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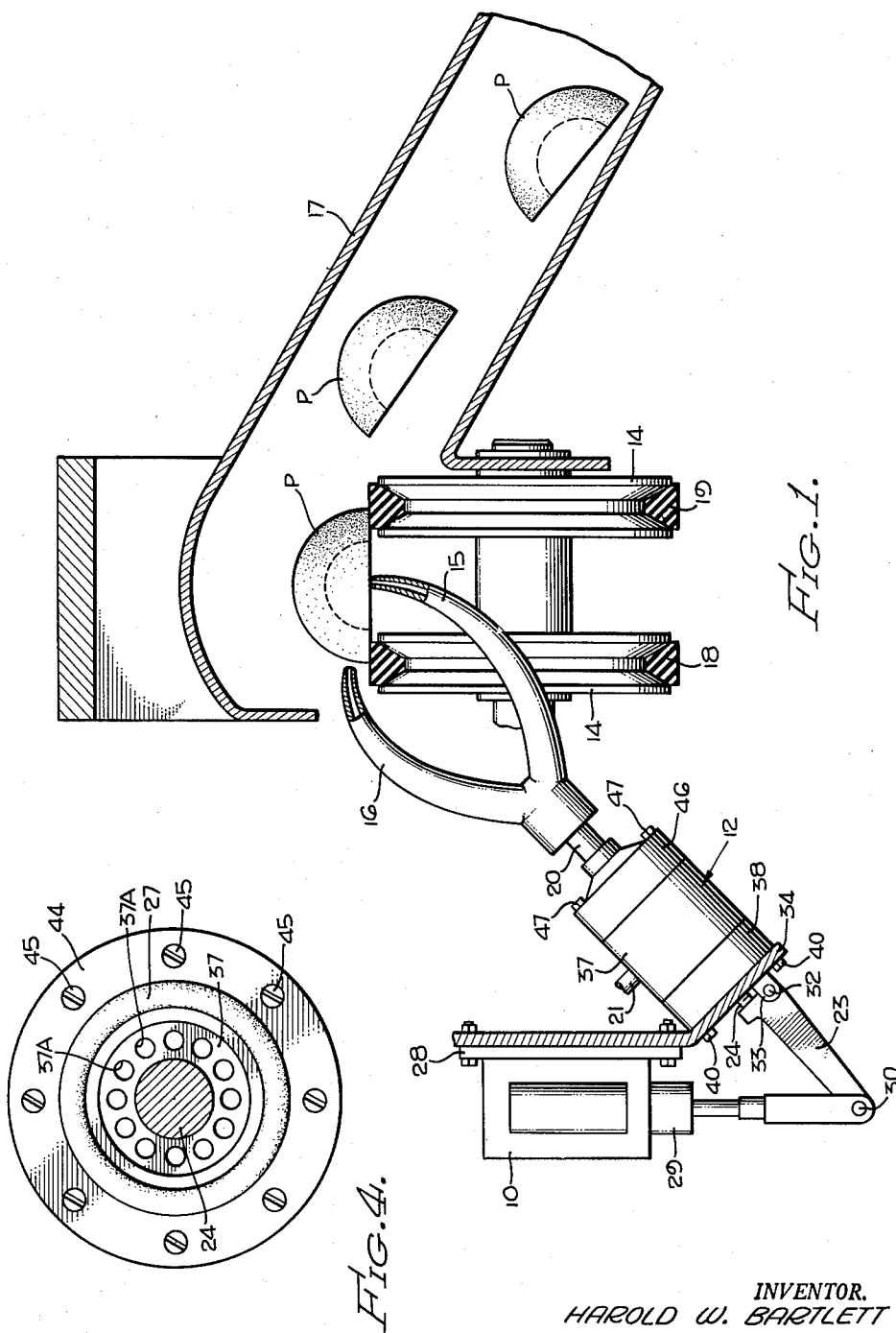
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AIR VALVE COMESTIBLE SORTING APPARATUS

Filed June 22, 1951

2 Sheets-Sheet 1



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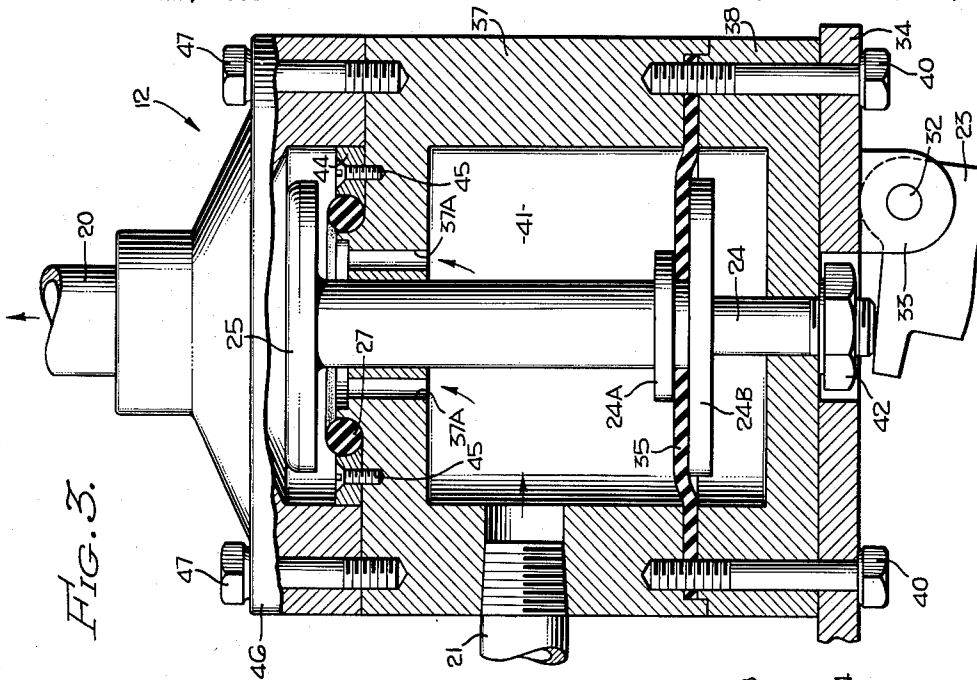
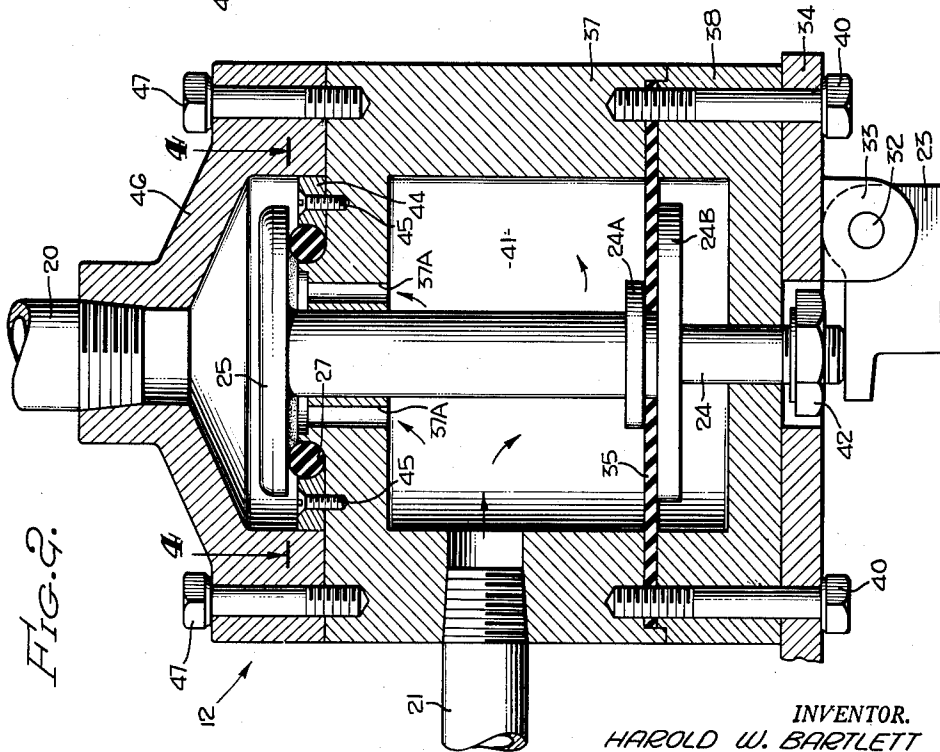
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AIR VALVE COMESTIBLE SORTING APPARATUS

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Application June 22, 1951, Serial No. 232,975

6 Claims. (Cl. 198—20)

The present invention relates to improvements in comestible sorting apparatus generally, and specifically to improved means for displacing comestibles from traveling belts on which they are transported; and more specifically, the present invention contemplates the provision of an improved air valve and associated pneumatic means for effecting the purposes described in detail hereinafter.

Various comestible sorting apparatus have been used in the prior art incorporating various means for removing comestibles from traveling conveyors. The present invention contemplates improved pneumatic means of this character, by the use of which comestibles may be sorted at a relatively high rate and without mechanical elements touching the comestible while being removed from the conveying means.

An object of the present invention, therefore, is to provide improved pneumatically operated means of this character for removing comestibles at a relatively high rate from a means upon which such comestibles are conveyed.

A specific object of the present invention is to provide improved pneumatic means of this character which incorporate two different air jets, i. e., one for raising the comestible and a second jet for blowing the comestible laterally from the conveying means while being raised by the first jet.

Another object of the present invention is to provide improved pneumatic means of this character featured by the incorporation therein of a new and improved air valve, the operating element of which is required to move only a relatively small distance in effecting the escape of relatively large amounts of compressed air.

A specific object of the present invention is to provide an improved air valve construction, the valve seat of which comprises an O-ring.

Another specific object of the present invention is to provide an improved valve of this character which incorporates differentially acting air pressure responsive means which is normally effective to maintain the valve in closed position, but which acts effectively in a direction to open the valve.

Another specific object of the present invention is to provide an improved air valve of this character operating such that the air pressure tends to open the valve rather than to close it.

Another specific object of the present invention is to provide an improved valve of this character which incorporates a diaphragm, the diaphragm being used in such a manner that the air pressure upon the same maintains the valve closed.

Another specific object of the present invention is to provide an improved valve of this character which requires only a relatively small differential pressure to cause unseating of the valve to allow escape of relatively large amounts of air with relatively small travel of a movable valve member.

Another object of the present invention is to provide an improved valve having the features mentioned above and which is yet characterized by the fact that tolerances

are liberal, thereby allowing simplification and a relatively inexpensive construction.

Another specific object of the present invention is to provide an improved valve which is capable of being opened and closed through millions of cycles without showing appreciable signs of wear.

Another specific object of the present invention is to provide an improved valve which avoids the necessity of a metal seat which otherwise would be subject to wear as a result of hammering.

Another specific object of the present invention is to provide an improved valve characterized by the fact that it does not require a stuffing box and it is without friction.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a view, partly in section and partly in elevation, showing apparatus embodying features of the present invention;

Figure 2 is a longitudinal sectional view through the valve shown in Figure 1 and with the valve in closed position;

Figure 3 is a sectional view corresponding to the sectional view shown in Figure 2, but with the movable valve element shown in actuated or valve open position;

Figure 4 is a view taken on the line 4—4 of Figure 2. Briefly, the apparatus described in detail herein forms a part of peach half sorting apparatus of the character described in applicant's copending patent application, Serial No. 80,865, filed March 11, 1949, and assigned to the same assignee as the present invention.

The apparatus functions to segregate peach halves in accordance with their degree of ripeness. Photoelectric means (not shown herein) are used to derive intelligence as to the ripeness of a peach half, and such intelligence is used to energize a corresponding one of a plurality of solenoids. Only one of such solenoids is shown herein and is designated by the reference numeral 10. Each of such solenoids, as exemplified by the solenoid 10, is of identical construction and each functions to actuate a corresponding air valve 12 for effecting removal of a peach half P from a power driven endless belt which, in fact, comprises two parallel extending endless belts 18, 19, which pass over the spaced driving pulleys 14, 14. The air valve 12 controls the flow of compressed air to the nozzles 15, 16. It is understood that each of the plurality of air valves 12 is disposed side by side in spaced relationship in the direction of travel of the peach halves P, and in alignment with a corresponding peach half chute 17.

It is observed that the nozzle 15 extends between the reaches of the belt 18 and is directed upwardly midway between the spaced belts 18, 19 to direct a jet of air vertically upwardly for purposes generally of lifting the peach half P from the belts 18, 19 upon which the same rests, and simultaneously the nozzle 16, which extends over the upper region of belt 18, directs a stream of air laterally of the belts 18, 19, so that while the peach half P is being lifted by the air jet from nozzle 15, such peach half is simultaneously moved or blown laterally by the air jet from nozzle 16 into the chute 17 through which it may gravitate to a suitable receptacle (not shown).

The nozzles 15, 16 are both constantly in communication with the outlet tube 20 of the momentarily closed air valve 12 which is now described in detail.

The air valve 12 is in its normally closed position shown in Figure 2, even though air under pressure is supplied thereto through air inlet opening 21. The valve

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12 is opened only upon energization of the solenoid 10, which results in pivotal movement of the lever 23 and resulting upward movement of the valve stem 24. The valve stem 24 mounts the disc-shaped valve element 25 which normally engages the rubber or elastic O-ring 27. An important feature of the present invention resides in the use of the O-ring 27 as a valve seat for the co-operating disc-shaped valve element 25. The solenoid 10 and air valve 12 are both mounted on a stationary frame 28, with the movable solenoid armature 29 being pin connected at 30 to the lower end of lever 23. The upper end of lever 23 is pivotally mounted at 32 to the bracket 33 on the stationary valve plate 34. This lever 23 has a portion thereof contacting the lower end of the valve stem 24 and is movable from the normal position shown in Figure 2 to the position shown in Figure 3 upon energization of the solenoid 10 to effect opening of the valve.

The valve stem 24 is fixed to the flexible annular diaphragm 35, the annular edge of which is clamped or bolted between the annular valve casing elements 37, 38 by a plurality of machine bolts 40 which pass through aligned apertures in the plate 34. The valve stem 24 is affixed to this flexible diaphragm 35 between the disc-shaped shoulders 24A, 24B. The lower end of the valve stem 24 is threaded and carries the stop nut 42, which is maintained thereon in adjusted position and functions, by engagement with the casing element 38, to limit upward movement of the valve stem 24.

The casing element 37, of annular form, has a plurality of parallel extending ports 37A, through which air passes in the direction indicated by the arrows in Figure 3 when the valve is opened. The upper face of the element 37 releasably mounts an O-ring 27 by means of the annular ring 44, which is fastened to the element 37 by screws 45. It is observed that the ring 44 has an inner concave surface for snugly engaging the O-ring 27, and likewise the casing element 37 is provided with a complementary concave surface for the same purpose whereby the O-ring 27 is firmly held, but with an upper portion thereof extending beyond the upper plane of the valve element 37 to allow some distortion of the O-ring 27, i. e., to allow the elastic O-ring 27 to be deformed slightly by the valve element 25 in closed position of the valve. The valve element 25 is enclosed by the valve plate 46, which is bolted to the casing element 37 by means of bolts 47. This valve plate 46 is threaded to receive the outlet tube 20.

It should be carefully observed from the foregoing description that the O-ring 27 is used as a valve seat. Also, the air within the air chamber 41 acts against the valve element 25 in such direction as to tend to open the same. However, the force developed on the valve element 25 by the air pressure is somewhat smaller than the oppositely acting force developed on the diaphragm 35 of larger exposed area. In other words, since the force developed on the diaphragm 35 is greater than the force developed on the valve element 25, the valve will remain in its closed position in Figure 2, even in the absence of any spring biasing force which may be exerted by the diaphragm 35.

It is thus clear that the introduction of air pressure into the chamber 41 will not result in opening of the valve, and that some external means is required to open the valve. Such external means comprises the solenoid actuated lever 23, as previously described. Upon relatively small displacement of the lever 23, the valve stem 24 is moved upwardly to open the valve. Movement of the valve stem 24 for this purpose may indeed be very small and in the order of .020 of an inch to allow the escape of a relatively large amount of air to the outlet tube 20, and consequently to the nozzles 15, 16 (Figure 1). By this construction large amounts of air may be liberated quickly, thereby permitting segregation of the peach halves at a relatively large rate.

A further inherent advantage in the construction dis-

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closed lies in the arrangement wherein the ports 37A constitute restrictions in the path of flow of compressed air from the chamber 41 to the valve disc 25. By virtue of the restricting effect of these ports there is a substantial pressure drop when valve disc 25 is in opened position so that the unit pressure acting upwardly on the valve disc 25 is less than the unit pressure acting thereon when the valve is closed. Even during periods when the valve is open the unit pressure acting on diaphragm 35 remains substantially constant and, therefore, there is a greater differential between the total pressure acting on diaphragm 35 and disc 25 tending to close the valve than there is when the valve is closed and the same unit pressure exists in chamber 41, ports 37A and the space immediately below disc 25. When the valve is closed the differential pressure holding the valve closed is at its minimum value and thus the valve may be readily and rapidly opened by the solenoid 10. On the other hand, when the valve is open the unit pressure acting on disc 25 is reduced and a greater differential exists tending to close the valve. Thus, de-energization of solenoid 10 will result in very rapid closing of the air valve and this characteristic renders the valve particularly useful for conditions where high speed operation is essential, as in the arrangement shown in Fig. 1.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. In an arrangement of the character described, a pair of parallel spaced endless belts forming comestible carrying means, a first air nozzle extending upwardly between said spaced belts to direct a stream of air upwardly against comestibles carried thereon to lift the same, a second nozzle disposed to direct a stream of air laterally of and above said spaced belts onto comestibles thus lifted by said first nozzle, a single air valve controlling the flow of air to each of said nozzles, electromagnetically operated means functioning to open said valve, said valve comprising a valve casing which defines an air chamber, a flexible diaphragm within said casing and defining a movable wall of said air chamber, an inlet opening to said chamber, an outlet opening for said chamber, normally closed valve means interposed between said chamber and said outlet means, said valve means comprising an O-ring mounted on said casing, a disc member contacting said O-ring, a valve stem connected to said disc member and said diaphragm for movement together, and means interconnecting said electromagnetically operated means to said stem.

2. In an arrangement of the character described, a pair of parallel spaced endless belts forming comestible carrying means, a first air nozzle extending upwardly between said spaced belts to direct a stream of air upwardly against comestibles carried thereon to lift the same, a second nozzle disposed to direct a stream of air laterally of and above said spaced belts onto comestibles thus lifted by said first nozzle, a single air valve controlling the flow of air to each of said nozzles, electromagnetically operated means functioning to open said valve, said valve comprising a valve casing which defines an air chamber, a flexible diaphragm within said casing and defining a movable wall of said air chamber, an inlet opening to said chamber, an outlet opening for said chamber, normally closed valve means interposed between said chamber and said outlet means, said valve means comprising an O-ring mounted on said casing, a disc member contacting said O-ring, means interconnecting said disc member and said diaphragm, and means interconnecting said electromagnetically operated means to the last mentioned means.

3. In an arrangement of the character described, a

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valve casing defining an air chamber, a flexible diaphragm mounted on said casing and forming a movable wall of said chamber, a valve stem attached to said diaphragm, a valve disc member mounted on said stem, said disc member serving as a second movable wall of said chamber, an O-ring mounted on said casing and serving as a valve seat contacting the inner surface of said disc member, the exposed area of said diaphragm being larger than the exposed area of said disc member whereby the force developed on said diaphragm causes the disc member to move into engagement with said O-ring, an electromagnetically operated means comprising a lever pivotally mounted on said casing and movable into engagement with said valve stem for moving said disc member away from said O-ring, and a pair of nozzles arranged to direct a stream of air in substantially mutually perpendicular directions in communication with said chamber through the space between said disc member and said O-ring.

4. In an arrangement of the character described, a valve casing defining an air chamber, a flexible diaphragm mounted on said casing and forming a movable wall of said chamber, a valve stem attached to said diaphragm, a valve disc member mounted on said stem, said disc member serving as a second movable wall of said chamber, an O-ring mounted on said casing and serving as a valve seat contacting the inner surface of said disc member, the exposed area of said diaphragm being larger than the exposed area of said disc member whereby the force developed on said diaphragm causes the disc member to move into engagement with said O-ring, an electromagnetically operated means comprising a lever pivotally mounted on said casing and movable into engagement with said valve stem for moving said disc member away from said O-ring, said chamber being in communication with an inlet opening, a chamber outlet opening, said disc member being interposed between said chamber and said outlet opening, comestible conveying means, a first nozzle connected to said outlet and functioning to direct an air jet upwardly against the comestible carried on said conveying means to lift the same from the conveying means, and a second nozzle connected to said outlet and functioning to direct a jet of air laterally of said conveying means to displace the comestible from said conveying means while being lifted by the air jet produced by the first nozzle.

5. In an arrangement of the character described, a valve casing, having a relatively large chamber which is intended normally to contain a fluid under a relatively high pressure, a flexible diaphragm mounted in said cas-

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ing and forming a movable wall of said chamber, a valve stem attached to said diaphragm, an O-ring mounted on said casing and serving as a valve seat, a disc member mounted on said stem and contacting said O-ring, said disc member forming a movable wall and having a smaller effective area than the effective area of said diaphragm, and conduit means which has an effective area substantially less than the effective area of said disc member communicating said chamber with said disc member, so that all of the fluid which flows from said chamber to said disc member flows through said conduit means and develops a pressure drop across said conduit means to thereby lower, by that amount, the pressure acting on said disc member.

6. In an arrangement of the character described, a valve casing defining a fluid chamber, a flexible diaphragm mounted on said casing and forming a movable wall of said chamber, means attached to said diaphragm for flexing the same, a valve member mounted for movement with said flexing means, said valve member serving as a second movable wall of said chamber, means mounted on said casing internally of said chamber and serving as a valve seat contacting the inner chamber surface of said valve member, the effective area of said diaphragm being larger than the effective area of said valve member whereby the force developed on said diaphragm causes the valve member to move into engagement with said valve seat, and conduit means which has an effective area substantially less than the effective area of said disc member communicating said chamber with said disc member so that all of the fluid which flows from said chamber to said disc member flows through said conduit means to develop a pressure drop across said conduit means, to thereby lower the pressure acting on said valve member to that extent.

References Cited in the file of this patent

UNITED STATES PATENTS

184,279	Chamberlain	Nov. 14, 1876
313,313	Gannaway	Mar. 3, 1885
1,392,952	Link	Oct. 11, 1921
1,596,968	Hansen	Aug. 24, 1926
1,680,245	Penn	Aug. 7, 1928
2,146,572	Hohn et al.	Feb. 7, 1939
2,168,419	Paterson	Aug. 8, 1939
2,377,123	Ballamy et al.	May 29, 1945
2,524,951	Ashton	Oct. 10, 1950