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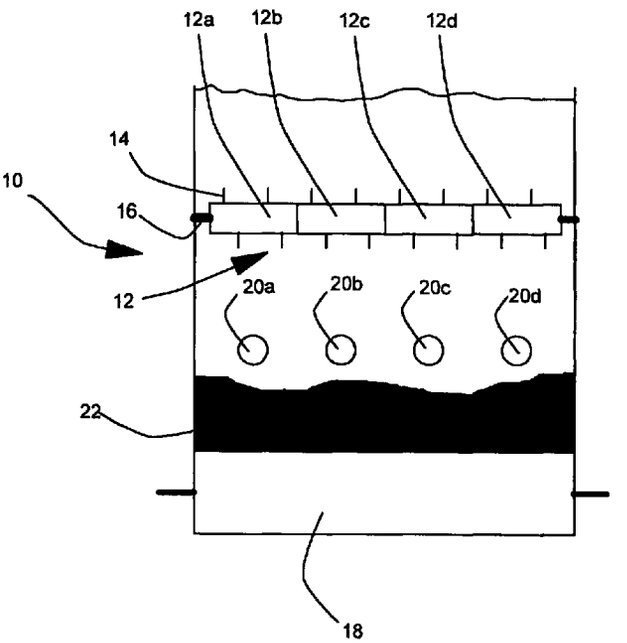
(54) Improved hopper

(57) A hopper 10 for tobacco includes a delivery roller 12 made up of four roller sections 12a,b,c,d. Operation of each section is controlled by a respective photo sensitive cell 20a,b,c,d which sends a signal causing the respective roller section to cease rotating in response to sensing a build up of tobacco on the carded drum 18 below the delivery roller in the hopper exit.

Fig.1



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Description

[0001] The present invention relates to a hopper for particulate material such as tobacco, and is especially useful in tobacco rod makers.

[0002] In conventional tobacco delivery hoppers for tobacco rod makers, a spiked delivery roller extends across the hopper, parallel to the carded drum which dispenses tobacco from the hopper to the suction box of the tobacco rod maker. A single photo sensitive cell is disposed in a side wall of the hopper; when the photo sensitive cell senses the presence of tobacco, it sends a signal to the motor controlling the delivery roller to slow or stop it. This provides a crude system for ensuring that there is an adequate supply of tobacco from the hopper to the suction box. However, it does not take account of the possibility that the tobacco is lying unevenly on the carding drum which forms the bottom of a hopper. Thus, delivery of tobacco to the suction box may be uneven, possibly resulting in a tobacco rod of irregular density.

[0003] According to the present invention there is provided a hopper for particulate material such as tobacco comprising a delivery roller disposed in the path of incoming material and a sensor for sensing a level of material in the hopper, characterised in that the delivery roller comprises a plurality of independently driven roller sections each associated with a sensor such that activation of the sensor causes the motion of the associated roller section to change. Preferably, the sensors sense a desired maximum level of material in the hopper. Also preferably, the sensors respond to detecting material by causing the associated roller section to rotate.

[0004] The invention will be further described by way of example with reference to the drawings in which:

Figures 1 and 2 show schematically a hopper according to an embodiment of the invention; and
Figure 3 shows schematically one embodiment of a roller for use in a hopper according to the invention.

[0005] The hopper 10 shown in the drawings is a tobacco rod maker hopper of generally conventional design. A delivery roller 12 is disposed across the inlet of the hopper. The circumferential surface of the roller 12 has spikes 14 to engage with tobacco entering the hopper. The roller 12 is mounted on a driven shaft 16 and comprises four separate roller sections 12a,b,c,d. At the bottom of the hopper two rotatable carded drums 18 (only one drum is shown) are disposed. Between the level of the delivery roller 12 and the carded drum 18, in a location corresponding to the desired maximum level of tobacco in the hopper, a generally horizontal row of four photo sensitive cells 20a,b,c,d is disposed. Each cell 20a,b,c,d is connected to an actuator for a respective roller section 12a,b,c,d, and each cell is at a point in the hopper wall vertically below the projection of the respective roller section onto the hopper side wall.

[0006] In use, tobacco enters the hopper 10 from above. All the delivery roller sections 12a,b,c,d rotate to distribute incoming tobacco onto the rotating carded drum 18 which forms the floor of the hopper. This situation, shown in figure 1, obtains so long as the level of tobacco in the hopper remains below the level of all the photo sensitive cells 20a,b,c,d. Figure 2 shows a hopper 10 in which the level of tobacco 22 has risen to the desired maximum level adjacent two cells 20b,d. Activation of these cells by the tobacco causes them to send a signal which disengages the respective roller sections 12b,d, which causes less tobacco to be distributed to the regions of the hopper 10 covered by the activated photo sensitive cells 20b,d.

[0007] Once the level of tobacco has fallen below the level of the activated photo sensitive cells, the disengaged roller sections are reengaged and rotate, distributing tobacco to those regions once more. If desired, reengagement of roller sections may be delayed for a fixed time after the respective photo sensitive cell is deactivated, allowing the level of tobacco in the region monitored by the activated cell to drop below the desired maximum.

[0008] The signal sent by a photo sensitive cell on activation can cause the respective roller section to engage the driven shaft in any of several ways. For example, the signal can cause an electromagnetic clutch within the roller section to engage the driven shaft, causing the roller section to rotate. Alternatively, the signal can cause a solenoid to move a key in one of the shaft or the roller section into a keyway in the other; the relative rotation of the driven shaft and the unengaged roller section will bring the key and keyway into opposition so that engagement takes place.

[0009] Figure 3 shows a pneumatic clutch arrangement. A delivery roller 12 comprises four roller sections 12a,b,c,d (the spikes of the roller are not shown). The driven shaft 16 on which the roller 12 is mounted has passageways 24a,b,c,d each of which opens in the circumferential wall of the shaft 16 away from the roller 12 and each of which ends in an actuator chamber 26a,b,c,d which opens in the circumferential wall of the shaft 16 adjacent a respective one of the roller sections 12a,b,c,d. Each actuator chamber 26a,b,c,d houses a friction block 28a,b,c,d which engages sealingly with the side walls of the chamber 26a,b,c,d but is free to move in the chamber toward and away from the respective roller section 12a,b,c,d. In the embodiment shown, two of the channels 24a,b open in the circumferential wall of the shaft 16 to one side of the roller 12 and two to the other side.

[0010] A source of compressed air (not shown) is connected to each of the passageways 24a,b,c,d by air supply pipes 30a,b,c,d. The supply pipes 30a,b,c,d are connected to the passageways 24a,b,c,d in such a manner that the shaft 16 can rotate without rotation of the supply pipes. The connection may be such that each

supply pipe 30a,b,c,d is in constant communication with a respective passageway 24a,b,c,d throughout a revolution of the shaft 16. This can be achieved by providing a plenum block 32 circumferentially around the shaft 16 through which the air supply pipes 30a,b,c,d pass. The ends of the supply pipes adjacent the shaft each end in a respective circumferential plenum chamber 34a,b,c,d, each of which is in constant communication with the respective passageway 24a,b,c,d as the shaft rotates. Alternatively it can be that the communication is broken as the shaft rotates, the open ends of the channels being sealed during the rest of the revolution of the shaft by means not shown such as sealing blocks extending circumferentially around the shaft 16 through which the air supply pipes 30a,b,c,d pass.

[0011] In use, when no signal is received from one of the sensors 20a, indicating an acceptable level of tobacco in the part of the hopper covered by that sensor, a valve (not shown) in the respective air supply pipe 30a is open admitting air under pressure into the circumferential plenum chamber 34a in the plenum block 32 and thence into the respective passageway 24a in the rotating shaft 16 and the actuator chamber 26a at the other end of the passageway 24a. The raised air pressure in the actuator chamber 26a urges the friction block 28a in the actuator chamber 26a against the wall of the respective roller section 12a, causing it to rotate with the shaft 16.

[0012] If the sensor 20a sends a signal indicating a build up of tobacco in the part of the hopper covered by that sensor, the valve in the air supply pipe 30a closes. The air pressure in the actuation chamber 26a returns to atmospheric as air leaks out of the passageway 24a, so that the friction block 28a is no longer urged against the wall of the roller section 12a, thus disengaging that roller section from the shaft 16 so that the roller section stops rotating. It will be appreciated that the other roller sections 12b,c,d are disengaged and engaged in the same way in response to a signal or the lack of a signal from the respective sensors 20b,c,d in the hopper.

[0013] It will be appreciated that the signal from the activated cell can pass through a processing device which then sends a signal to the respective roller section. It will also be appreciated that the cell may be activated to send a signal when it is not detecting tobacco, and cease to send the signal or send a different signal when it detects tobacco.

[0014] It will be seen that the present invention provides a hopper which can control the level of its contents more precisely than is the case for conventional hoppers. This allows an even delivery of material from the hopper to be achieved. This is particularly advantageous in the case of a tobacco rod maker hopper, since it ensures an even tobacco density in the resulting tobacco rod.

Claims

1. A hopper for particulate material such as tobacco comprising a delivery roller disposed in the path of incoming material and a sensor for sensing a level of material in the hopper, characterised in that the delivery roller comprises a plurality of independently driven roller sections each associated with a respective sensor such that activation of the sensor causes the motion of the respective associated roller section to change.

2. A hopper according to claim 1 in which the sensors sense a desired maximum level of material in the hopper.

3. A hopper according to claim 1 or 2 in which the sensors respond to detecting material by causing the respective associated roller sections to rotate.

4. A hopper according to claim 1, 2 or 3 in which the roller comprises four roller sections.

5. A hopper according to any preceding claim in which the material is delivered by the delivery roller onto the surface of a carding drum.

6. A hopper according to any preceding claim in which the roller sections are mounted on a common shaft

7. A hopper according to claim 6 in which the roller sections are brought into and out of driving engagement with the shaft in response to the signal from the sensor.

8. A hopper according to claim 6 or 7 in which a roller section is brought into and out of driving engagement with the shaft by an electromagnetic clutch.

9. A hopper beginning to claim 6 or 7 in which a roller section is brought into and out of driving engagement with the shaft by a solenoid operated key and keyway.

10. A hopper according to claim 6 or 7 in which a roller section is brought into and out of driving engagement with the shaft by a pneumatic clutch.

Fig.1

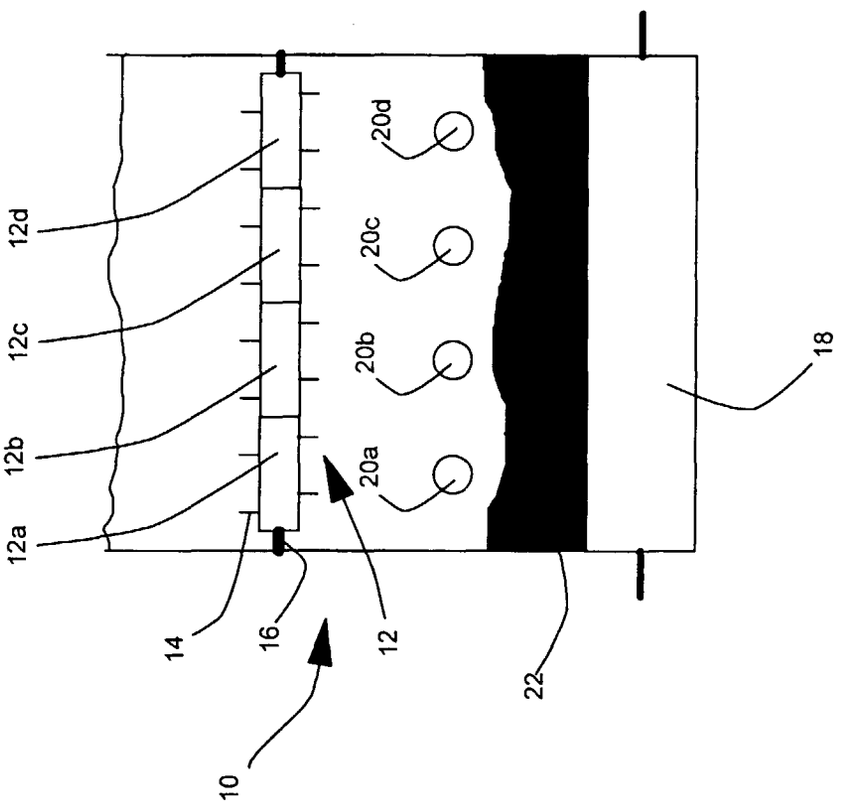


Fig. 2

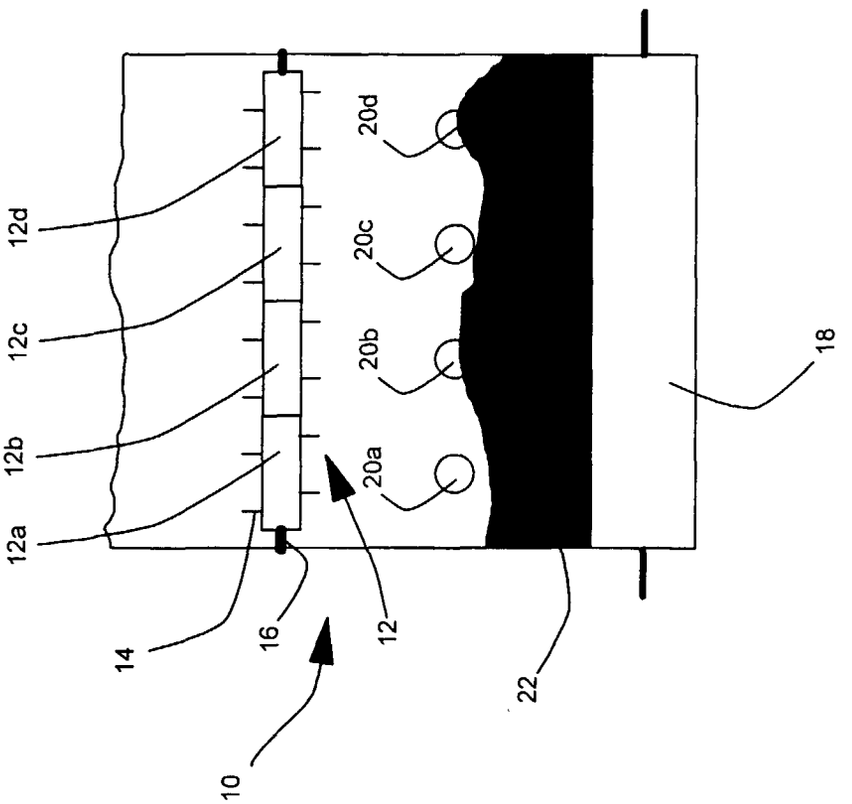
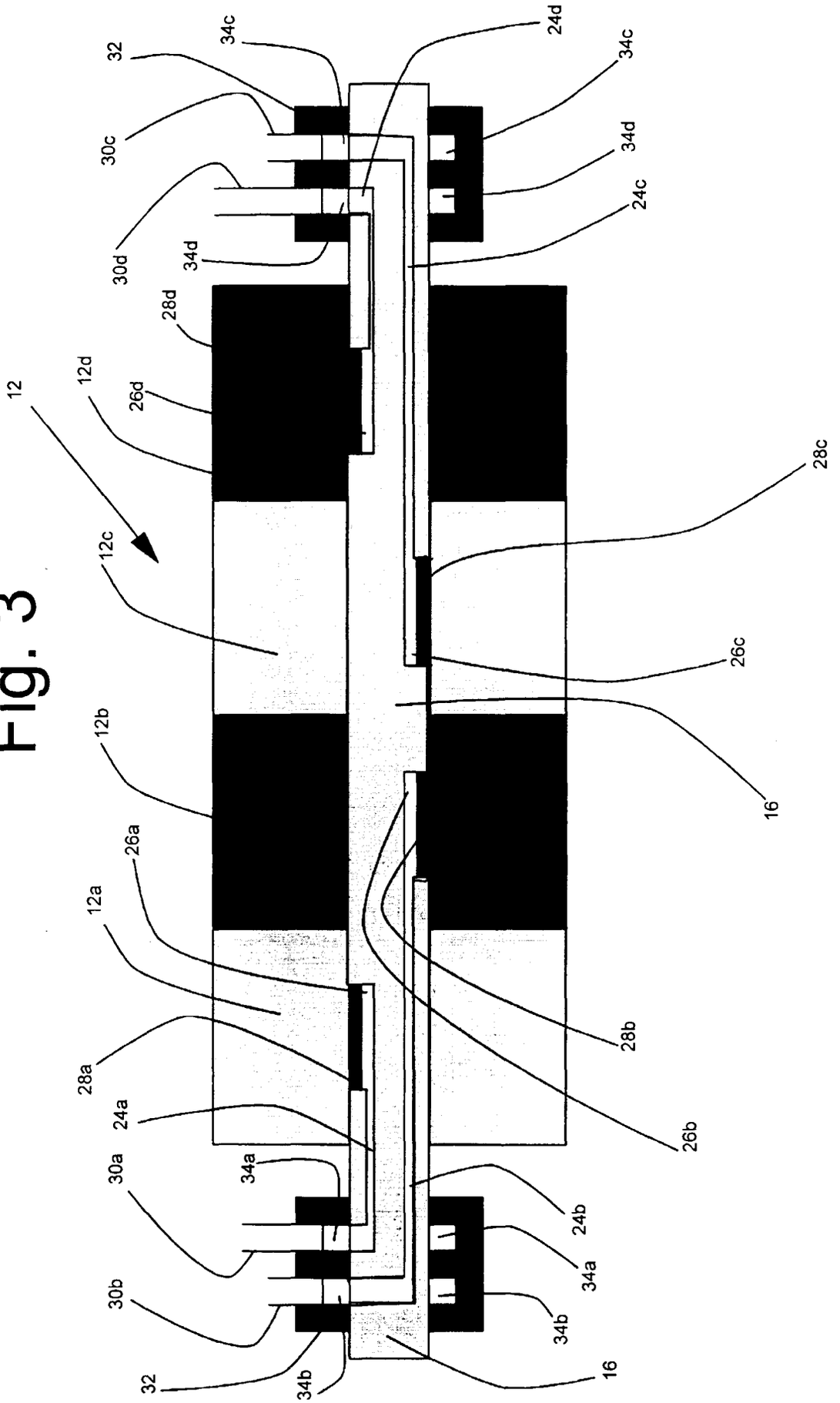


Fig. 3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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 1429

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 4 235 248 A (SCHUMACHER) 25 November 1980 * column 9, line 11 - line 61 *	1-5,7	A24C5/39
A	GB 2 093 330 A (G.D. SOCIETA PER AZIONI) 2 September 1982 * page 1, line 27 - line 55 *	1,3	
A	FR 1 273 931 A (USINES DECOUFLE) 9 February 1962 * the whole document *	1	
A	DE 447 288 C (KOERNER) * the whole document *	1,4	
A	DE 226 423 C (OETTINGER)		
A	GB 286 406 A (LEGG)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A24C
B65G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 August 1998	Riegel, R

CATEGORY OF CITED DOCUMENTS

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