
(12) PATENT ABRIDGMENT **(11) Document No. AU-B-52359/90**
(19) AUSTRALIAN PATENT OFFICE **(10) Acceptance No. 630440**

- (54) Title
A PROCESS AND APPARATUS FOR THE SEALING OF PAPER SHEETS
- International Patent Classification(s)
(51)^s **B43M 005/00** **B42D 015/08** **B43M 005/02** **B65D 027/12**
- (21) Application No. : **52359/90** (22) Application Date : **29.03.90**
- (43) Publication Date : **14.11.91**
- (44) Publication Date of Accepted Application : **29.10.92**
- (71) Applicant(s)
DATAPAC SRL
- (72) Inventor(s)
ARMANDO SPERONI; ALDO BEDODI
- (74) Attorney or Agent
WATERMARK PATENT & TRADEMARK ATTORNEYS , Locked Bag 5, HAWTHORN VIC 3122
- (56) Prior Art Documents
GB 2224461
GB 2190652
IT 1169138

(57) Claim

1. An apparatus for closing and sealing edges of paper envelopes and the like, comprising a plurality of folding means including first means for folding a paper sheet along one of orthogonal axes thereof; a plurality of moistening means including first means for moistening opposing edges of said folded sheet to be sealed, a plurality of pairs of knurling rollers including a first pair of knurling rollers applying pressure to said edges for closing and sealing said moistened edges; said plurality of folding means including second means for folding said paper sheet along another of orthogonal axes thereof; said plurality of moistening means including second means for moistening opposing edges of said double-folded paper sheet to be sealed; said plurality of pairs of knurling rollers including a second pair of knurling rollers applying pressure to said opposing edges of said double-folded paper sheet for closing and sealing said opposing edges; and an elongated paper sheet-conveying belt for advancing said paper sheet through said plurality of folding means, said plurality of moistening means, and said plurality of pairs of knurling rollers, wherein moisture content of said paper sheet moistened by each jet is between 5% and 98% by weight, whereby all edges of the paper sheet to be sealed are closed and sealed without application of any adhesive therebetween, each of said moistening means being positioned between a respective folding means and a respective pair of knurling rollers so as to apply moisture to the edges to be sealed immediately before each sealing procedure.

630440

Form 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-69

COMPLETE SPECIFICATION

(ORIGINAL)

Class

Int. Class

Application Number:

Lodged:

Complete Specification Lodged:

Accepted:

Published:

Priority :

Related Art :

Name of Applicant : DATAPAC Srl

Address of Applicant : Via Chelini 7, 00197 Roma, Italy

Actual Inventor : ARMANDO SPERONI and ALDO BEXODI

Address for Service : **WATERMARK PATENT & TRADEMARK ATTORNEYS.
LOCKED BAG NO. 5, HAWTHORN, VICTORIA 3122, AUSTRALIA**

Complete Specification for the invention entitled:

A PROCESS AND APPARATUS FOR THE SEALING OF PAPER SHEETS

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

US

SPECIFICATION

The present invention relates to the joining along at least one edge of paper sheets and particularly to the closing of envelopes such as for example the so-called self-enveloping forms without recourse to adhesive substances.

In the following description reference shall be made to self-enveloping forms without it having to be construed as a limitation of the scope of the invention.

As it is known in recent years the so-called self-enveloping forms have acquired widespread popularity and diffusion, being especially used for the printing and mailing of invoices, bills, etc., particularly from companies and suppliers of public utility services (electricity, gas, telephone, tap water), which are compelled to issue at very close times (actually every two months) bills or invoices for a great number of customers, these bills having to be mailed and delivered by the mail service (or equivalent service), respecting the rules thereof, (such as for example the fact that for taking advantage of a discounted tariff with respect to the normal rate, the envelope must have an open side for postal inspection).

The self-enveloping form has permitted and permits to face such a requirement since it can be supplied to the billing and printing centers as a continuous form strip and, once it has been printed and completed with the address of the customer, it is folded to form an envelope.

The latter thus has one side naturally closed, corresponding to the final folding of the sheet already folded in two or three parts according to parallel folding lines, and must be sealed along at least two of the three remaining edges (depending on whether one open edge for postal inspection must be left).

According to known and used technique such a closing and sealing has been carried out by coating with an adhesive (either reversible or unreversible depending on the need of permitting or not more than one operation of opening and closure of the "envelope") the sheet not yet folded but provided with the weakening lines for the separation by tearing of the edges and/or of portions of the sheet and before the "processing" thereof at the printing and billing center.

In the most widespread types of self-envoloping forms that has meant that the adhesive had to be coated along edge stripes of the still blank form or sheet on both sides of the sheet, the said stripes having to mate with each other after the several folding operations.

This fact has been and is a not negligible drawback and problem, as detailedly discussed in the preamble of the Italian patent No. 1,1169,138 filed on 24th November 1983 in the name of the same inventors of the present invention, which is herein included by reference.

This Italian patent discloses and claims a solution of the technical problem of the closing of envelopes and particularly of self-envoloping forms, consisting in knurling the edges to be sealed, preferably by action of two opposed knurling rollers between which the superimposed and mating edges to be sealed are passed.

The interference pressure between th two rollers causes surface portions of the paper to be deformed in a combined manner, thus sealing together the two superimposed edges of paper.

Obviously such a solution is useful only for the cases of a sealing which can not be opened without being destroyed.

The success of the seeling operation depends however on the

careful control of the mechanical conditions under which it is carried out and on the paper having constant characteristics owing to the fact that, as already mentioned, the sealing is ensured by the simultaneous deformation of mating portions of the two sheets or edges of paper undergoing the action of the relieved and depressed portions of the two knurling rollers.

It is evident that any improvement of the afore said surface deformation leads to an improved sealing, so that it is made suitable also for the cases to date excluded by the mailing service from the number of uses of this process, for instance the registered mail.

It has been now found and is the main object of the present invention that it is possible to ensure the sealing of envelopes, particularly self-enveloping forms fulfilling all the requirements both mechanical and of ruling nature, by means of a closing and sealing process by knurling, characterized in that the mating and superimposed paper edges to be subjected to the action of the knurling means are previously moistened so that the paper forming the said edges has a moisture content of between 5% and 98% by weight referred to the paper weight.

It has been surprisingly found that when the knurling operation is carried out on edges of thus moistened paper a mutual interpenetration of the fibers forming the two paper edges takes place whereby the sealing is resistant both to the opening efforts and in the long run, it disappearing only with its destruction.

Thus the main object of the present invention is a closing and sealing process for two paper surfaces, particularly envelopes and preferably self-enveloping forms, of the type in which the edges to be sealed are subjected to the action of

knurling means, which process is characterized in that said edges upon undergoing the action of the knurling means have a moisture content higher than that of the paper to be printed, said moisture content being of between 5% and 98%, preferably of the order of about 9-10%.

According to the preferred embodiment of the process of the present invention said edges are moistened immediately before arriving to the knurling means.

Another object of the present invention resides in the apparatus for the carrying out of the process as above defined, of the type comprising conveying means adapted to transfer at least two sheets to be joined with the edges to be joined at the knurling means, characterized in that upstream of said knurling means moistening means for said edges to be joined are provided.

According to the preferred embodiment of the apparatus of the present invention, in which said knurling means consists of two opposed rollers having knurling surfaces between which two edges to be closed or sealed are passed, under the simultaneous action of a knurling adjustable pressure, said moistening means consist of spraying nozzles mounted in upstream position in the path of the sheets to be joined, so as to impinge against only the edges to be joined with jets of atomized water, dosed in such a manner that in a predetermined time the moisture content of said edges arrives to a predetermined value.

In the case of self-enveloping forms said moistening nozzles means are positioned downstream of the standard folding means for the forms coming out of the tearing or cutting means which in turn are positioned downstream of the printer. According to a modification several stations can be provided for the closing by knurling and corresponding

moistening stations positioned immediately downstream of each folding step of the form.

One of the main advantages of the present invention is that the moistening phase can be carried out also onto the paper surfaces opposite to those which are effectively into contact and consequently the latter are simultaneously deformed and reciprocally interpenetrated owing to the action of the knurling rollers.

The specific features and the advantages of the present invention shall more clearly appear from the following description of a preferred embodiment made with respect with the accompanying drawings, in which:

figures 1, 2, 3 respectively show a self-enveloping form in the several folding and sealing phases; and

figure 4 is a schematic plant view from above of the moistening station.

Before providing the detailed description referred to the drawings, it must be stated in advance that as regards the knurling means and station and consequently the related apparatus, in the present specification reference is made to the specification and drawings and of the already mentioned Italian Patent No. 1,169,138 , herein inserted by reference as the whole.

Referring now to figures 1, 2, and 3 a form M is shown which for easiness is divided in four sectors A, B, C, D by two orthogonal folding lines 10 and 11.

The line 10 is formed by two lengths 10A and 10B with respect to which the adjacent sectors (A,B) and (C,D) are folded in opposite directions, since the folding with respect to the line 10 takes place after the folding with respect to the line 11.

The lines 12 indicate weakening lines, for instance by means

of holes, for the possible tearing of the corresponding edges of the envelope B.

The references 13 (A,B,C,D) , 14 (A,B,C,D) and 15 (A,B,C,D) indicate stripes or edges of paper defined by the weakening lines 12.

As it can be seen from the figures 1, 2 and 3, the form M coming out of the printer and thus completed for example in form of a bill or invoice and possibly divided in two half forms, namely the zones A and B for the true bill, and zones C and D for a form for postal and/or bank payment, is firstly folded along the middle line 11 taking the configuration of figure 2 and thereafter folded again along the folding lines 10a and 10b taking the configuration of figure 3.

When the sheet is in the configuration of figure 2, the edges 14a, 14d, and 14b and 14g are sealed together by means of the apparatus of the above identified Italian Patent.

According to the present invention these edges before undergoing the action of the knurling rollers 4, 4' of the above identified Patent, are moistened so as to bring their moisture content to about 9%, in the manner hereinafter described with reference to figure 4.

Likewise when the folding of figure 3 has been carried out , the edges 13a, 13b, 13c and 13d as well as 15a, 15b, 15c and 15d are sealed together. In this case too before the action of the knurling rollers 4, 4' an adequate moistening takes place as hereinafter described.

Referring now to figure 4 , reference 16 indicate a conveying belt (in form of belt or rollers) onto which the forms M arrive to the folding device 17 in the condition of figure 2.

Reference 18 indicates two spraying heads of a type avail-

able from the market and adapted to guide a jet of atomized water against the paper at a suitable distance.

In figure 4 the folded form in the condition of figure 2, coming out of the moistening station has the edges 14a, 14b, 14c and 14d moistened and ready to undergo the action of the knurling rollers (4, 4') which are effective in this position.

Once this phase of partial sealing is completed, the form M must undergo a second folding, passing from the condition of figure 2 to that of figure 3.

Before this phase the form enters the second moistening station 19 in which the spraying nozzles 20 carry out the moistening function for the edges 13d and 15c.

To this end the nozzles 20 are mounted in a cross-wise movable manner (as shown by arrows F) with respect to the advancing direction of the conveying belt 16 and at the station 19 the form M must stop for the time necessary for the operation of the moistening nozzles.

The moistening is immediately followed by a not shown folding station.

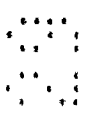
Obviously downstream of the moistening station 19 a further station 21 for the sealing by means of the action of knurling rollers is provided.

The above description has been made with a reference to the simplest self-enveloping form type. It is evident that by modifications self appearing to the skilled technician the same sealing can be applied to self-enveloping forms of different type, such as for example those with double folding (namely with two crossing folding lines 11).

As already mentioned, the present invention may find identical application to the closing and the sealing of conventional envelopes as well as to the closing and sealing of

other paper or paper board products, such as for example paper board boxes, since by applying the principle of the preliminary moistening it is only necessary to provided an effective knurling action , namely an interference pressure between the two knurling rollers adapted to the thickness and to the properties of the two paper edges to be sealed together.

It is thus meant that the invention is not to be construed as limited to the shown and/or described embodiment but extending to other cases of the sealing of two surfaces of paper or paper board by means of knurling with preliminary moistening.



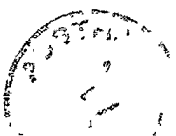
10/11/54

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for closing and sealing edges of paper envelopes and the like, comprising a plurality of folding means including first means for folding a paper sheet along one of orthogonal axes thereof; a plurality of moistening means including first means for moistening opposing edges of said folded sheet to be sealed, a plurality of pairs of knurling rollers including a first pair of knurling rollers applying pressure to said edges for closing and sealing said moistened edges; said plurality of folding means including second means for folding said paper sheet along another of orthogonal axes thereof; said plurality of moistening means including second means for moistening opposing edges of said double-folded paper sheet to be sealed; said plurality of pairs of knurling rollers including a second pair of knurling rollers applying pressure to said opposing edges of said double-folded paper sheet for closing and sealing said opposing edges; and an elongated paper sheet-conveying belt for advancing said paper sheet through said plurality of folding means, said plurality of moistening means, and said plurality of pairs of knurling rollers, wherein moisture content of said paper sheet moistened by each jet is between 5% and 98% by weight, whereby all edges of the paper sheet to be sealed are closed and sealed without application of any adhesive therebetween, each of said moistening means being positioned between a respective folding means and a respective pair of knurling rollers so as to apply moisture to the edges to be sealed immediately before each sealing procedure.

2. The apparatus according to claim 1, wherein said first moistening means include two spraying heads for moistening said opposing edges with a jet of atomised water and positioned at said conveying belt opposite each other for applying water onto the edges parallel to an axis of elongation of said conveying belt, and said second moistening means include two spraying heads for moistening said edges with a jet of atomised water and positioned at said conveying belt for applying water onto the edges transversely of the axis of elongation of said conveyor belt.

3. The apparatus according to claim 2, wherein the spraying heads of said second moistening means are reciprocally movable in the direction transversal to the elongation of the conveying belt.



4. A process for closing and sealing edges of paper envelopes and the like, comprising the steps of:

folding a paper sheet along one of orthogonal axes thereof at a first folding station;
moistening edges of said folded sheet to be sealed;

applying pressure of first knurling rollers to said moistened edges to close and seal said edges;

advancing said paper sheet to a second folding station and folding said paper sheet along another of orthogonal axes thereof at said second folding station;

moistening opposing edges of said double-folded paper sheet to be sealed; and

applying pressure of second knurling rollers to said opposing edges for closing and sealing said edges, wherein moisture content of said paper sheet in each moistening step is between 5% and 98% by weight, and wherein each moistening step is carried out immediately before each of said pressure-applying steps, whereby said edges are closed and sealed due to deformation and mutual interpenetration of fibres of the edges being moistened and sealed by said knurling rollers without application of any adhesive therebetween.

5. The process according to claim 4, wherein said edges are moistened with a jet of atomised water applied to said edges by spraying in each moistening step.

6. A process according to claim 4, wherein said moisture content is about 9-10% by weight.

Dated this 25th day of August, 1992.

DATAPAC S.R.L.

WATERMARK PATENT & TRADEMARK ATTORNEYS
FLOOR 2, THE ATRIUM,
290 BURWOOD ROAD, HAWTHORN, VICTORIA 3122,
AUSTRALIA.

AU5235990.WPC

DOC017



Fig. 1

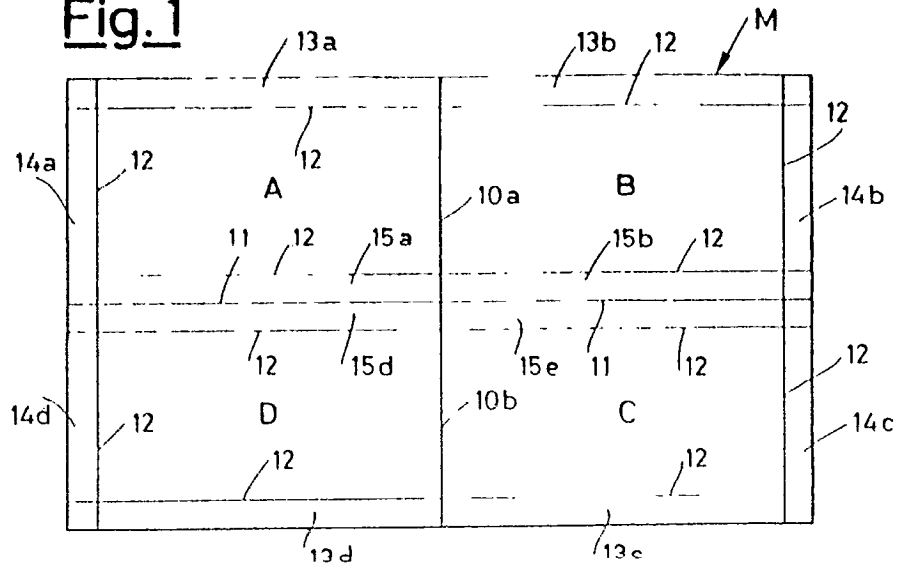


Fig. 2

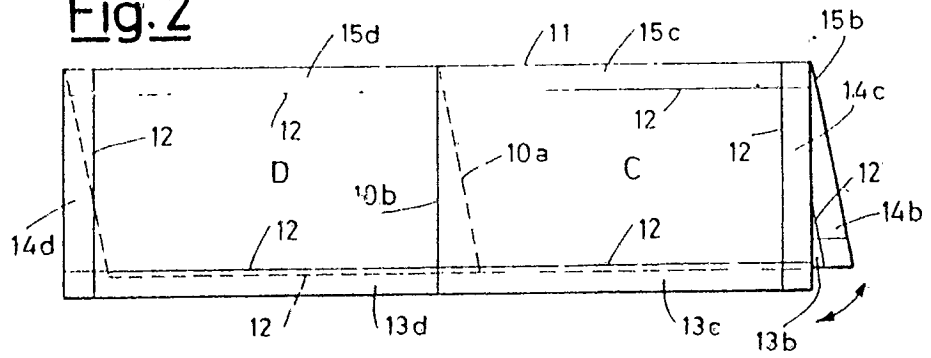
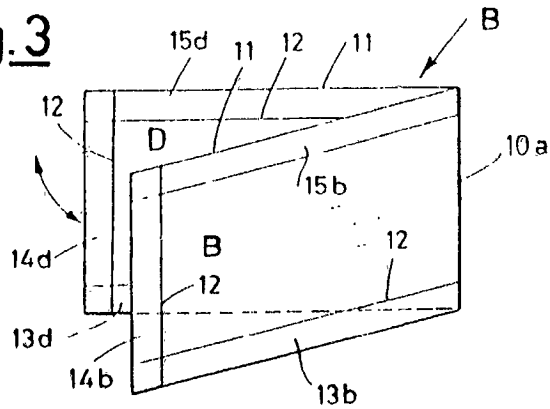


Fig. 3



52359/90

Fig.4

