

[54] CONVEYING APPARATUS WITH
CONTROLLED SPRAY MEANS FOR
COATING PRINTED PRODUCTS

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222/61

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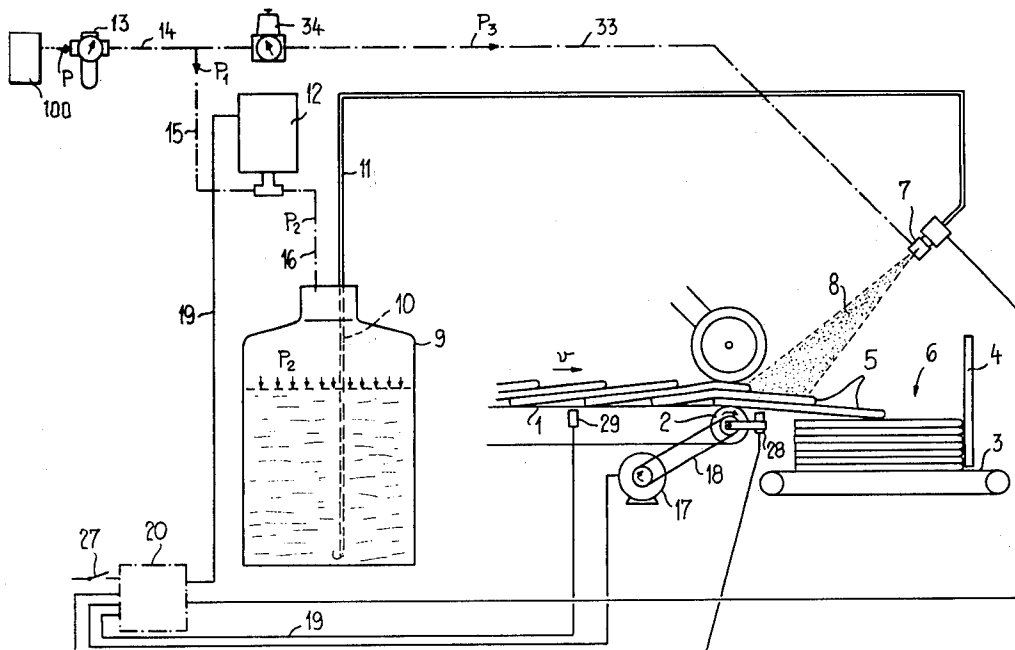
Primary Examiner—John P. McIntosh

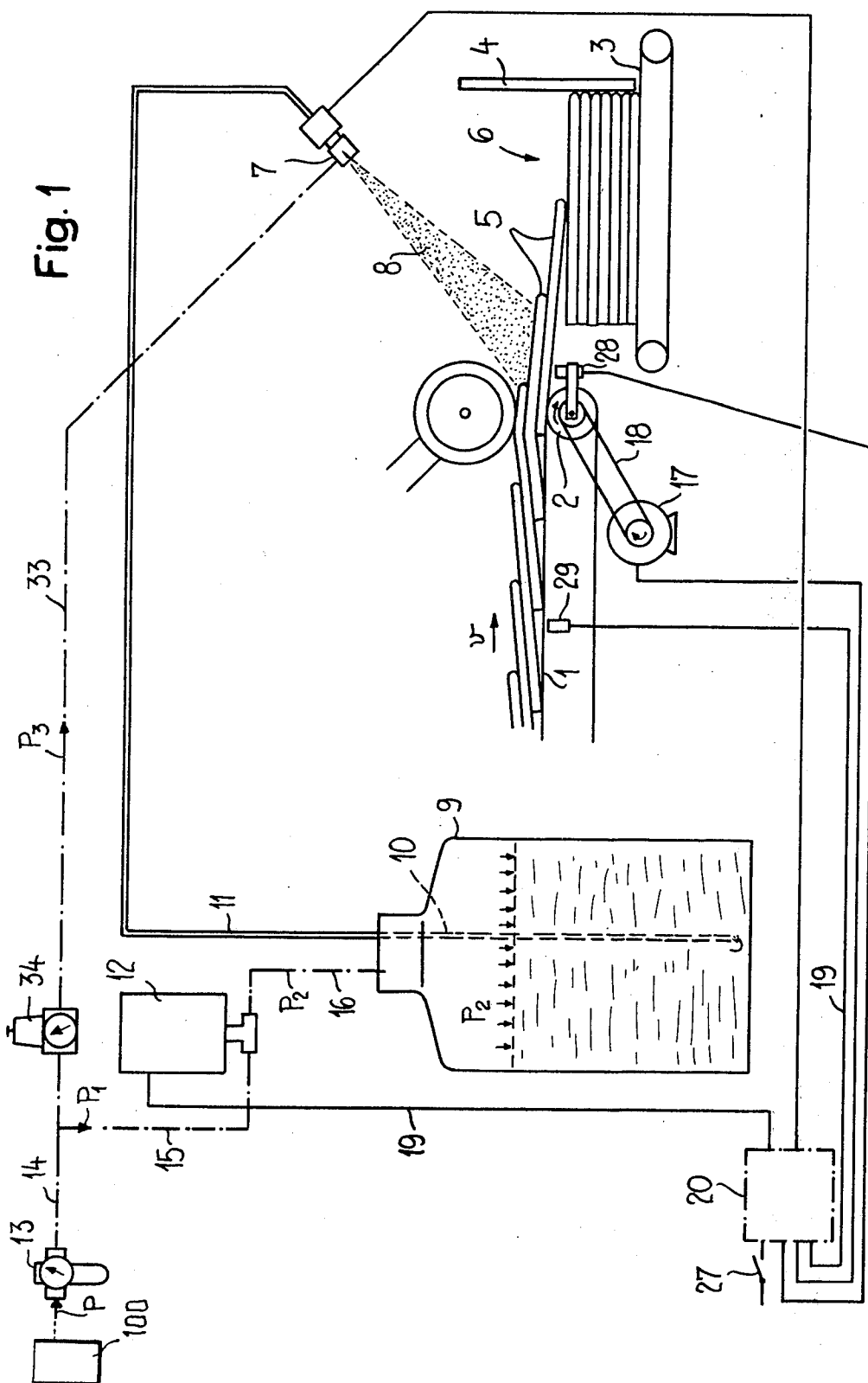
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[57] ABSTRACT

A conveying apparatus with a regulatable conveying stream for a liquid, wherein a pressure container for the liquid is connected with a conveying line and via a mechanical-pneumatic or electro-pneumatic converter, controlled by regulating signals, with a compressed air source.

4 Claims, 6 Drawing Figures





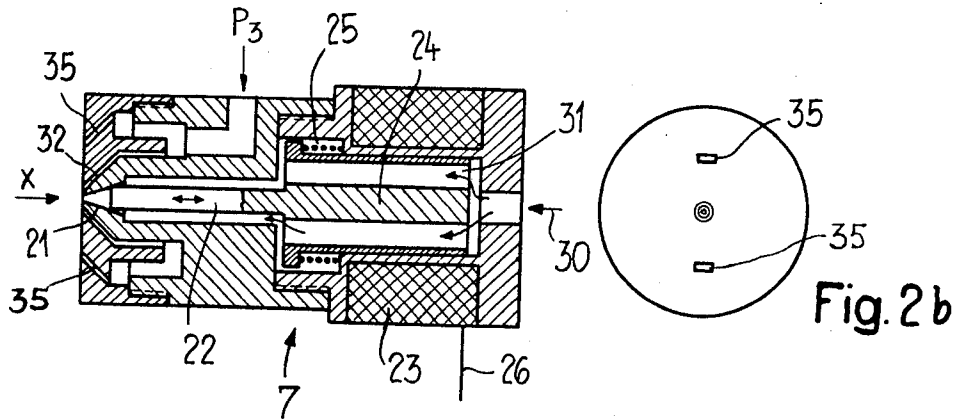


Fig. 2a

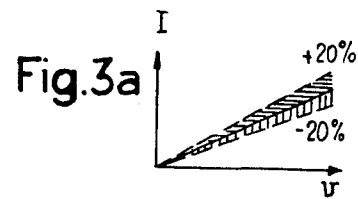


Fig. 3a

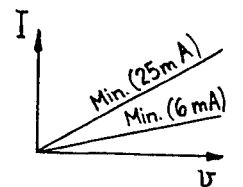


Fig. 3b

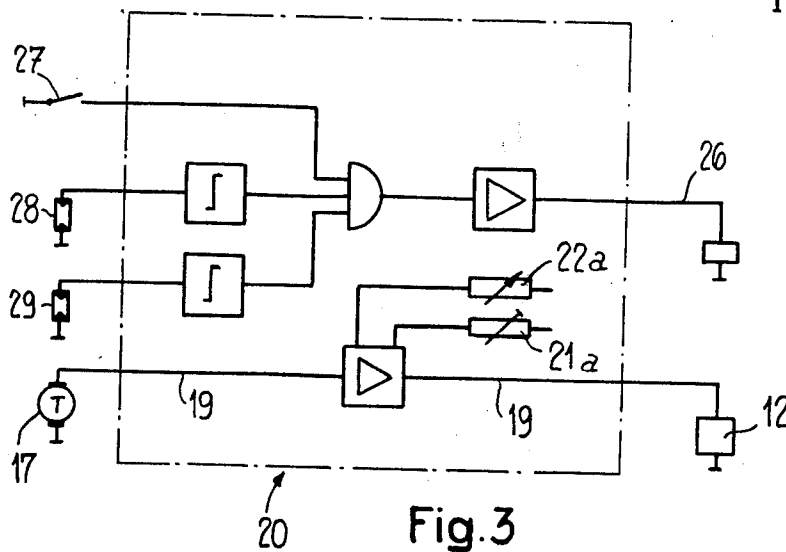


Fig. 3

CONVEYING APPARATUS WITH CONTROLLED SPRAY MEANS FOR COATING PRINTED PRODUCTS

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved conveying apparatus with a regulatable conveying stream for a liquid and also pertains to the use of such apparatus for the automated formation of packages from printed products.

Conveyor devices of such type have become known to the art for instance in the form of regulating pumps. Such pumps and the measures required for their operation are complicated and expensive, particularly when it is necessary to satisfy increased requirements concerning accuracy in operation. Therefore, in many instances the use of regulating pumps is inherently not possible.

Previously, there was employed for the regulation of the conveying stream, that is to say, the conveyed quantity per unit of time, regulation of the throughflow with the aid of a variable throughflow cross-section. In most instances, the accuracies which could be thus attained were unacceptable.

SUMMARY OF THE INVENTION

It is a primary object of the present invention to provide an improved construction of conveying apparatus with a regulatable conveying stream for a liquid which avoids the drawbacks and limitations of the prior art proposals.

According to the invention, a pressure container for the liquid is connected both with a conveying conduit and via a mechanical-pneumatic or electro-pneumatic converter, which can be controlled by regulating signals, with a compressed air source.

As should be readily understood from what has heretofore been discussed, with such apparatus the conveying stream can be regulated by influencing an air cushion, i.e., a transmission element which itself reacts with inertia. It has now been completely surprisingly found that with the described arrangement it is still possible to realize an exceptionally accurate regulation of the conveying stream and independent of coincidental factors. The expenditure necessary to achieve this purpose is relatively low, particularly since in many instances there is available a compressed air source and the regulation in any event is predicated upon the use of regulating signals.

A clear demonstration of the validity of what has been explained above can be recognized when the equipment of the invention is used for the automated formation of packages from printed products arriving in an overlapping fish-scale stream or arrangement for the purpose of stabilizing such packages, and wherein the fish-scale stream of printed products is subdivided into sections and the product copies contained in the individual sections are stacked into packages. With this environment of use of the equipment and as contemplated by the invention, a signal transmitter for the regulating signals and coupled with the converter is synchronously driven with a conveyor mechanism for the fish-scale stream product sections. Above the conveyor mechanism there is arranged a spray head which is coupled via the conveying conduit with the pressure container containing a bonding or adhesive agent. With this arrangement, there is suitable as the regulating

magnitude or parameter the velocity or speed of movement of the conveying mechanism; it is converted, for instance, by means of a tacho-generator into electrical voltage signals, and the pressure in the pressure container increasing proportional to the infeed speed of the products. Hence, there is insured that there is always delivered the same, namely a sufficient quantity of bonding agent, to the printed products moving past the spray head with variable speed. This bonding agent prevents falling apart of the product packages when they are delivered for further processing.

Additional details of the inventive apparatus in general and the inventive use thereof in particular will be more readily apparent from the description given hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein there has been schematically depicted an exemplary embodiment of apparatus in conjunction with its use for the automated formation of packages from printed products arriving in overlapping fish-scale stream formation, and wherein:

FIG. 1 schematically illustrates components of the apparatus structure of this development and also components of a package sorter;

FIG. 2a is a longitudinal sectional view of a spray head used with the arrangement of FIG. 1;

FIG. 2b is an end view of the spray head depicted in FIG. 2a, looking in the direction of the arrow X thereof;

FIG. 3 is an electric circuit diagram of the equipment; and

FIGS. 3a and 3b illustrate balancing or adjustment graphs for the control circuit of an electro-pneumatic converter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With the particular use of the equipment according to the showing of FIG. 1, the apparatus, as already indicated, serves the purpose of stabilizing packages formed from printed products arriving in overlapping fish-scale formation as is known in the newspaper or publishing art for instance. For this purpose there should be applied a small amount or spot of bonding agent at least at the printed products located closer to the top of the package or stack, in order to prevent such products from laterally sliding-off during transport of the package. In this manner there is generally increased the form retention characteristics of the not yet bound package and accordingly there is afforded the possibility of transporting such packages more quickly and also more positively. However, success depends to a considerable extent upon the application of a sufficient quantity of bonding agent or adhesive to the printed products. Conversely, there should of course not be applied more bonding agent than is absolutely necessary for the successful operation of the equipment. Such requirements can not be easily fulfilled and certainly not by carrying out one setting of the equipment which satisfies all operating conditions, since the speed of the fish-scale stream of products is not constant. There are, in fact, present unavoidable factors

which bring about fluctuations in the speed of the product stream during equipment operation.

Preceding the formation of the package is the subdivision of the fish-scale stream of products into sections containing the number of product copies which are provided for each package. These sections are then stacked into a package. This operation occurs in a so-called package sorter in that a separation element controlled by a counting pulse transmitter engages at the appropriate location into the fish-scale product stream and thus causes a temporary dam-up of the products at the point of attack of the separation element, while at the same time the products which have already passed beneath the separation element can be further conveyed until there is present a gap or space at the fish-scale product stream. Thereafter, the separation element is brought out of engagement, until after through-passage of the number of copies which are decisive for the next package, the operation described above repeats.

Now in FIG. 1 there is indicated by reference character 1 the conveyor band or belt of the package sorter which has not been particularly illustrated as to its further details, this conveyor band 1 being driven by a drive roller or roll 2. At the conveyor band 1 there are delivered to the stack forming elements the sections of the overlapping fish-scale product stream. With the illustrated arrangement, the stack forming elements comprise a further conveyor band 3, serving as the stack support, as well as a stop 4 against which impact the printed products, for instance newspaper copies 5, and which stop 4 can be selectively placed out of its product engaging position. If the package 6 which is in the process of being formed is complete, then, the stop or impact member 4 is brought out of its operable position and the package 6 is transported away by means of the conveyor band 3. At this point of time, the individual copies of the products, especially those copies located further towards the top of the stack, should bear sufficiently against one another.

To this end there is arranged above the conveyor band 1 (in its conveying direction somewhat shifted towards the front) a spray head 7. This spray head 7 serves to deliver a suitable bonding agent or adhesive in the form of a spray jet 8 to the newspaper copy 5 or other article being processed. If the conveying stream, in other words in this particular instance more accurately termed the spray stream of the bonding agent were constant, then depending upon the change in the velocity v with which the newspaper copies 5 move through the spray stream or jet 8, the quantity of bonding agent which is delivered and deposited upon the individual product copies will correspondingly fluctuate. Hence, as already mentioned, the spray stream must be regulated or controlled as a function of this velocity v .

Basically, the spray stream if forced out of a pressurized container or vessel 9 which, in turn, is connected via an immersion tube 10 with a conveying line or conduit 11 and thus with the spray head 7 and, on the other hand, via an electro-pneumatic converter or transducer 12, with the schematically illustrated compressed air source 100. The last-mentioned connection encompasses a pressure reduction valve 13, between such reduction valve 13 and the converter 12 the conduits or lines 14 and 15 and finally between the latter and the container 9 the conduit 16. The air pressure ahead of the reduction valve 13 possesses the value P , after the

pressure reduction valve 13 the value P_1 , and after the converter 12 and therefore also in the pressurized vessel or container 9 the value P_2 . Although the pressures P and P_1 are constant, the pressure P_2 varies as a function of the electro-pneumatic converter 12 which, as is known, changes the pressure—in the case under consideration—in direct proportion to the electrical voltage delivered thereto. Complete details of a suitable constructional form of such an electro-pneumatic converter have been disclosed in the accompanying instructions concerning the use of such equipment and the replacement part lists No. E/P-100-DI, April, 1969, of the concern Conoflow Europa N.V., Dordrecht, Holland. Such equipment works according to the principle of force comparison and forms an electrical input signal into a proportional pneumatic output pressure.

In the present case, the input signal is delivered in the form of an electric voltage from a tachogenerator 17 driven via a drive belt 18 from the drive roller 2 of the conveyor band 1. This signal, which is proportional to the speed of the conveyor band 1 under the explained conditions, arrives by means of the conductor or line 19 and via the electronic circuit, generally designated by reference character 20 (see also FIG. 3), at the converter 12. The electronic circuit 20 comprises a potentiometer 21a for the basic adjustment or setting (compare FIG. 3b) and a potentiometer 22a for the regulation or control region setting (compare FIG. 3a). These measures ensure that the pressure P_2 in the pressurized container of vessel 9 always is proportional to the speed of the conveyor band 1, whereby the conveying stream arriving through the conduit 11 at the spray head 7 is always regulated as a function of the band speed, that is to say, the speed v of the newspapers 5.

According to the showing of FIG. 2a, the conical spray nozzle 21 of the spray head 7 is controlled by a needle valve 24 which is connected with an armature 24 enclosed by a magnet coil 23 and retained in closed position by a spring 25. By means of a conductor or line 26 (see also FIG. 3) the coil 23 is connected with the electronic circuit, so that such is energized by the simultaneous actuation of three switches. The first switch 27 (FIG. 3) simultaneously serves as the main switch of the apparatus. Both of the other switches or scanners 28 and 29 are designed as photoelectric cells, and these photoelectric cells are arranged beneath the path of movement of the newspapers or the like and are actuated thereby. As best seen by referring to FIG. 1, both of the switches 28 and 29 are closed after the front end of a fish-scale stream section arrives at the region of the spray jet 8, until approximately the next to last product copy has reached the region of the spray jet. What is decisive for this mode of operation is the spacing of the photoelectric cell 29 from the photoelectric cell 28. The needle valve 22 thus frees the spray nozzle at such time and only for such length of time as spraying of the bonding agent or adhesive is sensible. Electronic circuit 20 includes a conventional timing element through which the nozzle release action can be somewhat delayed so that the first few copies of the fish-scale product stream section do not receive any bonding agent. This does not constitute any drawback, since at the region of such product copies the friction, brought about by the weight of the further product copies situated on top of the first few copies is large enough to prevent slip-out of the lower situated product copies.

As will be readily seen by referring to FIG. 2a, the adhesive or bonding agent arrives from the inlet 30 of the spray head 7 through channel 31 of the armature at the spray nozzle 21. This spray nozzle 21 is enclosed by a ring nozzle 32, to which there is delivered via an extension of the conduit 14, namely via the conduit 33 compressed air which is reduced in pressure to the value P_3 by a further pressure reduction valve 34. With the aid of this air there is formed the spray jet 8. The spray head 7, as best seen by referring to FIG. 2b, possesses two further slot-shaped air outlets or discharges 35 which are likewise supplied via the conduit 33 and serve the purpose of flattening the spray jet 8.

From the above discussion there already should be apparent the more essential mode of operation of such equipment; therefore it only will be briefly summarized hereinafter: the pressure P_2 at the pressurized container 9 increases or decreases respectively as a function of the speed v with which the newspapers move past the spray jet 8. Accordingly, the conveying stream, that is to say, the amount of bonding agent or adhesive sprayed per unit of time, increases or decreases, with the result that the newspapers always receive the same (useful) quantity of adhesive material. With the use of very simple means, it is thus possible to solve the problem of regulating a conveying stream and specifically with an accuracy which only then could be heretofore realized when using regulating pumps if there was undertaken a considerable expenditure.

The use of a pressurized container does not of necessity preclude a continuous conveying action. For instance, it would be possible to continuously replenish the liquid into the pressurized container from a suitable source, in order to insure for continuous operation. The electro-pneumatic converter is completely capable of also compensating for the stepwise refilling of liquid into the container. With the particularly described use, there are thus not necessary those measures, since with the relatively low requirement of bonding agent the required interruption in the operation of the equipment enables refilling of the container.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims. Accordingly,

What is claimed is:

1. In an apparatus for automatically forming packages of printed products from a stream of said products being conveyed in a fish-scale sequence, a bonding agent conveying apparatus comprising means for conveying said products in a fish-scale sequence, means for generating a regulating signal having a value which varies in accordance with the speed at which said products are being conveyed, a source of compressed air, a pressurized container for a liquid bonding agent, converter means controlled by said regulating signal and connecting the compressed air source with said pressurized container for regulating the pressure in said pressurized container in accordance with the speed at which said products are being conveyed, means proximate said conveyor for forming a regulatable spray stream of said liquid bonding agent onto said printed products, means for conveying the pressurized liquid bonding agent in said container to said liquid stream forming means, the rate of flow of said bonding agent into said liquid spray stream forming means being proportional to the pressure in said container and being substantially proportional to the speed at which said products are being conveyed, and means for forming a package of said printed products, wherein said bonding agent stabilizes said package of printed products.

2. The apparatus of claim 1 wherein said means for forming a regulatable stream of said bonding agent includes a spray nozzle, an electromagnetic valve means for controlling said spray nozzle, and scanner means responsive to the infeed of a fish-scale product stream into the path of the stream of bonding agent for releasing the spray nozzle to discharge a stream of bonding agent toward said product stream.

3. The apparatus as defined in claim 2, further comprising a second scanner means arranged upstream with respect to said first scanner means, said scanner means providing a signal for actuating said electromagnetic valve means.

4. The apparatus as defined in claim 3, further including a control circuit for the electro-magnetic valve, and a time-delay circuit means arranged in the control circuit of the electro-magnetic valve, said time-delay circuit means being adjusted or adjustable to a predetermined value.

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