Aug. 22, 1961 G. DE GOOIJER 2,997,179

SIFTING DEVICE AND METHOD FOR FILTERING WITH THE AID OF SAID SIFTING DEVICE

Filed July 28, 1959 2 Sheets-Sheet 1

FIG.1

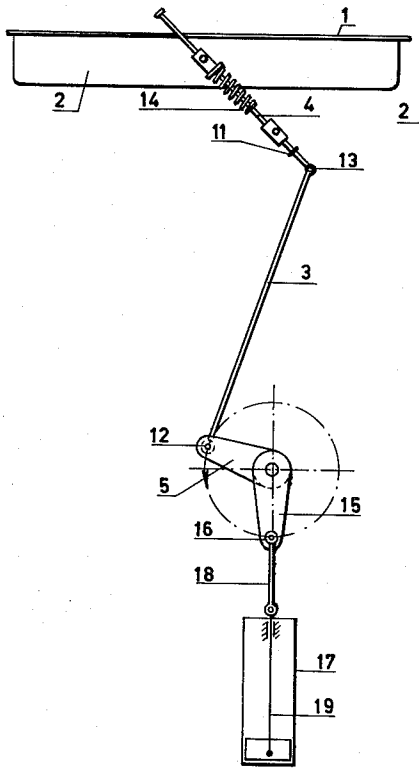


FIG.2

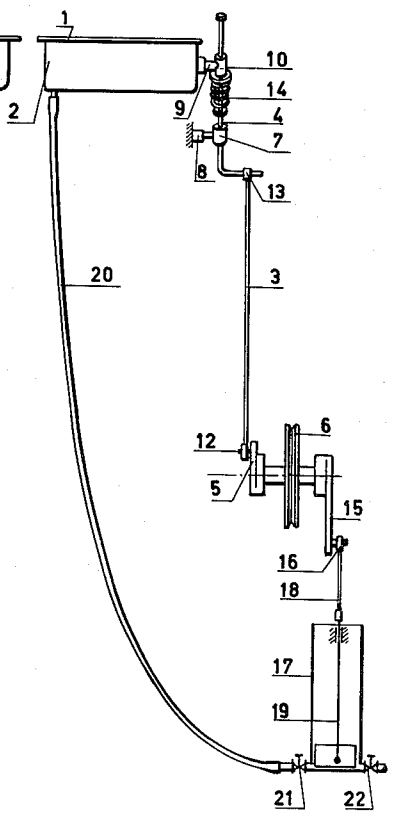


FIG.3

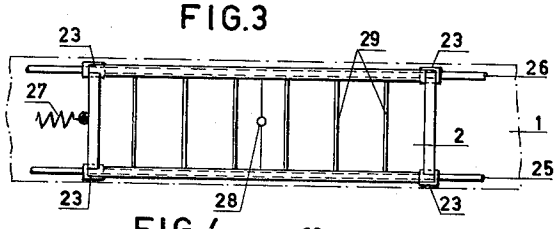
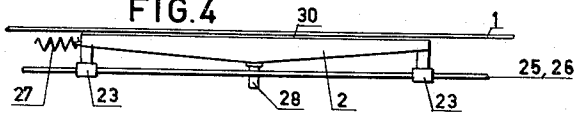


FIG.4



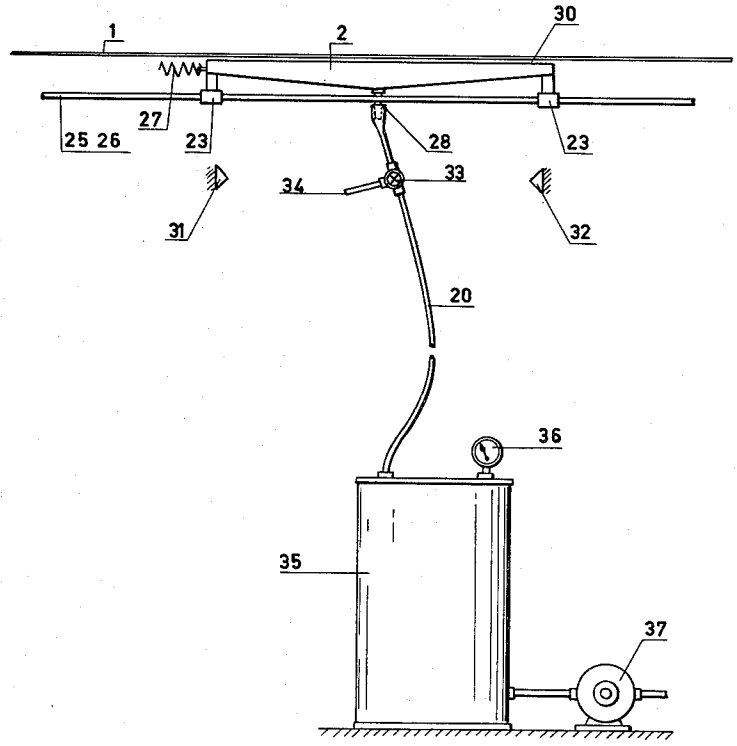
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SIFTING DEVICE AND METHOD FOR FILTERING WITH THE AID OF SAID SIFTING DEVICE

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FIG.5



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SIFTING DEVICE AND METHOD FOR FILTERING WITH THE AID OF SAID SIFTING DEVICE

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3 Claims. (Cl. 210—400)

The invention relates to a sifting device for sucking off a liquid from a suspension on a continuously running belt and a method for filtering a suspension, whereby on the surface of the belt liquid is removed from said suspension with the aid of a decreased pressure on the other side of the belt.

Sifting devices provided with an endless sifting belt and also provided with a fixed suction box having a suction mouthpiece over which the endless sifting belt moves forward, are known.

A device of this sort has the drawback that the mouthpiece of the suction box and the sifting belt are subjected to heavy wear and tear because of the friction existing between said parts. This disadvantage increases in proportion to the effectiveness of the suction device and the degree of vacuum.

This is generally the case when a low pressure in the suction box is desirable. In this case the mouthpiece of the suction box should fit closely against the sifting belt so that a tightness against the penetration of false air is obtained.

In addition to this, a further drawback also occurs in that the sifting belt is held back and is deformed by the vacuum in the suction box.

It is known, in order to lessen the wear of the suction box in sifting devices of the above-named type, to have said sifting devices provided with a perforated endless cloth running round the suction box, which is arranged between the mouthpiece of the suction box and the belt carrying the width of material, whereby the endless cloth is on both sides of the perforated part provided with compact rims which have backs running in longitudinal direction, that grip into corresponding grooves of the side rims of the mouthpiece of the suction box, in such a way that a tightness against the penetration of false air is obtained. In this case, however, the wear and tear which used to be caused by the friction of the sifting belt over the mouthpiece of the suction box, is now caused by the backs running in longitudinal direction that grip into corresponding grooves of the side rims of the mouthpiece.

It is, therefore, an object of the invention to construct a sifting device which practically does not show any wear by friction between sifting belt or filtering belt and suction box mouthpiece.

A further object of the invention is a very effective sifting device with a high vacuum in the suction box and in which the packing against the penetration of false air between the rim of the mouthpiece of the suction box and the belt can be effected in a simple and adequate way.

Another object of the invention is a sifting device with a flat filtering belt which is sucked off evenly over the whole of its breadth.

A still further object of the invention is a sifting device with a flat filtering belt with extremely small apertures.

And yet another object of the invention is a tobacco leaf which is made with the sifting device according to the invention.

The sifting device according to the invention eliminates the wear and tear of the sifting belt and the mouthpiece by applying a movable suction box with mouthpiece, which suction box intermittently follows the movement

of the belt from a starting position, and after this returns to said starting position, and with a vacuum apparatus also operating intermittently and synchronously to the movement of the suction box, which vacuum apparatus sucks the box while it is following the belt.

Preferably the device according to the present invention is also provided with a support for the sifting belt, which during suction brings the sifting belt into or keeps it in the desired form and which is positioned in the mouthpiece of the suction box, while a packing can be fastened on the rim of the mouthpiece of the suction box against the penetration of air.

Hereby it becomes possible to maintain a high vacuum in the suction box during suction, such as is desirable for instance in producing a synthetic tobacco leaf, whereby a suspension, containing 1 part by weight of ground tobacco:20 to 50 parts by weight of liquid, preferably 1 part by weight of ground tobacco:40 parts by weight of liquid, are to be filtered on an endless filtering belt with the aid of a sifting device.

An abnormal wear of the sifting belt and the suction box is prevented because in this invention sifting belt and suction box do not make any movements relative to one another during suction.

It is now possible to provide the mouthpiece of the suction box with tightly fitting packing material, preferably by soft rubber or the like.

In one embodiment the sifting device is provided with a driven eccentric having a driving-shaft mechanism, controlling the suction pump acting as a suction device as well as the movement of the suction box with the mouthpiece and in which a spring, which is provided about the driving shaft belonging to the box, presses the mouthpiece of the suction box against the filtering or sifting belt during the time that the box follows the movement of the belt, while the box, after attaining the end-position of this movement, leaves the filtering belt and returns to its starting position on a semi-circular way.

In this way a very simple synchronous coupling between the suction device and the movement of the suction box is obtained, while in that case the eccentric can be coupled to the driving mechanism of the belt in a simple way, for instance by a string.

If care is taken that the length of the movement of the box with the belt and the length of the mouthpiece of the box are chosen in such a way, that the mouthpiece in the starting position of the box partly overlaps the reach of the belt which had been sucked off when the box with the belt were in the end-position of the preceding movement, the whole of the belt will be sucked off without any places being left on the belt which are not sucked off.

In another embodiment the suction box repeatedly executes a forward and backward movement over rails running parallel to the upper part of the belt, whereby a suction device, more specially a suction pump, periodically sucks the belt against the box, causing the box to be carried along with the belt, executes the forward movement and tightens a draw spring, and whereby the belt loosens itself from the box at the end of said suction period, the draw spring sets the box back to the starting position.

In this embodiment the movement of the suction box is automatically synchronized with the movement of the belt, in that the belt carries the suction box along with it as long as there is sufficient vacuum in the box. If care is taken that the movement of the box and the belt during the suction stroke is less than the length of the box mouthpiece and that in addition the back-stroke period of the pump is sufficiently short, the belt can be completely sucked off without a coupling, for instance a mechanical or electrical one, being present between the

driving mechanism for the belt and the one for the suction device.

Hereby it is possible to choose the length of the mouthpiece with respect to the displacement of the belt in such a way, that the displacement of the mouthpiece makes out a fraction only of the length of the mouthpiece, which makes it possible for the belt to be locally sucked off by a plurality of suction strokes.

It is also possible to position several boxes one behind the other under the upper part of the belt and, if desired, to provide these with a separate suction mechanism.

Each box will then be able to suck off a fixed reach of the belt, and this in such a way that the belt is sucked off completely.

In this case it is no longer necessary for the mouthpiece of the box to overlap a reach of the belt which had been sucked off during a preceding movement.

The invention will now be further illustrated with the aid of a drawing in which a couple of embodiments are shown.

FIGS. 1 and 2 show schematical front and side views of a sifting device according to the invention, in which the suction box repeatedly carries out a movement which is such that the box during part of this movement presses against the sifting belt or filtering belt and follows the belt, while simultaneously to this part of the movement of the box a vacuum apparatus operating synchronously with the movement, sucks the box, after which the box leaves the belt and returns to the starting position on a semi-circular way.

FIGS. 3 and 4 represent schematical top and side views of a sifting device according to the invention in which the suction box executes a backwards and forwards movement in such a way, that the suction box locally follows the filtering belt by the belt being sucked against the box, and a spring restores the box to the starting position after the under-pressure in the box has fallen away.

FIG. 5 shows another embodiment of a vacuum apparatus operating synchronously with the movement of the box.

In the FIGURES 1 and 2, **1** is an endless sifting belt or filtering belt with a movable suction box **2** arranged underneath.

The movable suction box **2** is by means of a rod system **3**, **4** connected to an arm **5** which is driven by a pulley **6**.

A centre of rotation **8** is provided with a sliding bearing **7** in which the rod **4** can move backwards and forwards.

The suction box **2** is also provided with a centre of rotation **9** with a sliding bearing **10** for the rod **4**.

The rod **4** is further provided with a stop **11**. Now when the centre of rotation **12** of arm **5** executes a revolution, the rotation centre **13**, the point of junction of the rods **3** and **4**, executes a circular movement round the rotation centre **8**.

In consequence of this movement the suction box **2** also carries out a circular movement round the centre **8**.

Hereby the slack spring **14** takes care, that the suction box **2** is moved along the rod **4** in such a way, that the suction box is pressed against the belt, in that part of its circular movement in which it follows the belt. Of course the pulley **6** should be driven in such a way, that the suction box, in that part of its movement, in which it follows the belt, travels at practically the same speed as does the belt. The pulley **6** also drives an arm **15** which is provided with a rotation centre **16**. A piston pump **17** is fastened to the rotation centre **16** by means of a rod system **18**, **19**.

A flexible lead **20** connects the pump **17** with the suction box **2** and is provided with a ball valve **21**, which opens itself at the moment in which the pump starts its suction stroke, that is at the moment or just after the moment that the suction box begins to follow the belt.

The ball valve **21** shuts itself at the beginning of the back stroke of the pump that is at the moment or just before the moment at which the suction box leaves the belt.

The pump is further provided with a ball valve **22**.

The liquid sucked off with the solid particles therein, if any, which have passed through the belt are sluiced out through this valve during the back stroke of the pump.

In FIGS. 3 and 4, **1** is an endless sifting belt; in FIG. 3 the sifting belt or filtering belt **1** has for the sake of clarity only been indicated by a dash-dot line.

The suction box **2** is positioned on the guiding rods **25** and **26** with the sliding bearings **23**.

The draw spring **27** is connected on the one side to the suction box **2** and on the other side to a fixed point of the device.

If the suction lead connection **28** is connected for instance to a membrane pump by means of a suction lead, the belt is sucked against the suction box at the location of the box during the suction stroke of the pump and the box is carried away with the belt, causing the draw spring to be tightened, while at the return stroke of the pump the belt looses itself from the box and the box, which is now free from the belt, is set back to the starting position by the draw spring.

The supports **29** are provided in the mouthpiece **30** of the suction box for the purpose of locally bringing and/or maintaining the belt in the desired form during sucking off.

The mouthpiece **30** of the suction box serves to tighten the suction box during the suction stroke of the pump. As a matter of course the mouthpiece **30** can again be provided with a tightly fitting packing material.

In FIG. 5 the suction lead **20**, which connects the suction box **2** with the vacuum buffer vessel **35**, is interrupted by a three-way valve **33**.

A pressure regulator **36**, for instance in the form of a contact manometer, controls the motor of the vacuum pump **37** in such a way, that a sufficient vacuum is always retained in the vessel **35**.

When the spring **27** returns the suction box to the starting position of its movement the stop **31**—mechanically or electrically—sets the valve **33** to that position at which the passage between the buffer vessel **35** and the suction box **2** is open.

The belt **1** now carries the suction box **2** with it until the stop **32** has been reached.

The stop **32** now turns the valve in such a way that the latter closes the passage between the buffer vessel **35** and the suction box **2** and at the same time connects the suction box **2** to the outer air by means of the lead **34**, causing the box to loose itself from the belt. The liquid sucked off from the suspension should be drained regularly from the buffer vessel **35**. The apparatus necessary for this purpose is not indicated in the schematical drawing.

It is evident that a vacuum apparatus of this description can also be applied in a device as represented in the FIGURES 1 and 2.

In these figures the arm **15**, the rotation centre **16**, the piston pump **17** and the rod system **18**, **19** can as a matter of course be left out.

I claim:

1. A sifting device which comprises an endless sifting belt continuously moving over at least two spaced parallel horizontal rollers, at least one suction box having a mouthpiece applicable to form a seal with the said sifting belt, a vacuum means which sucks the sifting box and the belt against each other causing said box to be carried forward with the sifting belt, a means to release the vacuum in said box after said box has travelled a predetermined distance with said belt and a draw spring attached to said suction box which is tensioned by the forward movement of said box, and which restores the suction box to its starting position upon release of the vacuum.

2. Sifting device according to claim 1, wherein the vacuum means is a suction pump.

3. Sifting device according to claim 1, wherein said movement of said box with said belt and the length of said mouthpiece have been chosen in such a way, that said mouthpiece in said starting position of said box partly overlaps the reach of the belt which had been sucked off when the box with the belt were in the end-position of the preceding movement.

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