April 18, 1967 G. F. W. POWELL 3,314,538

DEVICE FOR SEPARATING IMPERFECT CIGARETTES FROM A PROCESSION OF CIGARETTES

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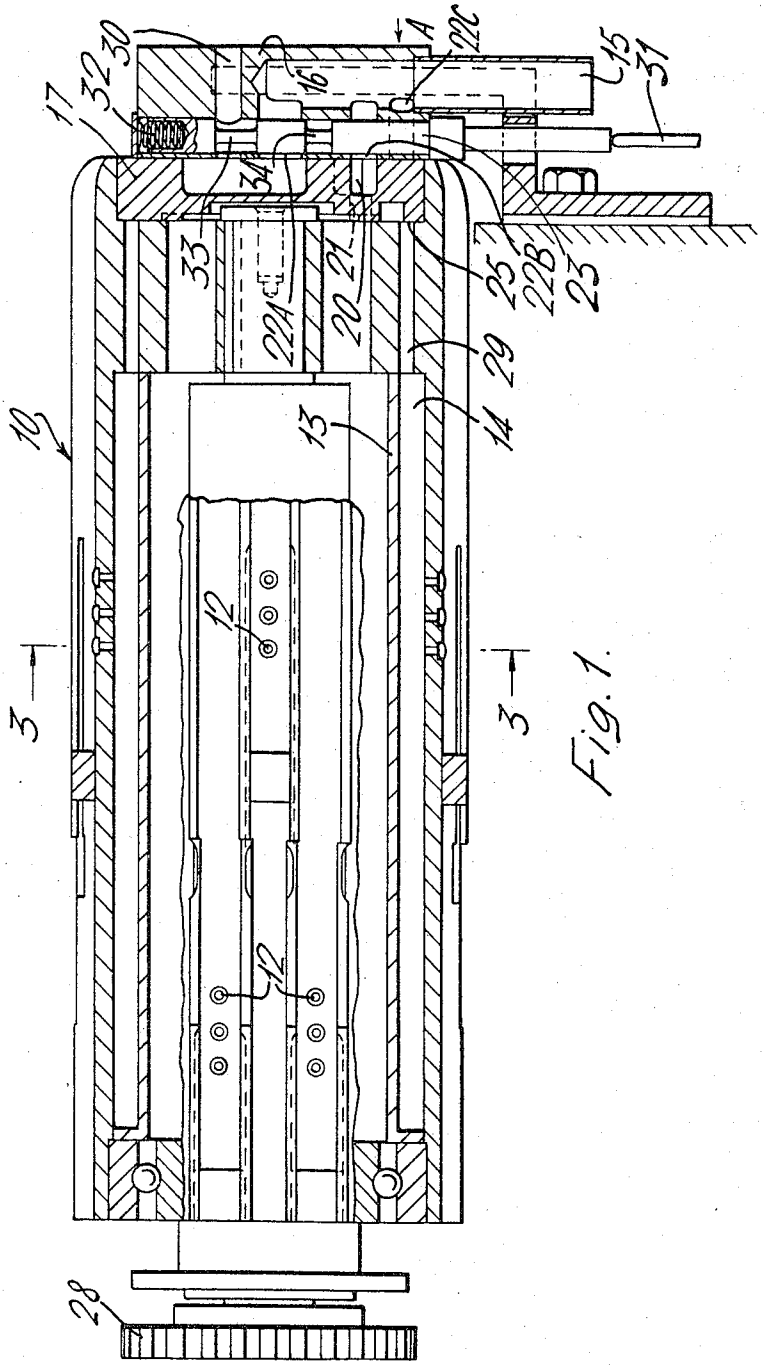


Fig. 1.

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Fig. 2.

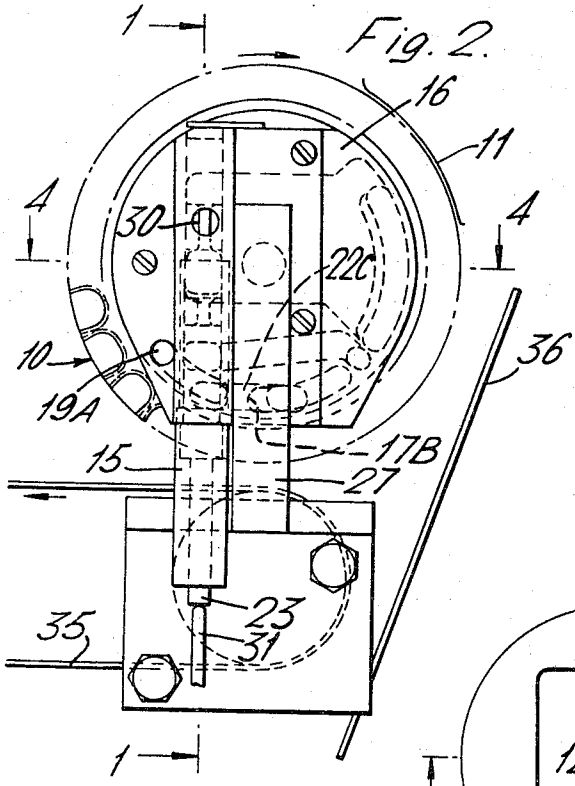


Fig. 6.

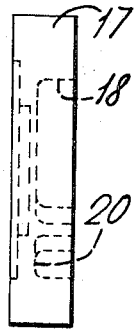


Fig. 5.

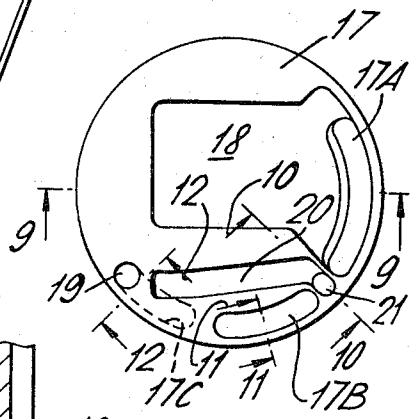


Fig. 4.

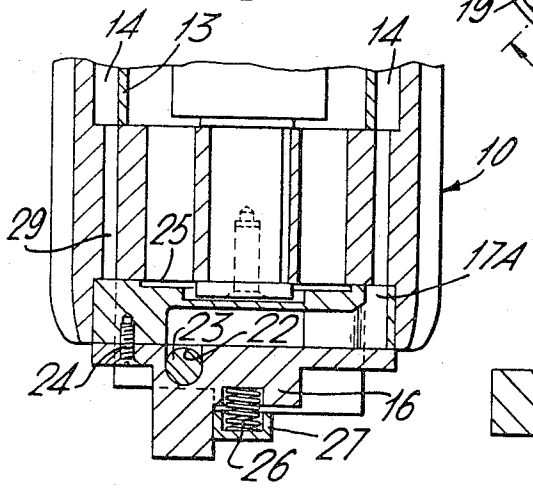
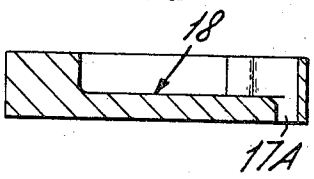


Fig. 9.



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Fig. 3.

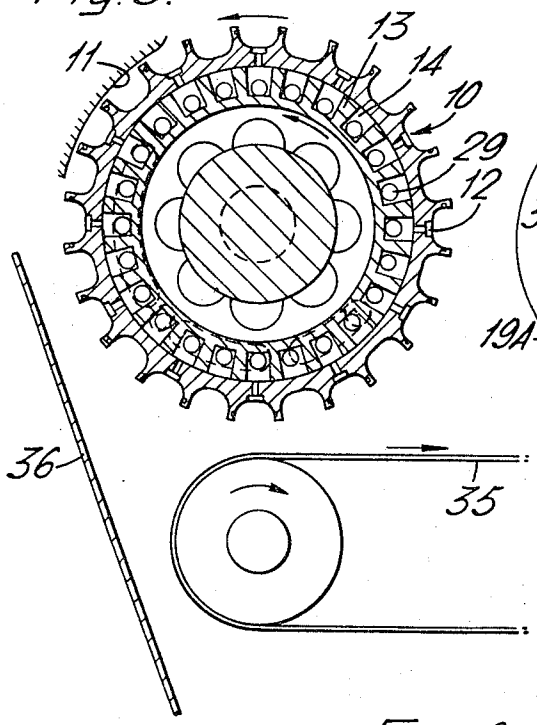


Fig. 7.

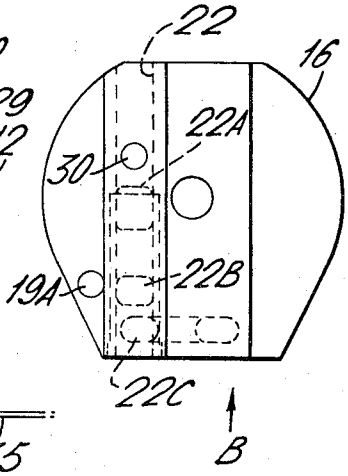


Fig. 8.

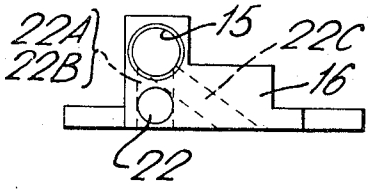


Fig. 10.

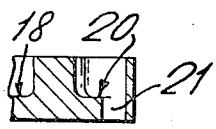


Fig. 11.

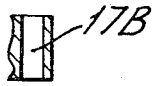
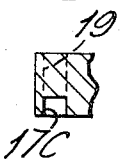


Fig. 12.



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Patented Apr. 18, 1967

3,314,538

DEVICE FOR SEPARATING IMPERFECT CIGARETTES FROM A PROCESSION OF CIGARETTES

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Filed June 2, 1965, Ser. No. 460,660
Claims priority, application Great Britain, July 20, 1964, 29,482/64
4 Claims. (Cl. 209—74)

This invention concerns a device for separating imperfect cigarettes from a procession of cigarettes.

In the manufacture of cigarettes it is common to convey cigarettes in the flutes of rotating drums. In continuous-rod cigarette-making machines, for example, the cigarettes emerging from the cut-off often pass into the flutes of a drum which eventually deposits them on the catcher band of the machine. In other methods of manufacture, for instance, for filter tip cigarettes, cigarettes are conveyed by fluted drums during the process of attaching mouthpieces to them. Usually two cigarettes are joined to a double-length mouthpiece, disposed between them, and the assemblage is then bisected to provide two filter-tip cigarettes.

In this specification the word "cigarettes" includes all such finished, or partial-products, embodying a piece of cigarette rod.

It is also common in the manufacture of cigarettes to provide detectors which detect various defects in cigarette rod, whether continuous, or cut into short lengths, and to provides devices for rejecting those cigarettes found to be defective, from the whole quantity being produced.

It has been proposed to feed cigarettes into fluted drums provided with devices in each flute which test the cigarettes by radiation gauge methods or dielectric measurement methods and to provide means for removing cigarettes found to be defective from the flutes by various devices. In one such arrangement the defective cigarettes are removed from the flutes by suction nozzles movable past the fluted drum and actuated by the operation of the testing devices to apply suction to the nozzles for this purpose. Cigarettes removed by any such devices are moved out of the flutes at one position in the drum revolution and the remainder are delivered by the drum at another position, usually at a later stage in the drum revolution.

It has been proposed in United States Application Serial No. 369,447, filed May 22, 1964, by David T. N. Williamson and Douglas William B. Muir, now U.S. Patent No. 3,250,249, to provide a device for detecting the presence of electrically-conductive particles, such as pieces of metal, in a continuous rod so that, inter alia, detected portions of the rod, corresponding to eventual cigarette lengths, are noted, and the resulting cigarettes can be delivered to a special output channel so as to separate them from cigarettes free of such material.

The present invention provides means for effecting such separation but it is to be understood that the invention is not limited to this particular use and that it can be employed in conjunction with any kind of detector.

According to the invention there is provided a device for separating imperfect cigarettes from a procession of cigarettes and for use with a detector for detecting imperfections in cigarettes, comprising a fluted drum and means for feeding cigarettes to the flutes thereof and means for causing satisfactory cigarettes to be conveyed by the drum to one delivery position and discharged at such position and means, operating in response to a detector signal, for causing imperfect cigarettes to be discharged from the drum at another position, wherein the cigarettes are held in the flutes by suction through holes

in the flutes, and satisfactory cigarettes are thus conveyed to the desired position of discharge where the suction is cut off so that the cigarettes can leave the flutes, but means is provided, operative in response to the detector signal, for stopping suction to flutes containing imperfect cigarettes so that these can leave the flutes at another position, in advance of said desired position of discharge.

The invention will be further described with reference to the accompanying drawings in which:

FIGURE 1 is a longitudinal axial section of a rotatable fluted drum suitable for use with the invention; and as applied to a continuous-rod cigarette-making machine, the view including a section of a fixed valve body and valve plate, taken on the line **1—1** of FIGURE 2.

FIGURE 2 is an end elevation of FIGURE 1, looking in the direction of arrow A, and also shows some additional parts.

FIGURE 3 is a sectional view of the drum shown in FIGURE 1 on the line **3—3** but showing some of the additional parts shown in FIGURE 2.

FIGURE 4 is a sectional view on the line **4—4**, FIGURE 2.

FIGURE 5 is a front elevation of a valve plate used in a valve system for controlling suction in the flutes of the drum.

FIGURE 6 is a side elevation of the plate shown in FIGURE 5.

FIGURE 7 is a front elevation of a valve body with which the plate of FIGURE 5 cooperates.

FIGURE 8 is a view of FIGURE 7, looking in the direction of the arrow B.

FIGURES 9 to 12 are local sections of FIGURE 5 on the lines **9—9**: **10—10**: **11—11** and **12—12** respectively.

Referring first to FIGURES 1 to 4, the fluted drum **10** shown, is rather similar to that shown and described in United States Patent No. 3,039,589, issued June 19, 1962, in the names of Desmond Walter Molins and Cyril Best. Cigarettes are fed into the flutes at the top of the drum, as described in said specification.

The flutes have holes **12** through which suction can be exerted as explained below. In FIGURE 1 the holes **12** in alternate flutes are shown in different positions. This is because the fluted drum shown is for collecting cigarettes in two side by side rows on a catcher band **35**. Alternate cigarettes are therefore arrested at different positions along the drum flutes as explained in the patent referred to above. Further, as will be clear from FIGURE 3, the holes **12** are radial to the centre of the drum and counterbored but in a modified form the holes are not counterbored and are displaced from the central plane of the flutes so that they are nearer to that wall of a flute which is leading as the drum rotates to compensate for the tendency of the cigarettes to roll down towards said wall as they move down with the revolving drum. A guide or shroud **11** keeps the cigarettes in place in the flutes, as the drum rotates, for a short distance from the feeding position. This is because suction is stopped in flutes containing defective cigarettes near the lower end of this guide and the guide prevents them from being prematurely thrown out by the drum rotation.

The drum is modified as compared with the drum in said patent by the fitting of an internal sleeve **13** which is grooved longitudinally so as to provide air passages **14**. A suction pipe **15** can communicate with these passages at times through a stationary valve body **16** and a stationary valve plate **17**. One face of the valve body **16** is flat and the body is fixed to the valve plate with this face in contact with a first flat face of the valve plate, a second flat face of the plate being in rubbing contact with a flat face at the end of the drum **10**. The valve plate has three long ports **17A**, **17B** and **17C**, of arcuate form, con-

centric with the axis of the fluted drum and disposed as best seen in FIGURE 5.

Referring now to FIGURES 5 and 6, the plate **17** has a deep depression **18** on its front or first flat face and the port **17A** extends from the face of this depression through the plate to the rear or second flat face. The port **17B** extends right through the plate from the front face to the rear face. The port **17C** is shallow and extends only a short distance into the plate from the rear face but a hole **19** connects this port to the front face of the plate.

The plate has a further narrow depression **20** which is as deep as **18**, and a hole **21** constituting a small intermediate port between the arcuate ports **17A** and **17B** extends from the face of this depression to the rear face of the plate.

The valve body **16**, FIGURES 7 and 8, has a cylindrical bore **22**, in which a piston valve **23** is movable, and from the hole **22** to the flat face, FIGURE 1, of the valve body, two ports **22A**, **22B** extend, these ports continuing into the hole in the body in which the suction pipe **15** is fixed. A port **22C** extends obliquely from the hole in the body in which pipe **15** is fixed, to the flat face of the body. The hole **19** in valve plate **17** is in line with a similar hole in the valve body, marked **19A**.

The valve body is fixed to the valve plate by screws, such as the one shown at **24**, FIGURE 4, and the two members are pressed against the flat face **25** of the fluted drum **10** in rubbing contact therewith. The pressure is exerted by a spring **26** which abuts against a blind hole in a fixed bracket **27**. Thus as the drum rotates, when driven by a gear wheel **28**, FIGURE 1, the passages **14** communicate in turn with the various ports and holes mentioned above, through holes **29** in the drum which lead to the passages **14**, the functioning of these parts being described in more detail presently. The valve body **16** also has a hole **30** which extends right through it and connects the cylindrical bore **22** to atmosphere when the piston valve is suitably disposed in the bore **22**. A rod **31** which is operated by a solenoid (not shown) can move the piston valve upwards to the position shown in FIGURE 1 and a spring **32** returns the piston valve when the solenoid is de-energised. The piston valve is shown in the upper position, which it occupies when defective cigarettes are to be discharged from the flutes. Assuming however that the piston valve is in its lower position the operation is as follows:

Cigarettes fed in turn to the top flute of the drum are carried round as the drum rotates in the direction of the arrow, FIGURE 2. While the cigarettes are satisfactory as determined by a detector, such as the one referred to, the piston valve remains in the lower position and the cigarettes are held in the flutes as they pass round beneath the shroud **11** and the following unshrouded space by suction through the port **17A**, as the grooves **14** of the sleeve **13** communicates with the suction pipe **15** through holes **29**, port **17A**, depression **18**, port **22A**, and a recessed part **33** of the piston valve. Then as the drum rotates the suction continues through the intermediate port **21**, depression **20**, port **22B** and a recessed portion **34** of the piston valve. Thereafter suction continues through port **17B** which is in direct communication with pipe **15** through the oblique port **22C** whose end adjacent the first flat face of the valve plate **17** overlaps port **17B**, as can be seen in FIGURE 2. Thus the cigarettes are held in the flutes by suction until a flute ceases to be in communication with the left-hand end, FIGURE 2, of port **17B**. Immediately afterwards, the flute in question is put in direct communication with the atmosphere through the hole **19A** in the valve body, hole **19** in plate **17** and the shallow port **17C** which connects with the last said hole.

The purpose of port **17C** is to ensure that cigarettes are positively released from the flutes immediately after the latter pass the left-hand end of port **17B**. The drum rotates quickly on a modern machine and there is a tendency for a cigarette to remain in a flute after suction has nominally ceased, because the suction holds them very firmly. By opening the flute to atmosphere through port **17C** the effective release of a cigarette is secured.

Thus satisfactory cigarettes fall on to a catcher band **35** and are carried away in the direction of the arrow, FIGURE 2.

If, however, cigarettes are found to be defective by the detector, a solenoid is energised and the rod **31** is pushed upwards to bring the piston valve **23** into the position shown in FIGURE 1. In this case the port **17A** is put into communication with the atmosphere through the depression **18**, the portion of the hole **30** adjacent the first flat face of the valve plate, the recess **33** in the piston valve and the remainder of the hole **30** and so no suction is exerted on flutes passing the port **17A**. As noted earlier, flutes in this region are shrouded for the reasons given but as soon as a flute in which suction has ceased passes the lower end of the shroud **11**, the cigarette rolls out and is guided by a plate **36** down to a waste box or the like.

The choice of the distance between the neighbouring ends of the arcuate ports **17A** and **17B** is somewhat restricted. It should be as small as possible so that suction in a flute is maintained with an almost imperceptible break but then there is a risk that as the holes **29** in the drum pass between these two ports they might overlap the neighbouring ends of the ports if the latter were too close together and suction in port **17B** might be adversely affected at times when port **17A** is open to atmosphere. The intermediate port **21** is therefore provided to isolate port **17B** from port **17A** when the latter is open to atmosphere so as to overcome this risk. When the piston valve is pushed to the upper position and the port **17A** is connected to atmosphere the port **21** is closed off from the suction system by the full diameter of the piston valve, see FIGURE 1. As a single defective cigarette will cause the piston valve **23** to be moved upward, possibly two, or even three, satisfactory cigarettes will aso be discarded but this is not important.

It will be understood that operation of the piston valve is subject to the time delay normally used to cover the movement of a cigarette between the detecting position and the position where an imperfect cigarette is to be discarded.

What I claim as my invention and desire to secure by Letters Patent is:

1. A device for separating imperfect cigarettes from a procession of cigarettes and for use with a detector which produces a signal on the detection of an imperfect cigarette, comprising a rotatably mounted fluted drum having a flat face at one end thereof, means for feeding cigarettes to the flutes thereof, a delivery position at which satisfactory cigarettes are discharged from the drum, a second position at which imperfect cigarettes are discharged from the drum, means defining at least one hole in each flute by which a cigarette can be suctionally held thereto, means defining air passages in the interior of the drum, one end of each air passage communicating with the hole of one flute and the other end defining an opening on the flat face of the drum, said openings together defining a ring concentric with the axis of the drum, a stationary valve device having a flat face, the valve device and the drum being so disposed that their flat faces are in rubbing contact, a suction duct in the valve device, means defining communicating passages between the flat face of the valve device and the suction duct and a movable valve piece in the valve device operable in response to a signal from said detector whereby suction can be regulated in each flute as the drum rotates so that imperfect cigarettes are discharged at the second position and acceptable cigarettes at the delivery position.

2. A device as claimed in claim **1** in which the valve device comprises a valve body having a cylindrical bore and a piston valve movable in said bore, the valve body

having a cylindrical bore and a piston valve movable in said bore, the valve body having a flat face, a valve plate fixed to the valve body and having two flat faces parallel to one another the first of these faces being in contact with the flat face of the valve body, and the second flat face being that in rubbing contact with the flat face of the drum end, said valve plate having a depression in the first flat face and a first arcuate port concentric with the drum axis and extending from the depression to the second flat face, a second arcuate port closely following the first and extending from the first flat face to the second flat face of the valve plate, a port extending from the flat face of the valve body to the cylindrical bore and into the suction duct, a recess in the piston valve adjoining said port when the piston valve is in its normal position and satisfactory cigarettes are passing whereby suction is exercised in a flute of the drum from the moment its associated hole reaches the first arcuate port until said associated hole passes beyond the end of said port, a second port extending from the flat face of the valve body, where it joins the second arcuate port, to the suction duct to continue suction in the flute until the associated hole passes the end of the second arcuate port whereupon a satisfactory cigarette may fall from the flute, the valve body having a hole extending from the flat face into the cylindrical bore and thence to the exterior of the body so that when the piston valve is moved in response to a detector signal the recess is aligned with the hole through the valve body and the first arcuate port is put in communication with the atmosphere through the depression in the valve body, the recess in the piston valve and said hole and the flutes passing by the first arcuate port are no longer subjected to suction and defective cigarettes may fall from them.

3. A device as claimed in claim 2 further comprising a hole through the valve plate and a hole aligned with the first said hole and passing through the valve body to its exterior, a third arcuate port formed in the second flat face of the valve plate and extending from the first said hole to a position near the end of the second arcuate port, whereby flutes leaving the said end, and no longer subject to suction, are forthwith put into communication with atmosphere through the third arcuate port and the aligned holes, to ensure that cigarettes are positively released

from the flutes immediately their respective holes in the flat end face of the drum pass beyond the second arcuate port.

4. A device as claimed in claim 2 comprising an intermediate port between the neighbouring ends of the first and second arcuate ports, a second recess in the piston valve, and a second depression in the first flat face of the valve plate with the intermediate port extending from the second depression to the second flat face of the valve plate, the second depression being so located that when the piston valve is in its normal position said second recess is in communication with the intermediate port through the second depression, a port in the valve body in line with the second recess in the piston valve when the latter is in its normal position and extending from the flat face of the body through the cylindrical bore and into the interior of the suction duct so that suction in the flutes is continued through the intermediate port, said port in the valve body and the second recess in the piston valve but when the piston valve is moved in response to a detector signal the intermediate port is shut off from the suction duct, whereby the intermediate port normally serves to continue suction in the flutes as the associated holes in the end face of the drum pass from the end of the first arcuate port to the beginning of the second arcuate port but isolates the first arcuate port from the second arcuate port so that suction in the second arcuate port is not adversely affected when the first arcuate port is open to atmosphere.

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