Nov. 22, 1932. W. E. HUMPHREY 1,888,673

SORTING APPARATUS

Filed Jan. 31, 1931 3 Sheets-Sheet 1

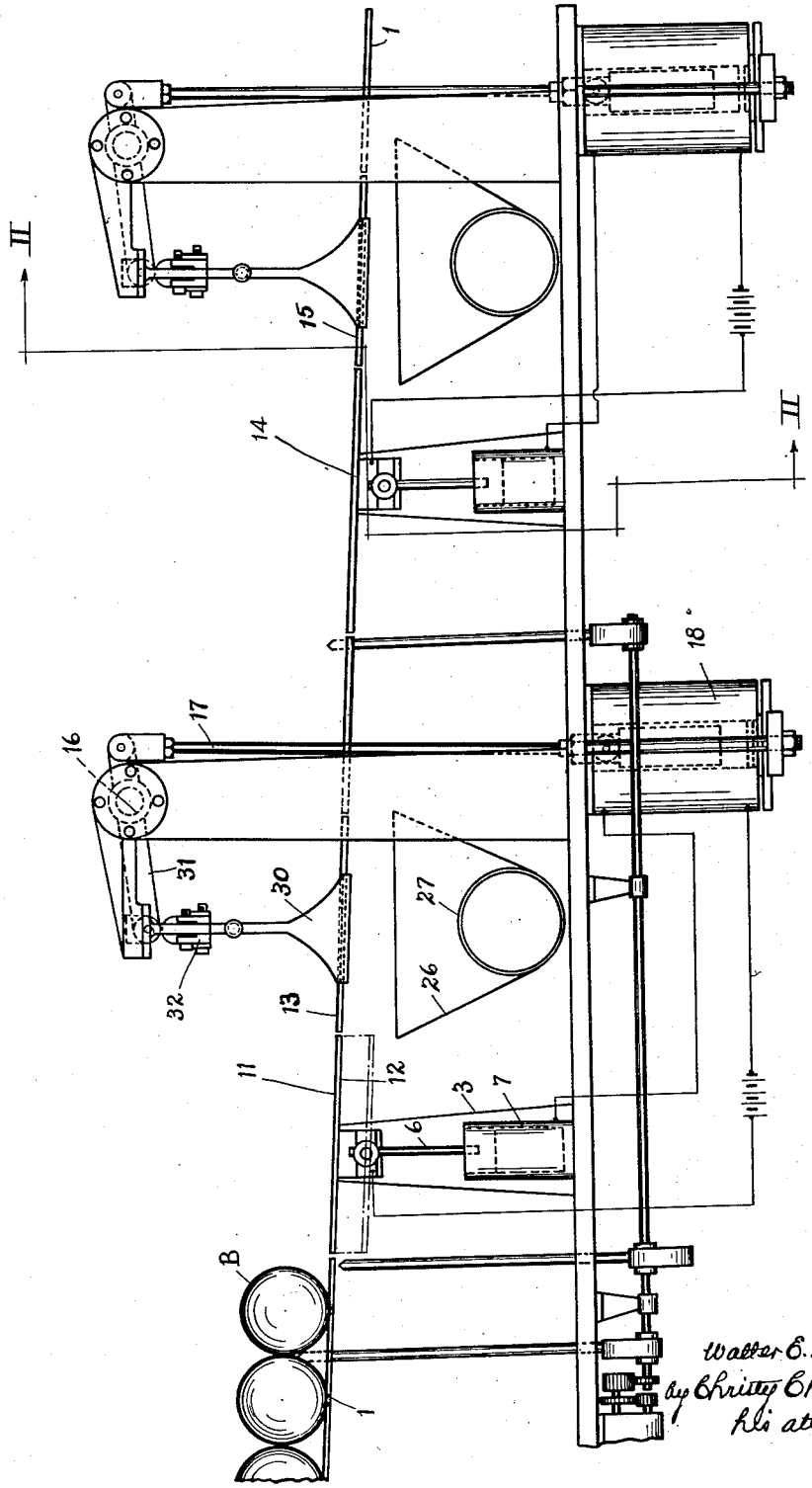


FIG. 1

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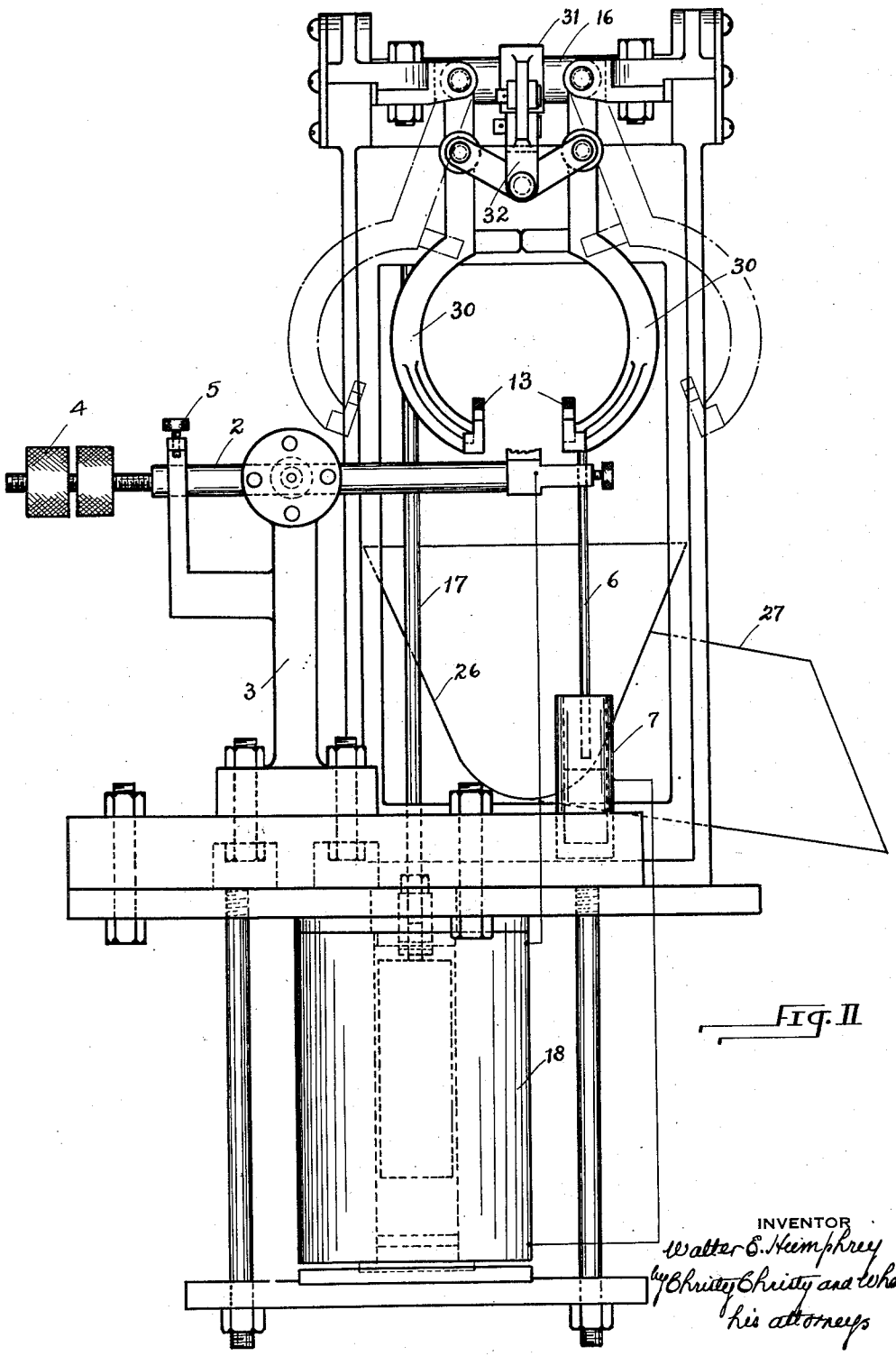


Fig. II

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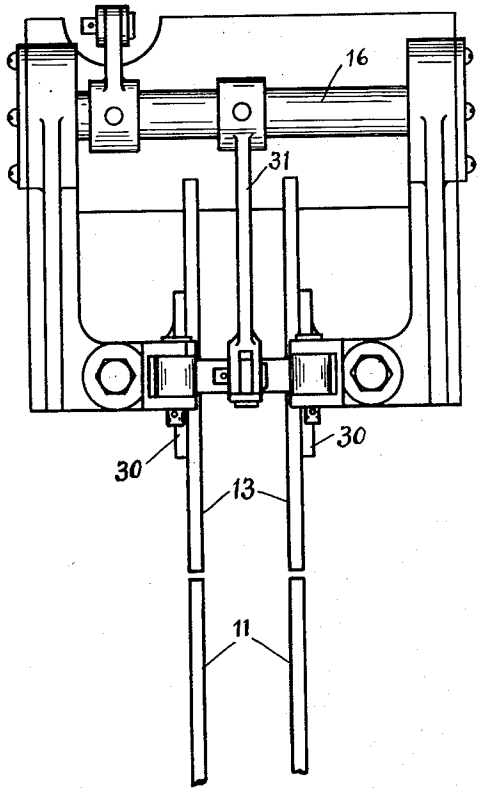


Fig. III

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Patented Nov. 22, 1932 1,888,673

UNITED STATES PATENT OFFICE

WALTER E. HUMPHREY, OF JEANNETTE, PENNSYLVANIA, ASSIGNOR TO PENNSYLVANIA RUBBER COMPANY, A CORPORATION OF PENNSYLVANIA

SORTING APPARATUS

Application filed January 31, 1931. Serial No. 512,610.

My invention relates to sorting apparatus, and, specifically, to apparatus for sorting articles by weight, to the end that out of a larger number those particular articles which meet and satisfy a certain standard shall be retained, while those which fail to meet and satisfy the standard shall be rejected. I have developed the invention in its application to apparatus for sorting tennis balls, and in that particular application I shall show and describe it, but it will be apparent that there is no essential feature of the apparatus which limits it to the sorting of tennis balls merely,—it is applicable wherever discreet articles are to be sorted by weight.

In the accompanying drawings Fig. I is a diagrammatic view in side elevation of the tennis ball sorting apparatus embodying the invention; Fig. II is a view to larger scale of the same apparatus seen in transverse section on the plane indicated at II—II, Fig. I; and Fig. III is a fragmentary view in plan of a portion of the apparatus.

In the manufacture of tennis balls, conditions of economic production are such that there may be wider variation in the weight of particular balls than the specifications of users require, and it accordingly becomes necessary to reject from the output of the ball-making shop both those individual balls which are overweight and those which are underweight. This selection is advantageously made when the balls come from their first vulcanization, partly cured and not yet covered.

In Letters Patent of the United States, No. 1,791,096, granted on my application, February 3, 1931, apparatus of the nature indicated is shown and described. This apparatus includes a runway, and the runway is made up in part of pairs of oppositely and vertically movable sections, and means are provided for shifting under the weight of a tennis ball one of such pairs of sections downwardly; and in sequence upon the downward shift of one of the pairs of sections, the other member of the pair is shifted upwardly. After the two sections have so been borne aside, and the ball which has brought about the shifting has escaped, the two sections of the pair return to their normal positions in the runway. I have found it desirable to eliminate from the apparatus the cumulative displacement of the oppositely moving sections, and my present invention consists in a movement of the second section, such in character and direction as not to be cumulative upon the movement of the first, with the consequence and effect that the succeeding balls in a series, advancing through the apparatus, will more certainly advance in the intended manner without being caught in an unintended manner or fouled by the moving parts.

An approximately horizontal runway 1 is fixed at a gentle incline, to the end that a succession of balls B may roll down without great acceleration of speed. This runway may conveniently be formed of a pair of rails 11 (see Fig. III).

The runway, otherwise stationary, includes co-operating movable sections; there is at least one pair of these, and for usual practice there are two pairs of such sections. If desired, there may be three or more such pairs, but typically there are two, and in Fig. I of the drawings I show two. The sections of the first pair (and in the provision of a single pair the invention may be realized) are indicated at 12 and 13. The higher of these (relative to the inclined runway), the section 12, is movable vertically downward through a conveniently small but sufficient interval. The lower section 13 is movable laterally through an interval which is sufficient to afford escape of the ball. In Fig. I the extreme downward position of the section 12 is indicated in dotted lines, and in Fig. II the extreme position of lateral displacement of the section 13 is similarly indicated.

Conveyor section 12 is carried on one arm of a horizontal beam 2, pivoted in delicate equipoise to swing vertically upon a standard 3 (compare Fig. II where a duplicate structure appears). The opposite arm of the beam carries an adjustable weight 4. The weight may be so nicely adjusted that, while a ball of normal weight will not disturb the equipoise, a ball that is too heavy will by overbalancing the weight 4 swing the beam, and in so doing cause the conveyor section 12 to descend to the dotted-line position, Fig. I. A stop 5 may be provided to limit the range of descent of the conveyor section.

The beam 2 carries a metal rod 6, adjustable in its extent as Fig. II shows, and a cup 7 of mercury is provided. The parts are so arranged and adjusted that the swinging of the beam under the weight of a too-heavy ball will bring rod 6 to contact with the body of mercury in cup 7, and in so doing will complete an electric circuit. The circuit so completed is effective through the instrumentalities presently to be described to shift the conveyor section 13 from the full-line to the dotted-line position, Fig. II.

The ball is not hindered in its course by the swinging of beam 2, and presently it passes beyond the conveyor section 12, and thereupon the beam, relieved of the weight of the ball, swings back to its initial position, and in so doing brings the conveyor section back, ready to receive the next following ball. By the return swing of the beam, the contact of rod 6 with the body of mercury in cup 7 is broken, and the circuit alluded to is broken.

The rails which make up the conveyor section 13 are borne severally upon arms 30, pivoted to swing in a vertical plane transverse to the extent of the conveyor, and so shaped that when in the normal position (shown in full lines in Fig. II) there is space between them for the free advance of the ball upon the conveyor tracks 13. A beam 31, pivoted upon a shaft 16, carries a block 32 to which the arms 30 are linked, as best shown in Fig. II, in such manner that when the arms 30 are in the normal position, shown in full lines, Fig. II, a rise of the block 32 will effect a spreading of the arms 30 to dotted-line position. Such upward movement of the block 32 is effected by the swinging of the beam 31 on the energizing of an electromagnet 18. In the operation of the machine the electric circuit which, as has already been described, is closed by the descent of the conveyor section 12, effects the energizing of the electromagnet 18. The energizing of the electromagnet 18, through the instrumentalities last described, effects the spreading of the conveyor section 13. When the conveyor section 12, relieved of its burden, rises, it effects the de-energizing of the electromagnet, and thereupon the parts which had swung to accomplish the spreading of the conveyor section 13 return by gravity to the normal position shown in full lines in Fig. II.

In operation the balls, controlled by means suitable for the purpose, roll one by one at suitable intervals down the conveyor. If the advancing ball is not of excessive weight, it will pass over conveyor section 12 without disturbing it, and from section 12 it will continue on its way through section 13, and section 13 will remain in the full-line position shown in Fig. II. If, however, the ball is overweight, its weight when it rests on section 12 will effect the descent of section 12 to the dotted-line position, Fig. I, the consequent energizing of electromagnet 18, and the opening of the conveyor section 13 to the dotted-line position, Fig. II. This will occur in the brief interval while the rolling ball continues on section 12. When then the ball reaches the end of conveyor section 12, it will fall free between the spread-apart members of the conveyor section 13. At that point a receiving hopper 26 may be placed, and from the hopper the ball may be conveyed away through a pipe (compare the pipe 27, Fig. II) to a suitable place of accumulation.

It needs but a glance at Fig. I to perceive that, with the provision of a second pair of conveyor sections 14 and 15 similarly operating, the apparatus may be adapted to select and divert not only the balls which are too heavy, but also the balls which are too light; or, rather, having diverted the balls which are too heavy, it may similarly divert the balls which in weight exceed another certain and smaller figure, and which are thus within the range permitted by the users' specifications. The balls which then remain to continue in their course along the conveyor, being less in weight than such smaller amount, are balls which are too light to satisfy the specifications. It is a matter merely of proportioning the parts, and particularly of adjusting the weights 4 upon their beams, to render the apparatus automatically effective to make the desired selection by weight.

The first hopper 26 then will receive the balls which are overweight, the second hopper will receive the balls of proper weight, while the balls which are underweight will continue their course along the conveyor.

It will be apparent that by adding still other pairs of similarly operated conveyor sections different grades of balls may be segregated from a common supply; that is to say, all balls which weigh from *a* ounces to *b*, all from *b* to *c*, all from *c* to *d*, etc.

Any commodities may in like manner be sorted, though, unless they be round and capable of rolling other provision will have to be made to cause them to advance singly along the conveyor.

I claim as my invention:

In apparatus for sorting articles by weight, a runway including two adjacent sections sev-

erally movable, one section movable downwardly and the adjacent section movable transversely with respect to the direction of movement of the first section, means yielding under weight for sustaining the downwardly movable section in its elevated position, and means responsive to such downward movement of the section last mentioned for effecting the transverse movement of the second section.

In testimony whereof I have hereunto set my hand.

WALTER E. HUMPHREY.