July 14, 1970 L. MARTIN 3,520,276

COATING MACHINE ENSURING A TRANSFER OF THE COATING SUBSTANCE UNDER CONTROLLED CONDITIONS

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FIG. 3

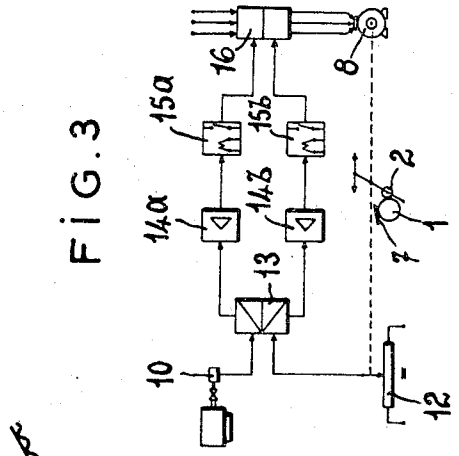
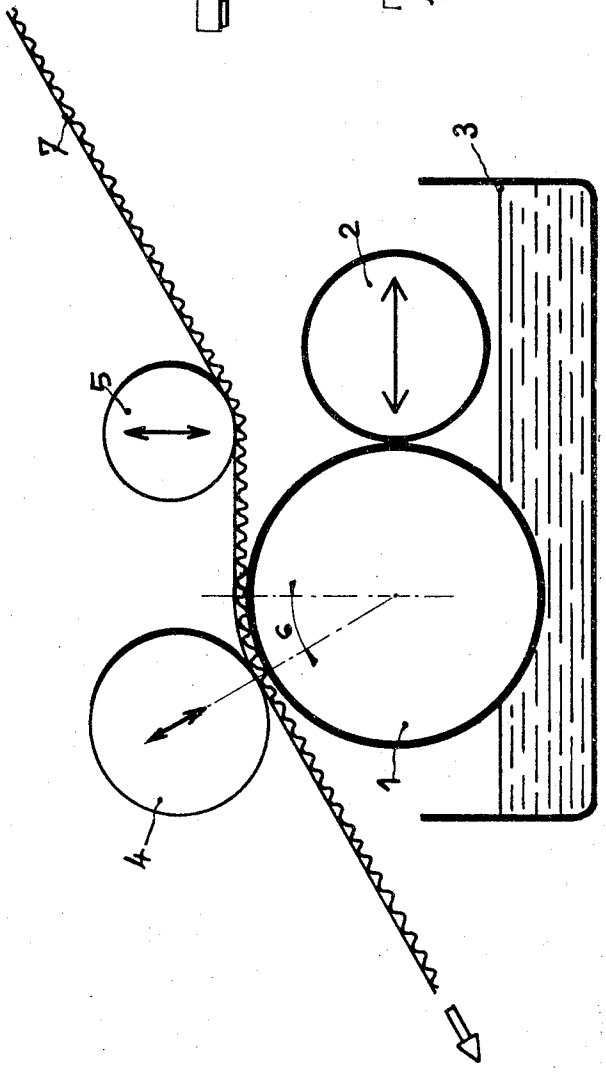


FIG. 1



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COATING MACHINE ENSURING A TRANSFER OF THE COATING SUBSTANCE
UNDER CONTROLLED CONDITIONS
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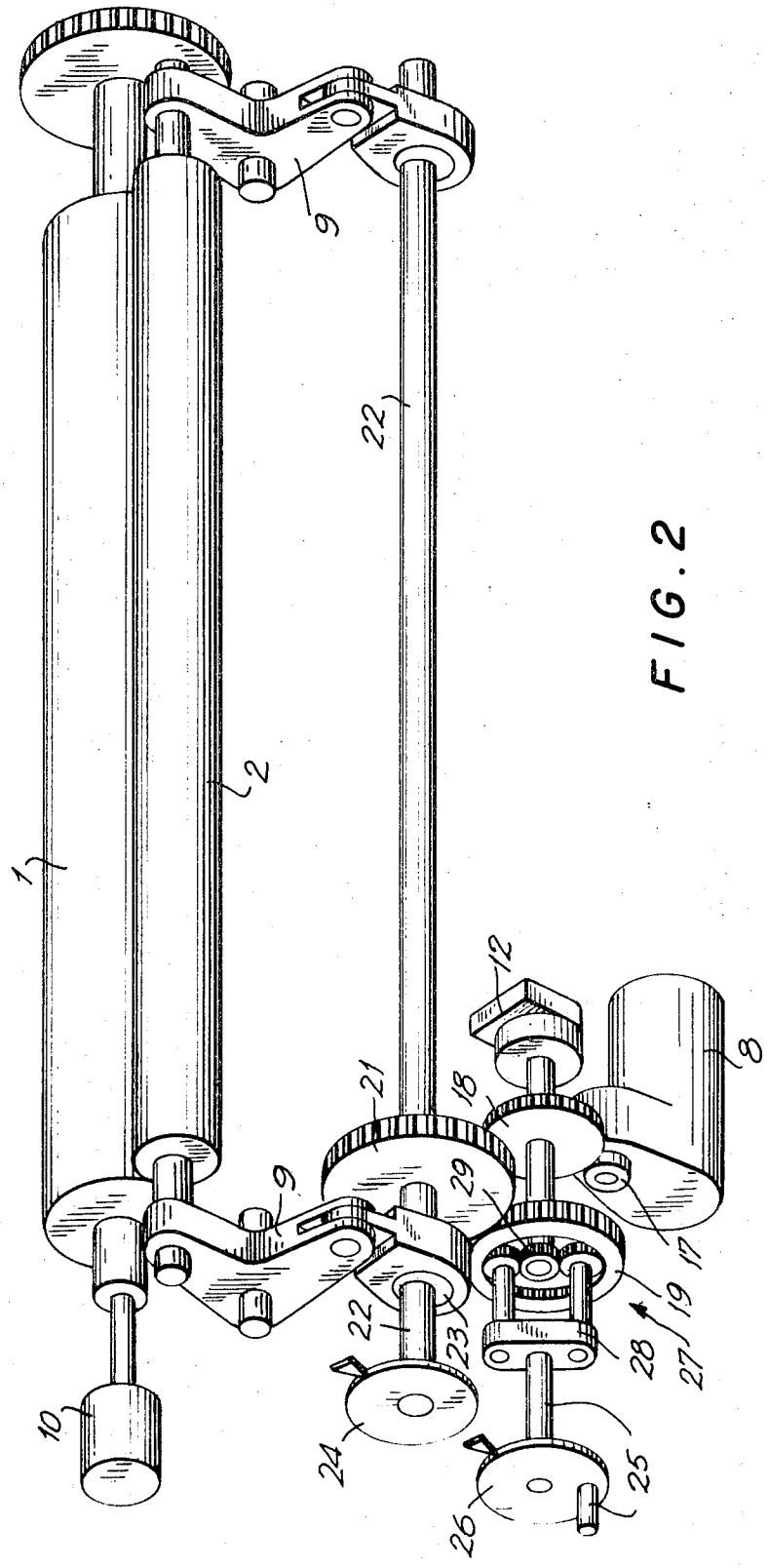

FIG. 2

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COATING MACHINE ENSURING A TRANSFER OF THE COATING SUBSTANCE UNDER CONTROLLED CONDITIONS

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Int. Cl. B05c 1/04
U.S. Cl. 118—8 1 Claim

ABSTRACT OF THE DISCLOSURE

A glue-coating machine having a glue-applying cylinder on which the material to be coated is fed, a rotary doctor cylinder being operatively associated with the glue-applying cylinder with a narrow gap between the two cylinders which regulates the quantity of glue applied to the material, the glue being supplied to the glue-applying cylinder ahead of the doctor cylinder. The spacing between the axes of the two cylinders is automatically adjusted to thereby adjust the thickness of film of the coating substance in the gap between the cylinders. This is achieved by a first mechanism producing a signal related to the speed of progression of the material fed over the glue-applying cylinder, a second mechanism producing a second signal related to the spacing between the axes of the two cylinders and a device for receiving the signals produced by the first and second mechanisms and for combining the signals and controlling the spacing between the cylinders in accordance with the combined signals.

When coating a yielding or rigid product in the shape of a plate or of a roll and in particular when it is desired to size the upper sections of a corrugated cardboard of the so-called single faced type with a view to applying a covering sheet transforming it into a so-called double faced corrugated cardboard, the parameters governing the deposit or transfer of the coating material are as follows:

Nature, viscosity and adhesivity of the glue, size, varnish or the like coating material;

Nature, porosity and moisture contents of the cardboard or paper;

Thickness of the film of glue covering the glue-applying cylinder.

In particular, said thickness of the film of glue is governed by:

The surface pressure which has a tendency to render said thickness uniform;

The centrifugal force which has a tendency to destroy said uniformity by forming annular bulges which may in fact be broken whereupon glue may be projected outwardly;

The distance separating the doctor cylinder from the glue-applying cylinder and consequently the spacing between the axes of said cylinders.

Centrifugal force depends in its turn on the speed of rotation of said cylinders and it is consequently related to the speed of progression of the cardboard or the like material to be coated. However, by reason of the increase in the speed of progression and thereby of centrifugal force, the amount of glue transferred increases even if the thickness of the film of glue remains constant; this leads consequently to an increased expenditure of glue which does not improve the grade of the finished product and slows down its drying.

Such an increase might be prevented by correcting manually and uninterruptedly the spacing between the

axes of the cylinders. Such an operation is however out of the question in practice since it is a difficult matter to detect the thickness of the deposit. In practice one merely limits the spacing between the axes of the cylinder in an arbitrary manner, taking into account the speed of progression of the cardboard.

The present invention has as an object to provide an automatic adjustment of the thickness of the film of glue in a manner such that the transfer of the glue whatever may be the speed of progression of the cardboard is well-defined and assumes a constant value if required, this being obtained by subjecting the spacing between the axes of the cooperating cylinders to the action of two supplies of information governed respectively by the speed of progression of the cardboard or the like article to be coated and by the spacing between said cylinder axes.

While the machine allows also an adjustment by hand the direction of the automatic correction is such that the thickness of the film decreases when the speed of progression increases.

The accompanying diagrammatic drawings illustrate by way of example and in a non-limiting sense a preferred embodiment of a machine executed in accordance with the invention. In said drawings:

FIG. 1 is a diagrammatic illustration of the principal components of a machine adapted to size a strip of corrugated cardboard of the so-called single surface type.

FIG. 2 is a perspective view of a control mechanism for such a machine.

FIG. 3 is a diagram illustrating the operation of said mechanism.

Generally speaking, the coating machine includes, as illustrated in FIG. 1, a glue-applying cylinder **1**, a doctor cylinder **2** means for feeding glue, size or varnish as provided in the case illustrated by immersion of the cylinder **1** in the vat **3** and a presser cylinder **4**. An adjustably positioned cylinder **5** defines the length of the arc **6** over which the single surface cardboard **7** is in contact with the glue-applying cylinder **1**. The glue-applying cylinder **1** serves for transferring glue onto the article to be coated constituted by the strip of cardboard **7**. The doctor cylinder **2** adjusts the thickness of the film of glue in accordance with the adjustment of the spacing between its axis and that of the above mentioned cylinder **1**.

The glue is fed, in the case illustrated, by immersion of the glue-applying cylinder **1** in the vat **3** in which the level of the glue is generally held at a constant height. The glue may be fed however as well by means of a jet projected between the two cylinders **1** and **2** in which case the vat **3** serves only for recovering the glue and operates as a dry casing in association with an external pump.

In the machine described by way of example, the adjustment of the thickness of the film of glue is automatic as provided by way of example through an adjusting system including the following elements (FIG. 2):

An auxiliary motor **8** associated with a speed reducer and controlling two bell cranks **9** carrying the shaft of the doctor cylinder **2**;

A control voltage supply constituted by a tachometric dynamo **10** generating a voltage controlled by the speed of progression of the cardboard; a further supply of feedback voltage opposing the control voltage is regulated by the modifications in the spacing produced between the axes of the cylinders **1** and **2** by the auxiliary motor **8**, the last-mentioned supply being constituted by a potentiometer **12** fed by a stabilized voltage controlled by the relative shifting between the glue-applying cylinder **1** and the doctor cylinder **2**;

An electronic system **13** (FIG. 3) which receives the

control and feed-back voltages and compares them, said system having a tendency to eliminate the difference between said voltages by shifting the doctor cylinder in the desired direction as provided by the auxiliary motor **8** controlled by the rectifier amplifiers **14***a* and **14***b*, the relays **15***a* and **15***b* and the reversing switch **16**.

The automatic adjustment of the spacing between the cylinders **1** and **2** is ensured by the fact that the auxiliary motor **8** drives as illustrated in FIG. 2, the sunwheel **19** of the planetary gear system **27** through the agency of the intermediate pinions **17** and **18**, the inner sunwheel **29** and the planet pinions. The outer sunwheel **19** driven by the planet pinions meshes with a pinion **21** driving a shaft **22** carrying eccentric members **23** adapted to shift the levers **9**, the angular position of which, defines the value of the spacing between the axes of the two cylinders **1** and **2**, which value is continuously given out by a vernier **24**.

There is furthermore provided an arrangement for manual adjustment **25** which allows the operator to set the spacing between the axes of cylinders **1** and **2** at an optimum value at the start, at which moment the vernier **26** shows the minimum desired thickness of glue which is to be preferred for the highest speed, said adjusting means allowing furthermore a correction during operation if required.

To this end, the control of the spacing between said axes includes the above-mentioned sun and planet gear **27** having a double input, of which one input is constituted by a planet carrier arm **28** driven by the hand-controlled arrangement while the other input is constituted by the above mentioned inner sunwheel **29** driven by the auxiliary motor **8**. The shaft of the hand-controlled arrangement **25** carries furthermore a self-locking system preventing said shaft from rotating in either direction unless it is driven by the hand controlled arrangement.

The control mechanism described shows a well-defined response curve so that it is advisable, while retaining the shape of said curve, to shift it forwardly or rearwardly in accordance with the values of certain parameters depending on the features of the cardboard and glue which are being used. To this end, an auxiliary manually adjustable potentiometer is inserted in series with the main potentiometer **12**. Such an auxiliary potentiometer provides the auxiliary advantage of furthering the gauging of the electronic system.

I claim:

1. A machine for coating glue and the like coating substance over a sheet of material chiefly the crests of the outer corrugations of a sheet of corrugated cardboard carrying a covering surface only on the side opposed to said crests, prior to the application of the second covering surface over said crests, said machine comprising a glue-applying cylinder over a predetermined arc of which the material to be coated is fed, a rotary doctor cylinder operatively associated with said glue-applying cylinder ahead of said arc, with a narrow gap between the two cylinders, means for feeding the coating substance to the glue-applying cylinder ahead of the doctor cylinder and means for adjusting automatically the spacing between the axes of said two cylinders to thereby adjust the thickness of hte film of coating substance in the gap between the cylinders, the latter said means including a first mechanism for producing a signal related to the speed of progression of the material fed over the glue-applying cylinder, a second mechanism for producing a second signal related to the spacing between the axes of the two cylinders, means for receiving said signals produced by said first and second mechanisms and for combining said signals and controlling said spacing between the cylinders in accordance with the combined signals, said first mechanism being a tachometric dynamo controlled by the speed of progression of the material, the second mechanism being constituted by a potentiometer the magnitude of which is governed by the spacing between the two cylinders, the means for controlling the spacing being constituted by an electronic system defining the difference between the voltage signal fed by the dynamo and the voltage signal fed by the potentiometer, an auxiliary motor controlled by said electronic system and controlling said doctor cylinder to modify the spacing between the cylinder axes, a planetary gear system between the auxiliary motor and the doctor cylinder a lever adapted to shift the doctor cylinder towards and away from the glue-applying cylinder, means indicating the spacing between the cylinder axes and controlled by the planetary gear system and hand-operable means adapted to act on the planet wheels of the planetary gear system.

References Cited

UNITED STATES PATENTS

581,056	4/1897	Bodkin	118—262 X
1,347,066	7/1920	Vuono.	
2,053,730	9/1936	Menkaw	118—262 X
2,369,378	7/1945	Thiele et al.	118—262 X
2,613,600	10/1952	McWhorter	118—262 X
2,681,636	6/1954	Fredolph	118—262 X
2,827,873	3/1958	Thorn	118—7
3,103,459	9/1963	Kane	118—262 X

ROBERT I. SMITH, Primary Examiner

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118—262