of a bin 66 positioned adjacent the exit side of the lower belt 14. The bin is formed with a plurality of hinged partition members 67, hinged at 68 and having separator portions 69 formed at the opposite ends of said partition members. These separator portions overlie the belt 14 and direct the sized objects into the proper compartment in the bin. These partition members may be adjustable and this is accomplished by means of a threaded rod 70 fastened to legs 11 and 12, and suitable connections 71 between the separator portions 69 and the rod 70 permitting limited adjustment of the partition members.

Positioned at the rear of the machine, a suitable means is provided to receive the undersized objects which pass through the lower end of the apparatus. This means is shown here as consisting of a bin 72. A conveyor arrangement may be substituted for this bin if desired.

The operation of the apparatus thus described is as follows:

The objects to be sized are conveyed along the belt 61 and are deflected by the member 64 into the chute 65 where the objects are directed to the space between the belts 14 and 28. Due to the inclination of the belt 14, the objects would normally roll down the incline and emerge at the lower end of the belt. However, the belt 14 moves in a transverse position thereby causing the objects to move in the general direction of the belt while at the same time rolling down the incline. This causes the objects to move in a generally diagonal path from the chute to the opposite end of the apparatus. As seen in Figure 1, the upper belt 28 is spaced above the lower belt to form a V-shaped crevice with the lower belt. The lower end of the upper belt is spaced from the lower end of the lower belt a sufficient distance to permit the undersized objects, which are to be rejected, to pass between the belts into the bin 72. This distance can be adjusted as desired by means of the adjusting knob 50. The upper end of the upper belt is spaced a sufficient distance from the upper end of the lower belt to permit ingress of the largest objects to be sized. This distance may also be adjusted at the will of the operator. Since the upper belt is at a greater angle than the lower belt, the distance between the belts will progressively decrease from left to right as viewed in Figure 1. Thus, as the object being sized reaches a point in its travel where its diameter corresponds with the space between the belts, it will no longer roll downwardly but will be propelled sidewise into the proper compartment of the bin 66. Wedging of the objects will be prevented by the movement of the upper belt. Thus, it will be readily apparent that undersized objects will pass through the apparatus with the remaining objects being separated into various like sizes into bin 66. The partition members 69 can be adjusted to permit slight variance of the size of the objects being collected in a single compartment.

In the modification disclosed in Figures 9 and 10, a system of rollers is substituted for the upper belt 28, the remaining parts of the apparatus being substantially the same as described above. A pair of roller carrying bars are mounted at each side of the apparatus as indicated at 73 and 74. The ends of the bars are secured to brackets suitably mounted in the upper part of the legs 11 and 12 for vertical and angular adjustment by adjusting screws 75.

A plurality of rollers 76 are rotatably mounted on the bars 73 and 74 and are provided with a chain connection 77 between the rollers whereby the rollers may rotate as a unit in the direction indicated by the arrows in Figure 9. The motor 59' is suitably geared to one of the rollers for rotating same, said rotation being transmitted to the other rollers.

The operation of the modified form of the apparatus shown in Figures 9 and 10 is the same as previously described. The rollers function in the same manner as the upper belt shown in the first form of the invention.

It is clearly manifest from the foregoing description that the operation is entirely automatic and that a large number of objects can be sized simultaneously.

From the foregoing description of the construction and operation of the apparatus, it will be readily apparent that the present device is well adapted to accomplish the objects of the present invention. It will be understood that minor changes may be made with respect to details of construction without departing from the spirit of the invention. Therefore, I do not wish to be limited precisely to the construction herein shown except as may be required by the appended claims with reference to the prior art.

Having thus described the invention, what is claimed is:

1. An apparatus for sizing rollable objects comprising a lower endless belt, the upper surface of which is inclined downwardly, said belt being movable in one direction, means positioned above said belt substantially the full area of said upper surface and forming a plane spaced from said surface to provide a space in which the rollable objects are received, said plane formed by said means being inclined more than said belt surface whereby the plane and the surface converge downwardly, said means being movable in a direction substantially at right angles to the direction of travel of said belt, whereby the objects being sized are discharged in the direction of travel of said lower belt.

2. An apparatus of the character described in claim 1, said means comprising an endless belt.

3. An apparatus of the character described in claim 1, said means comprising an endless belt, and a supporting plate mounted below the upper portion of the lower endless belt to prevent sagging thereof.

4. An apparatus of the character described in claim 1, said means comprising an endless belt and a supporting plate positioned above the lower portion of the upper belt.

5. An apparatus of the character described in claim 1, said means comprising an endless belt, and means for raising or lowering the second endless belt for varying the inclination of said second endless belt.

6. An apparatus of the character described in claim 1 and compartments adjacent the exit side of the endless belt for receiving the objects discharged from said belt.

7. An apparatus of the character described in claim 1, said means comprising a series of closely spaced parallel rollers.

8. An apparatus of the character described in claim 7 and means for adjusting the position of the rollers to vary the space between said rollers and said belt.

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