



AU9516441

(12) PATENT ABRIDGMENT (11) Document No. AU-B-16441/95
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 687513

- (54) Title
AN INFEED STATION FOR A WEB MATERIAL WHICH IS CONTINUOUSLY FED TO A STATION FOR PROCESSING IT IN CYCLIC MANNER
- (51)⁶ International Patent Classification(s)
B65H 020/24 B41F 001/26
- (21) Application No. : **16441/95** (22) Application Date : **12.04.95**
- (30) Priority Data
- (31) Number (32) Date (33) Country
1267/94 25.04.94 CH SWITZERLAND
- (43) Publication Date : **02.11.95**
- (44) Publication Date of Accepted Application : **26.02.98**
- (71) Applicant(s)
BOBST S A
- (72) Inventor(s)
EDOUARD BOREL
- (74) Attorney or Agent
F B RICE & CO , 605 Darling Street, BALMAIN NSW 2041
- (57) Claim

1. An infeed station comprising an eccentric roller mounted between two rotary plates around which a web material travels in such a manner that its speed of advance is converted from a constant inlet speed to an output speed which varies under predetermined conditions during an operating cycle of the station, and an infeed roller (15) which guides the web of material from the eccentric roller to the platen, characterised in that the infeed roller is driven by an independent device in such a manner that the peripheral speed of the infeed roller is arranged to follow changes in the variable speed of the web material passing through the station and such that the peripheral speed of the infeed roller is greater than the outlet speed of the web material.

AUSTRALIA

Patents Act 1990

BOBST S A

ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title:

**"An infeed station for a web material
which is continuously fed to a station
for processing it in cyclic manner"**

The following statement is a full description of this invention including the best method of performing it known to us:-

The invention relates to a station for feeding a web material, such as cardboard, to a station such as a platen press for processing the material in cyclic manner.

- 5 In a platen press, the advancing web material has to be temporarily stopped during the cutting work. Consequently, as a result of the continuous supply, web material accumulates in front of the cutting plate. Accordingly an infeed station has been designed so as
- 10 to control the formation of a loop of web material in cyclic manner so as greatly to reduce the clattering effect of the web when the loop touches the loop-regulating means, by using a device which guides the web material around the circumference of an eccentric
- 15 roller mounted between two rotary plates as described e.g. in Swiss Patent Specification CH 602 462.

As a result of the eccentric roller in the loop monitoring device, the constant speed V_0 of the web entering the station is converted, at each operating

20 cycle of the machine, into an intermittent speed V_{IT} while maintaining a constant tension on the web. The variation in speed V_{IT} during an operating cycle of the machine (the cycle can be divided into units of time but is more usually divided into units of angular

25 position of the main motor in the station) follows a

predetermined curve which is optimised with regard to the dynamic characteristics of the web material.

The web material, which comes out of the eccentric roller at an adjusted speed, is guided by a final roller or "infeed roller" towards the platen. To prevent a collapse of tension in the web material at the infeed roller when moving at the maximum speed VIT, the peripheral speed VRO of the infeed roller is fixed at a fairly high value, above the maximum VIT. In other words the infeed roller is permanently driven at a constant speed of rotation by the main motor and a gear train on the station, so that its peripheral speed is always greater than the instantaneous speed of advance of the web material, with the result that the web continuously slides on the infeed roller. The work performed by the friction forces on the surface of contact between the web and the roller is dissipated in heat, and consequently a powerful device is needed for cooling the infeed roller.

The device operates satisfactorily with ordinary cardboard, but rapidly reaches its limit as soon as it is desired to increase the production rate and consequently the speed of advance, particularly when the reverse side of the cardboard is covered by a fragile layer, e.g. of polyethylene. In such cases the heat and the friction forces between the infeed roller and the cardboard heat and tear away part of the fragile layer, and plastics in a pasty state enters the female corrugating parts of the platen. Also, unacceptable acceleration marks appear on the

cardboard, depending on the position of the infeed belts.

It is practically impossible to make an indefinite increase in the power of the device for cooling the infeed cylinder with water, since the resulting external water of condensation causes the web to slide on the roller. Also, these machines may be used in environments which are already overheated; inter alia in summer.

- Furthermore, since the acceleration is proportional to the square of the speed, it is clear that a 40% increase in the speed of advance of the web material means that the acceleration force doubles, with an effect normally on the entire kinematic drive chain of the machine, which means that some components will quickly need to be unrealistically over-dimensioned.

The aim of the invention is to obviate the aforementioned problems by providing an infeed station which permits a higher rate of operation, even for fragile cardboard, while protecting the web material or a peripheral layer from damage, and subject to the mechanical limitations of the components driving the machine.

- The present invention provides
~~These objects are achieved by means of~~ an infeed station comprising an eccentric roller mounted between two rotary plates around which the web material travels in such a manner that its speed of advance is converted from a constant inlet speed V_0 to an outlet speed V_1 which varies under predetermined conditions during an



operating cycle of the station, which also comprises an infeed roller which guides the web of material from the eccentric roller to the platen, in that the infeed roller is driven by an independent device in such a
5 manner that its peripheral speed VR varies in similar manner to the outlet speed VIT of the web material while permanently remaining at a higher value.

By means of this drive device, which is independent of the main motor on the station, the infeed roller is
10 driven at a peripheral speed VR which increases and then decreases simultaneously with the intermittent speed VIT of the web material, so that the deviation between these two speeds is kept at a minimum, while always remaining positive. This special control of the
15 infeed roller results in an appreciable decrease in the heat evolved by friction, in which case the only result is to preserve a fragile layer of web material, or alternatively the cooling device can be the same but the web material can move at higher speed.

20 In a preferred embodiment, the independent device for driving the infeed roller comprises a DC electric motor together with a reduction gear comprising two pairs of toothed wheels.

The electric motor is connected to the infeed roller
25 shaft by two gears, a first having a ratio of the order of 20 : 36 and the second having a ratio of the order of 15 : 38, the total moment of inertia of the cylinder, the gears and the motor relative to the motor outlet shaft not exceeding 0.04 kg/m².

The invention will be more clearly understood from a study of an embodiment given by way of non-limitative example and described in the accompanying drawings, in which:

5 Fig. 1 is a diagrammatic side view of an infeed station;

Fig. 2 is a graph showing the advance, the speed and the acceleration of a web in relation to examples of peripheral speeds and accelerations of the infeed
10 roller in dependence on the operating cycle of the station and expressed in degrees of rotation of the main driving motor, and

Fig. 3 is a diagrammatic perspective view of an independent drive for the infeed roller.

15 Fig. 1 shows an infeed station 10 which receives an upstream web of material 5 at a constant speed V_0 and delivers the web 5 downstream at an intermittent speed V_{IT} to a platen press 20. In order to bring about the variation in speed, the web 5 passes around a low-inertia roller 13 mounted in eccentric manner on two
20 lateral rotary plates. Accordingly, at each rotation of the plates, the web forms a loop having monitored dimensions, the outlet speed being practically zero during formation of the loop.

25 The pair of rollers 11 tensions the web during the upstream journey, whereas an infeed roller 15, guiding the web towards the platen press, maintains the tension in the loop by friction forces, since the peripheral

speed VR of the roller is always greater than the instantaneous speed VIT of the web.

As shown more clearly in Fig. 2, the advance AVIT of the web at the outlet of the loop is not proportional to the overall drive of the machine; after being zero during the descent of the eccentric roller, it builds up very quickly during the ascent. The intermittent speed VIT of the web thus follows a bell curve optimised in dependence on the characteristics of the web material. Under these conditions, the average value in the cycle corresponds to the speed V0 of arrival, which is usually of the order of 3.5 m/s. The curves ACIT represents the corresponding acceleration conditions, comprising acceleration up to about 190 m/s² followed by deceleration of the order of -255 m/s².

The maximum intermittent speed VIT of the web may reach a value of the order of 8.5 m/s. In conventional machines, therefore, the upper infeed roller is kept at a constant peripheral speed VRO of the order of 9 m/s. The area S1 indicates the extent of the instantaneous speed difference, which results in a proportional amount of heat to be dissipated.

According to the invention, as shown in Fig. 3, the cylinder 13 is driven by an independent electric motor 35 via a reducing mechanism comprising a double gear 40/42 and 44/46. By means of the motor 35, the roller is driven not at a constant speed but along a curve VR1 or VR2.

In the first curve, the speed VR1 of the infeed roller increases then decreases in linear manner from 2 m/s to 9.2 m/s. The acceleration and the subsequent braking ACR1 applied by the motor are constant.

- 5 In the second curve, the speed VR2 of the infeed roller varies in accordance with a bell curve which is nearer the speed curve VIT of the web. The acceleration ACR2 then goes through a maximum.

- 10 The area S2 represents the residual speed difference between the web and the roller, now reduced to an optimised value so as to maintain a sufficient tension on the strip and reduce heat losses to a minimum.

- 15 The moment of inertia of the infeed roller 15 and of the drive device is evaluated in known manner, step by step, by noting the moment of inertia and the elasticity of each component, i.e. the roller 15 on its shaft 47, the driven bevel gear 46, the driving bevel gear 44, the shaft 45, the driven toothed wheel 42, the driving toothed wheel 40, the outlet shaft 36 and the
20 motor 35, allowing for the reduction ratios, e.g. 15 : 38 at the wheels 44/46 and 20/36 at the wheels 40/42. The total moment of inertia relative to the motor 35 may typically be of the order of 0.03 kg/m² and in all cases is below 0.04 kg/m².

- 25 The maximum torque required by the motor [is] equal to the moment of inertia multiplied by the maximum angular acceleration required.



6 In the case of adaptation to an existing machine, the load torque initially provided for continuously driving the infeed roller on the differential and the general kinematic drive chain of the machine can be compensated by a motor brake. The energy required is then made up by the electric mains.

10 The speed, in accordance with a predetermined profile applied to the electric motor, can be controlled in known manner by data-processing means or by electrical engineering.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An infeed station comprising an eccentric roller mounted between two rotary plates around which a web material travels in such a manner that its speed of advance is converted from a constant inlet speed to an output speed which varies under predetermined conditions during an operating cycle of the station, and an infeed roller (15) which guides the web of material from the eccentric roller to the platen, characterised in that the infeed roller is driven by an independent device in such a manner that the peripheral speed of the infeed roller is arranged to follow changes in the variable speed of the web material passing through the station and such that the peripheral speed of the infeed roller is greater than the outlet speed of the web material.
2. An infeed station according to claim 1, characterised in that the independent device for driving the infeed roller comprises a DC electric motor coupled through a reduction gear which comprises two pairs of reduction gears.
3. An infeed station according to claim 2, characterised in that the electric motor is connected to the infeed roller shaft by said two reduction gears, a first of said gears having a ratio of the order of 20 : 36 and the second having a ratio of the order of 15 : 38, the total moment of inertia of the cylinder, the gears and the motor relative to the motor outlet shaft not exceeding 0.04 kg/m².



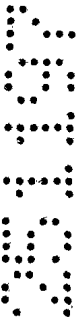
4. An infeed station as claimed in any preceding claim and substantially as hereinbefore described with reference to and/or as shown in Figure 3 of the accompanying drawings.

Dated this twenty-fifth day of November 1997

BOBST S A

Patent Attorneys for the Applicant:

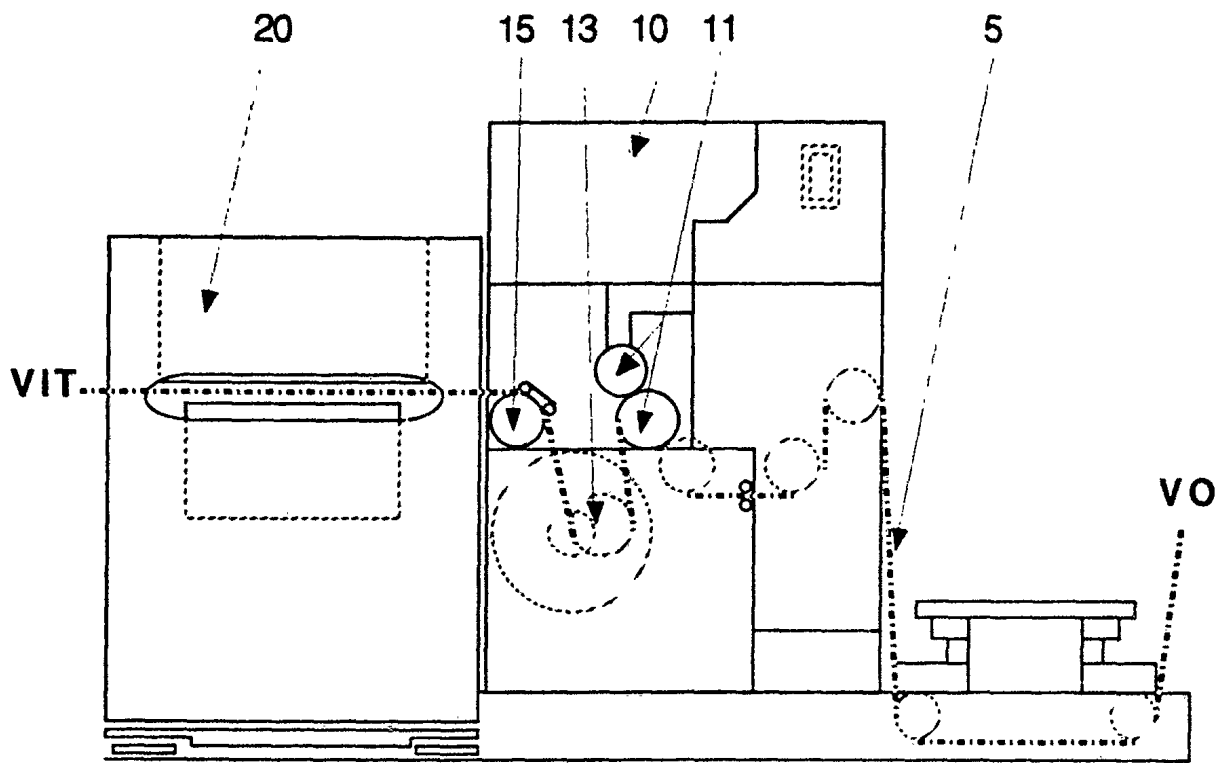
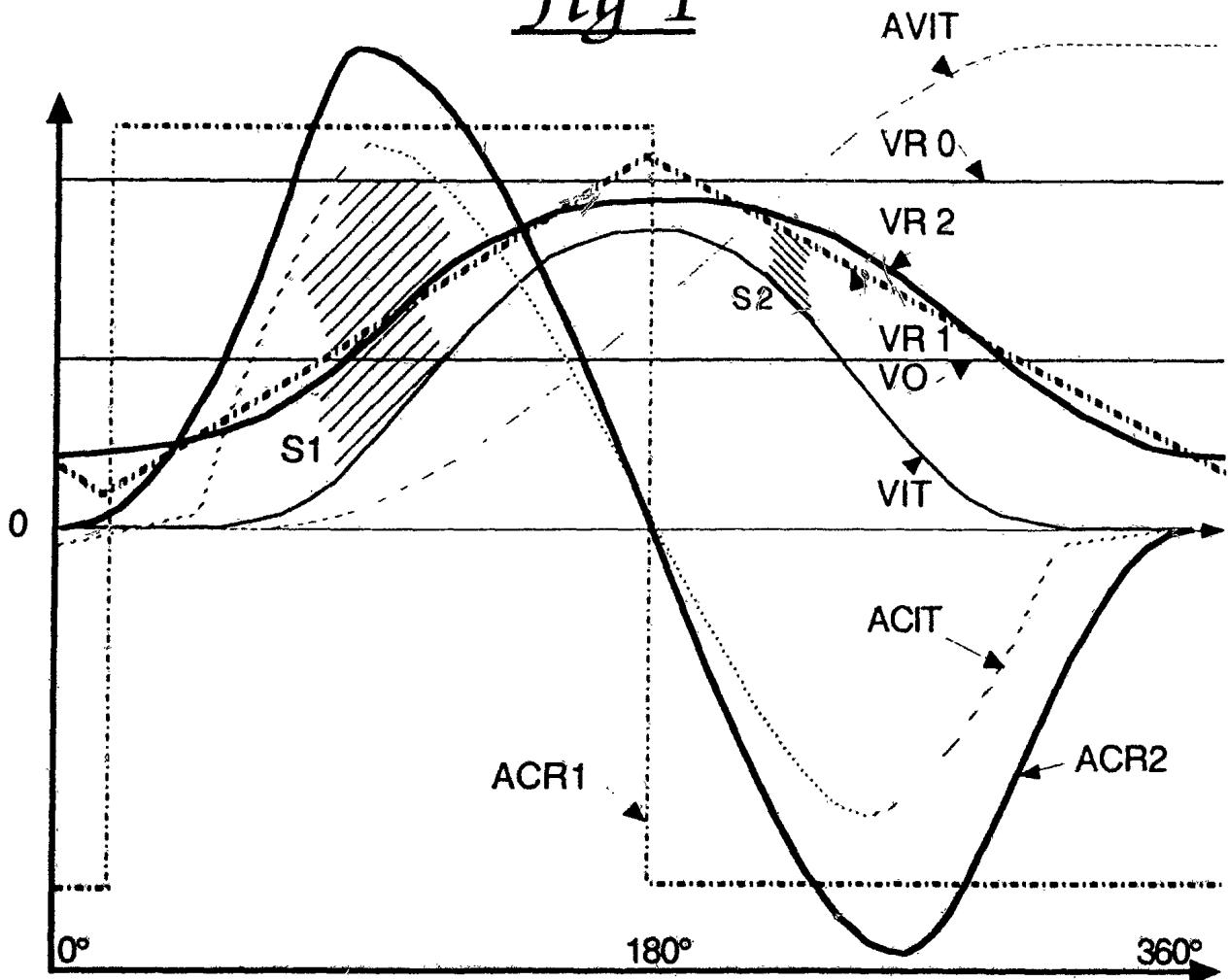
F.B. RICE & CO.

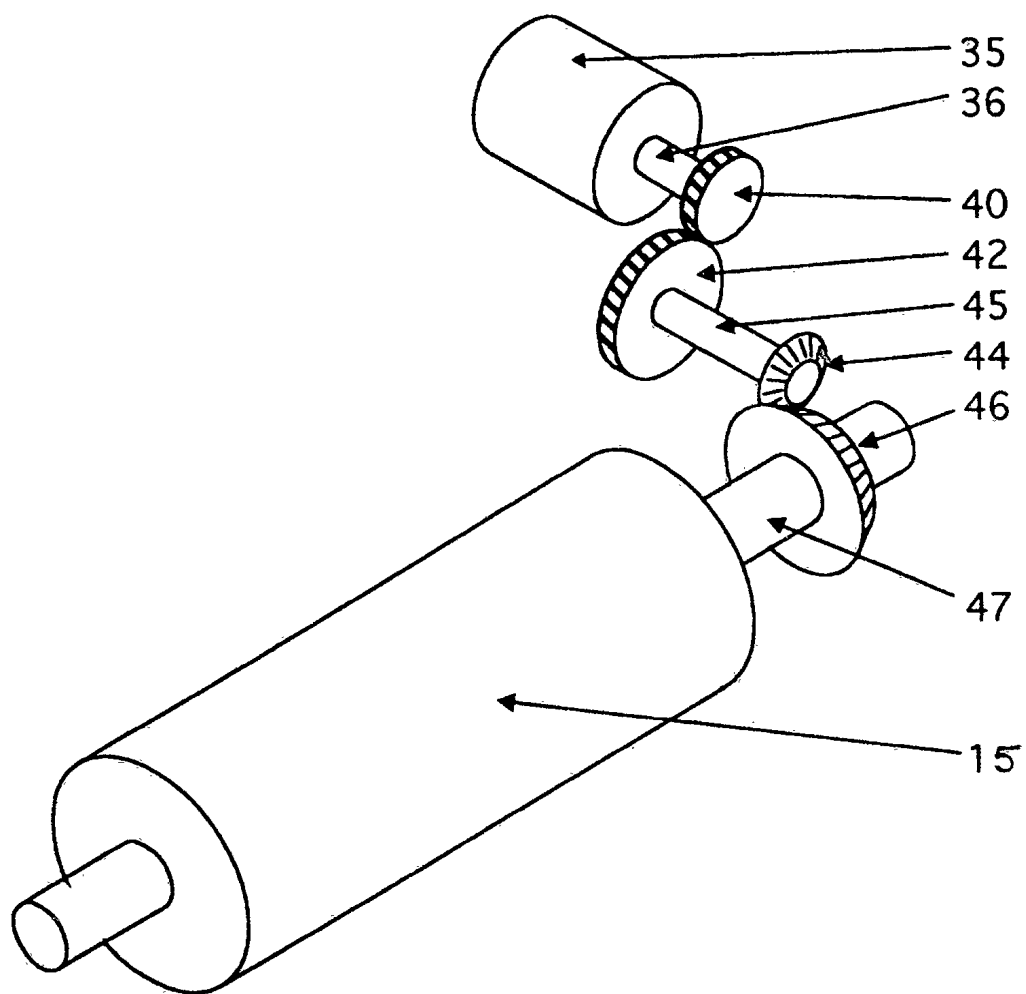


A B S T R A C T

The infeed station (10) comprising an eccentric roller (13) mounted between two rotary plates around which a web material (5) travels in such a manner that its speed of advance is converted from a constant inlet speed to an outlet speed which varies under predetermined conditions during an operating cycle of the station, which also comprises an infeed roller (15) which guides the web of material from the eccentric roller to the platen press. The infeed roller is driven by an independent device (35, 40/42, 44/46) in such a manner that its peripheral speed varies in similar manner to the outlet speed of the web material while permanently remaining at a higher value.

(Fig. 3)

Fig 1Fig 2

Fig 3