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Hergeth

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[54] **APPARATUS FOR REGULATING THE SUPPLY OF FIBROUS MATERIAL FED TO PROCESSING MACHINES**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**.....**D01g 15/40**

[58] **Field of Search**.....19/105, 239, 240, 19/97.5; 302/28, 35, 40, 42; 221/39; 214/17 C, 17 CA; 200/83 F

[56] **References Cited**

UNITED STATES PATENTS

3,158,291	11/1964	Lytton et al.	19/105 UX
3,414,330	12/1968	Trutzschler	19/105 UX
3,070,847	1/1963	Schwab	19/105 UX
3,169,664	2/1965	Meinicke	19/105 UX
2,952,047	9/1960	Lytton et al.	19/97.5 UX
2,644,866	7/1953	Turnupseed et al.	200/83 F

FOREIGN PATENTS OR APPLICATIONS

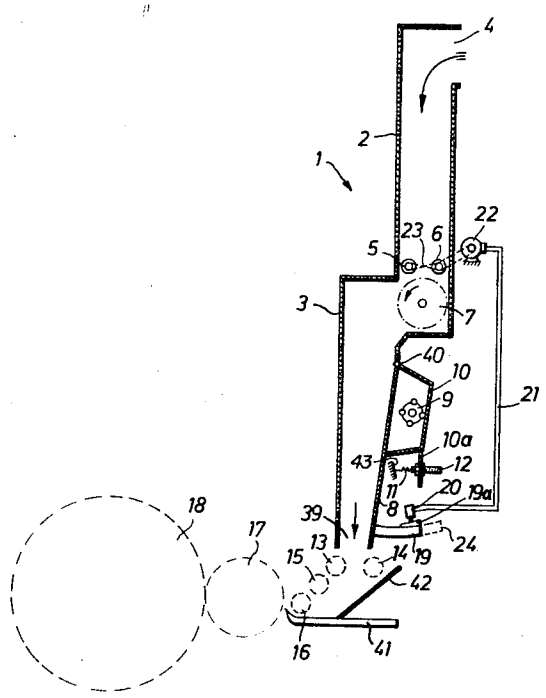
1,019,056	2/1966	Great Britain	19/105

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[57] **ABSTRACT**

A process and apparatus for regulating the supply of fibrous material fed to processing machines includes means for determining the density of the fibrous material as it passes through a hopper and for adjusting the rate of feed of the fibrous material into the hopper in response to the density determination whereby the fibrous material may be maintained at a predetermined density. The density determination may be made either by a movable wall of the hopper which moves in response to variations in the amount of fibrous material contained in the hopper or by directing an air stream through fibrous material in the hopper and measuring the air pressure change caused by variations in the density of the fibrous material.

6 Claims, 4 Drawing Figures



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FIG. 1

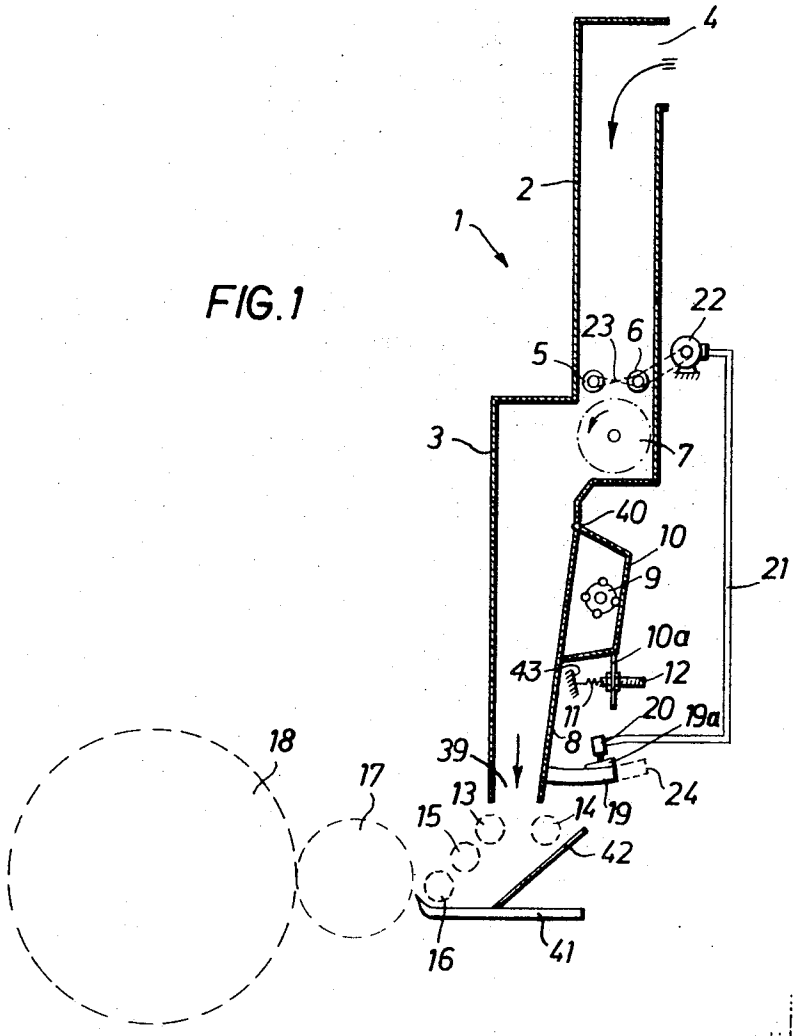
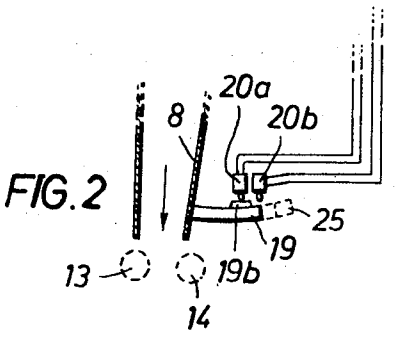
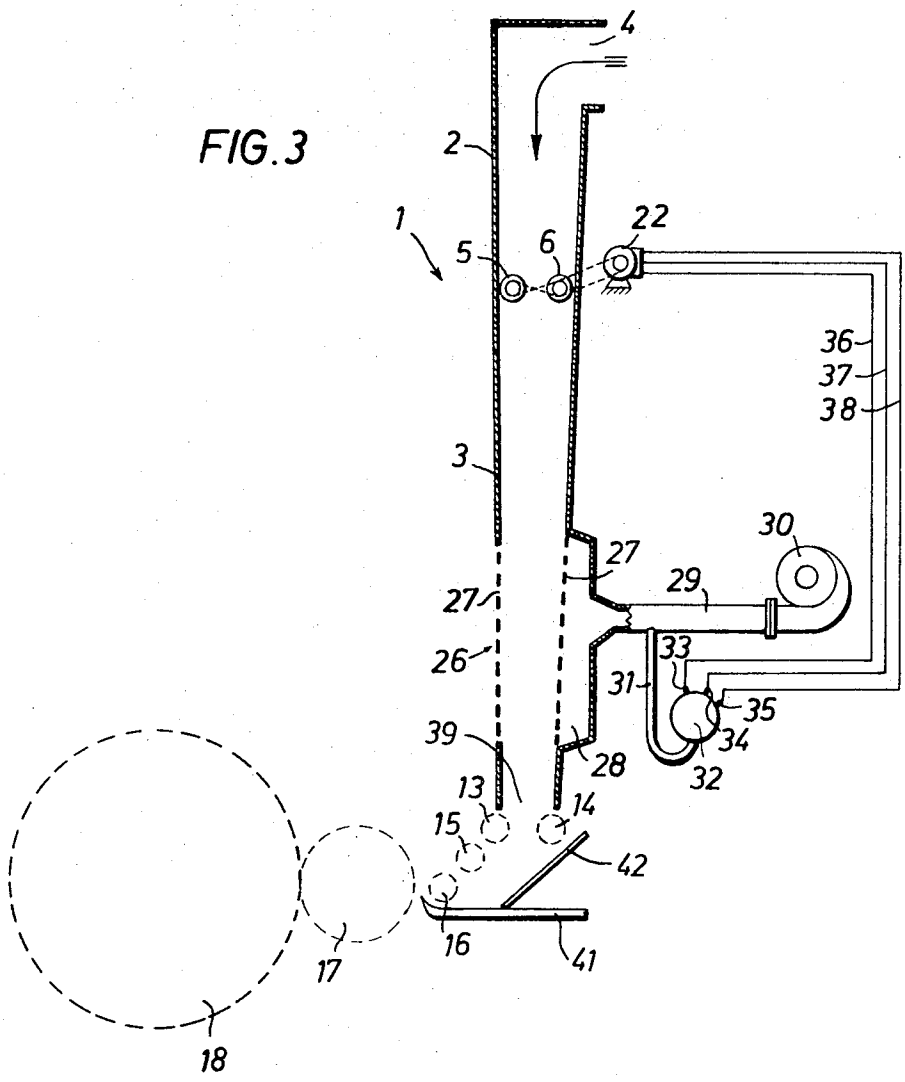


FIG. 2



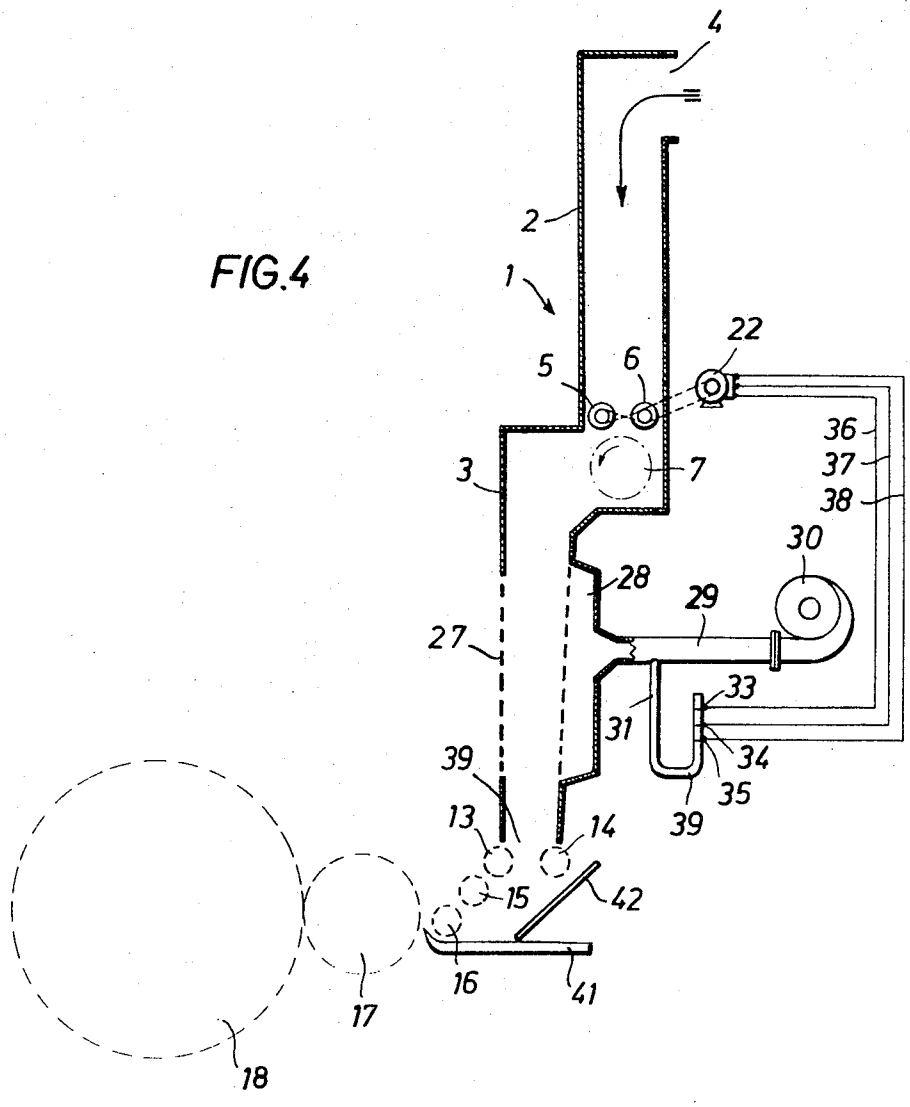
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FIG. 3



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FIG.4



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APPARATUS FOR REGULATING THE SUPPLY OF FIBROUS MATERIAL FED TO PROCESSING MACHINES

This invention relates to a process and an apparatus for regulating the supply of fibrous material fed to processing machines such as carding machines, opening and cleaning machines and beaters.

The supply of fibrous material fed to processing machines should be of uniform density and in flock form so that the non-woven fabric fed to the processing machines will be uniform. Various devices have been used in an attempt to obtain uniform density of the fibrous material. Most of the devices include a vertically extending hopper, as for example, as shown in German Pat. No. 1,135,346. The fibrous material is fed through the inlet at the top of the hopper and means is provided in an attempt to obtain fibrous material having a uniform density before the fibrous material passes through the outlet at the bottom of the hopper. The apparatus as disclosed in the German patent provides means for vigorously shaking the fibrous material in the hopper, the shaking time being inversely dependent upon the density of the fibrous material being fed into the hopper. Thus, the pressure of the fibrous material due to its density in the hopper serves to automatically control the rate of the shaking movement and the time the fibrous material is subjected to the shaking. Theoretically, the density of the fibrous material as it passes through the outlet should be uniform irrespective of the rate at which the fibrous material passes through the hopper. Although this apparatus does produce fibrous material approaching uniformity in density, the present invention makes further improvements for obtaining uniformity of the density of the fibrous material.

It is an object of the present invention to provide apparatus for regulating the supply of fibrous material which is fed to processing machines by utilizing the measurement of the existing density of the fibrous material in a hopper to obtain a continuously uniform density in the fibrous material as it passes through the outlet thereof.

A further object of the invention is to utilize measurements of the existing density of the fibrous material in a hopper to automatically control the rate at which the fibrous material is fed into the hopper.

A still further object of the invention is to utilize measurements of the existing density of the fibrous material in a hopper to automatically control the drive means for rolls which serve to feed fibrous material into the hopper.

A still further object of the invention is to utilize the measurements of the existing density of the fibrous material in a hopper to automatically control the rate at which the means for feeding fibrous material into the hopper is driven.

Other objects and advantages of this invention will be in part apparent and in part pointed out hereinafter.

In the drawings:

FIG. 1 is a schematic side view, partly in section, of one embodiment of the present invention,

FIG. 2 is a schematic detail, partly in section, of a modification of a part of the apparatus shown in FIG. 1,

FIG. 3 is a schematic side view, partly in section, of another embodiment of the invention, and

FIG. 4 is a schematic side view, partly in section, of a still further embodiment of the invention.

With reference to FIG. 1, a hopper shown generally as 1 includes an inlet 4 at the top end and an outlet 39 at the bottom end. Near the lower end of the upper shaft 2 feed rollers 5 and 6 are provided immediately above opening roll 7. The lower portion of the hopper includes a movable wall 8 which is pivotally mounted at 40. An arm 10 is secured to the back part of the movable wall 8 and cooperates with a cam roller 9 which is rotatably driven to cause the movable wall to shake. A tension spring 11 is secured at one end to an extension 10a of the arm 10 causing the movable wall 8 to be biased to the left as viewed in FIG. 1. Tension in the spring 11 may be regulated by set screw 12. Take-off rollers 13, 14, 15 and 16 and guides 41 and 42 are arranged at the outlet 39 of the hopper to supply the fibrous material to the carding machine 17, 18. The take-off rollers are driven at a constant speed by the carding machine.

An arm 19 extends transversely from the lower end of the movable wall 8 and supports a cam 19a. Movement of the wall 8 causes the cam 19*a* to operate a limit switch 20 which serves to operate drive motor 22 through circuit 21. The drive motor drives one of the pair of rolls 5, 6, the other roll being driven through transmission member 23.

The fibrous material fed through inlet 4 is positively driven downwardly by feed rollers 5 and 6 onto rotatably driven opening roll 7 which serves to expand and loosen the fibrous material. The fibrous material is then fed downwardly through the lower portion 3 of the hopper and it is drawn through the outlet 39 by the take-off rollers 13 – 16. The movable wall 8 is continuously shaken by the action of cam roll 9 against arm 10 causing the fibrous material to be compacted somewhat as it moves downwardly through the hopper. If the density of the fibrous material in the lower part 3 of the hopper is below a predetermined level, the movable wall 8 will be caused to move to the left as viewed in FIG. 1 under the influence of spring 11. This in turn will cause limit switch 20 to be actuated causing motor 22 to be speeded up from a normal speed and the feed rollers 5 and 6 to feed fibrous material at a faster rate. The result will be an increase in the density of the fibrous material in the lower portion 3 of the hopper whereby the movable wall 8 will be moved to the right against the tension of spring 11 so that the contact piece 19 moves to the position 24 and cam 19*a* releases limit switch 20 slowing down drive motor 22. Thus, the density of the fibrous material can be prevented from increasing substantially above the predetermined density and the density of the fibrous material as it is drawn through the outlet of the hopper is maintained at a substantially constant density.

Another embodiment of the limit switch arrangement of FIG. 1 is shown in FIG. 2. In this instance, two limit switches 20*a* and 20*b* are provided which cooperate with cam 19*b*. It will be apparent that more than two switches may be provided if necessary all of which would be operated by the cam 19*b* dependent upon the position of the movable wall 8. The two switches in this instance regulate the speed of the driven motor 22 between a higher and a lower speed. If the density of the fibrous material in the lower part 3 of the hopper is below a predetermined value, drive motor 22 will operate at the higher speed; but if the density is above a predetermined value, motor 22 will run at the

lower speed. If the density of the fibrous material reaches an even higher value, the movable wall **8** will be pressed sufficiently to the right to position **25** such that the cam **19***a* moves beyond switch **20***b* causing the motor **22** to stop.

Another embodiment of the density control mechanism is shown in FIG. **3**. The hopper **1** is similar to that in FIG. **1**, however, the opening roll **7** has been eliminated. The lower portion **3** of the hopper, section **26**, includes perforations **27** in the opposite walls thereof. A chamber **28** encloses the perforations on one wall and is connected by duct **29** to a fan **30**. The fan may be designed to either draw a suction through duct **29** or, conversely, compress air through duct **29**. A negative or positive air pressure is created in duct **29** and in either case, an air stream is caused to pass through the perforations **27** in the opposite walls and the fibrous material contained therebetween. A tube **31**, one end of which is connected to duct **29**, leads to a transducer **32** which is sensitive to changes in air pressure. A diaphragm-type device is suitable, the diaphragm serving to mechanically make and break contact with points **33**, **34** and **35** in sequence and thereby electrically regulate the speed of motor **22** through control circuits **36**, **37** and **38**.

The resistance to air flow across the hopper through perforations **27** will vary depending upon the density of the fibrous material contained in the hopper. The fluctuations in negative or positive air pressure in duct **29** are transmitted through tube **31** to transducer **32** thereby making and breaking the electrical circuits through contact points **33**, **34** and **35**. Thus the speed of the motor **22** can be controlled to change the speed of feed rollers **5** and **6** and the rate at which fibrous material is fed towards the lower part **3** of the hopper. The density of the fibrous material as it is drawn through the outlet of the hopper can be maintained substantially constant.

A still further embodiment shown in FIG. **4** is similar to the embodiments shown in FIGS. **1** and **3** except that the air pressure measuring arrangement in FIG. **4** is somewhat different from that shown in FIG. **3**. In place of the transducer **32** at the end of tube **31**, a U-tube arrangement **39** is provided which contains liquid mercury. The level of the mercury is caused to fluctuate with variations in the air pressure (negative or positive) in duct **29** causing the mercury to make contact with one or more of the contact points **33**, **34** and **35** which are located at different levels of the U-tube **39**. Thus, like the embodiment shown in FIG. **3**, the speed of the motor **22** can be controlled electrically through circuits **36**, **37** and **38** and consequently the rate at which the fibrous material is fed into the lower portion **3** of the hopper and the density of the fibrous material in the lower portion of the hopper can be controlled and maintained substantially constant.

As many embodiments may be made of the above invention, and as changes may be made in the embodiments set forth above, without departing from the scope of the invention, it is to be understood that all matter here and before set forth or shown in the accompanying drawings is to be interpreted as illustrative only and not in a limiting sense.

I claim:

1. Apparatus for regulating the supply of fibrous material fed to processing machines such as carding machines, opening and cleaning machines and beaters comprising

a. a hopper having an inlet at the top thereof for receiving fibrous material, an outlet at the bottom thereof for dispensing fibrous material, and a plurality of opposed walls for containing said fibrous material between said inlet and outlet, at least one of said walls being pivotally mounted for movement towards and away from an opposed wall,

b. means biasing said one pivoted wall towards said opposed wall such that an increase in the amount of fibrous material in said hopper will cause deflection of said pivoted wall against the force of said biasing means and away from said opposed wall and a decrease in the amount of fibrous material in said hopper will cause said biasing means to move said pivoted wall towards said opposed wall,

c. means adjacent said inlet for feeding the fibrous material towards said outlet,

d. means for shaking said pivoted wall to direct said fibrous material downwardly, and

e. regulating means operatively connected to said pivoted wall and responsive to the position of said pivoted wall for controlling the rate at which said fibrous material is fed by said feeding means,

f. whereby any variations in the density of the fibrous material will cause said pivoted wall to move and said regulating means to control said feeding means such that said fibrous material may be maintained at a predetermined substantially constant density.

2. Apparatus as claimed in claim **1** wherein said feeding means comprises at least one pair of rollers and means for driving said rollers to feed fibrous material therebetween.

3. Apparatus as claimed in claim **1** and said shaking means comprises a rotatably driven cam roll.

4. Apparatus as claimed in claim **1** wherein said regulating means comprises at least one limit switch for controlling operation of said feeding means and cam means operatively connected to said pivoted wall for operating said limit switch with movement of said pivoted wall.

5. Apparatus as claimed in claim **4** comprising a plurality of said limit switches, each adapted to control said feeding means to feed said fibrous material at a different predetermined rate, said cam means being operatively connected to said pivoted wall to operate said limit switches successively during movement of said pivoted wall.

6. Apparatus as claimed in claim **1** wherein said regulating means includes means for decreasing the rate at which said fibrous material is fed by said feeding means when said pivoted wall moves away from said opposed wall and for increasing said rate when said pivoted wall moves towards said opposed wall.

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