

PATENT APPLICATION FORM
COMMONWEALTH OF AUSTRALIA
Patents Act 1952

609057
Regulation 9

We, Austec Holdings Pty Limited

of 215-216 Parramatta Road, HOMEBUSH NSW 2140 AUSTRALIA

hereby apply for the grant of a Standard Patent for an invention
entitled SPRAY DEVICE

which is described in the accompanying complete specification.

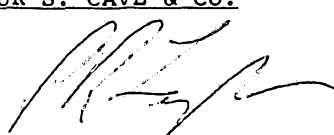
This application is a divisional application made by virtue of
Section 51 of the Patents Act, 1952. The details of the original
application are as follows:

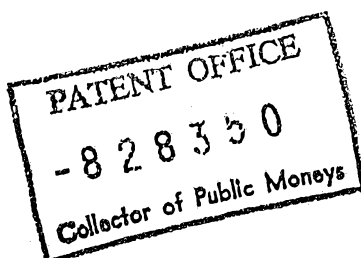
Number of Original Application: 14118/83
Person by whom made: AUSTEC HOLDINGS PTY
LIMITED

Our address for service is ARTHUR S. CAVE & CO., Patent and Trade
Mark Attorneys, 1 Alfred Street, Sydney, New South Wales,
Australia, 2000.

DATED this 17th day of September, 1987.

AUSTEC HOLDINGS PTY LIMITED
By Its Patent Attorneys
ARTHUR S. CAVE & CO.


PAUL R. TAYLOR F.I.P.A.A.



APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 29-1-91

LODGED AT SUB-OFFICE
17 SEP 1987
Sydney

PATENT DECLARATION FORM (NON-CONVENTION)
COMMONWEALTH OF AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A NON-CONVENTION APPLICATION
FOR A PATENT

In support of the Application made by AUSTEC HOLDINGS PTY LTD
for a patent for an invention entitled: SPRAY DEVICE

I/we GLEN... LOGAN... SHEFFER..... (full name of declarant)
of A. TENNYSON... ST. DULWICH HILL... SYDNEY..... (full address)
do solemnly and sincerely declare as follows:- AUSTRALIA

1. I am/~~we are~~ authorised by AUSTEC HOLDINGS PTY LTD the applicant for the patent to make this declaration on its behalf.

2. KEITH WALLACE PAINTER

of 214 Parramatta Road, Homebush, New South Wales, 2140, Australia
is the actual inventor of the invention and the facts upon which the applicant is entitled to make the application are as follows:

The Applicant is the Assignee of the said invention from the actual inventor.

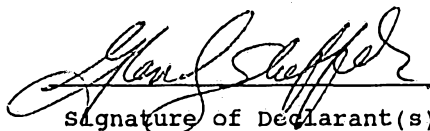
Declared at Homebush this SECOND day of APRIL, 19 90.

To:

The Commissioner of Patents

ARTHUR S. CAVE & CO.

PATENT AND TRADE MARK ATTORNEYS
SYDNEY


Signature of Declarant(s)

(12) PATENT ABRIDGMENT (11) Document No. AU-B-78678/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 609057

(54) Title
SPRAYING DEVICE

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(71) Applicant(s)
AUSTEC HOLDINGS PTY LIMITED

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(56) Prior Art Documents
AU 444672 25054/71 79.4 68.9
AU 62305/73 41.9 41.2
AU 80333/87 C09J 5/00

(57) Claim

1. A method of bonding a laminate to a substrate comprising:
 - (a) feeding a laminate and a substrate into a laminating roll press such that the laminate comes into contact with the substrate at a first roll;
 - (b) locating at least two spray heads adjacent to the surface to be sprayed; each spray head discharging one of at least two viscous liquids;
 - (c) metering the liquid to each spray head, to ensure the liquids discharged from the at least two spray heads are discharged in a predetermined and exact ratio to one another;
 - (d) ejecting the liquid from each spray head toward the surface by application of gas pressure in order to achieve partial mixing of the liquids ejected from the

(11) AU-B-78678/87
(10) 609057

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spray heads at the surface by producing partial overlapping of the liquids in a spatter distribution on the surface.

- (e) completing the mixing of the at least two component adhesive at the first roll where the laminate comes into contact with the substrate such that the mixed adhesive is distributed between the laminate and the substrate.

AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

609057

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority:
Related Art:

This document contains the
amendments made under
Section 49 and is correct for
printing.

TO BE COMPLETED BY APPLICANT

Name of Applicant: AUSTEC HOLDINGS PTY LIMITED

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Complete Specification for the invention entitled SPRAY DEVICE.

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

This invention concerns a spraying method and a spray device for spraying viscous liquids.

The invention will be described with particular preference to its suitability for adhesive application in a laminating machine, but those skilled in the spraying art will appreciate that the device may also find application not only in the manufacture of building boards but in food processing and in defence industries.

In the manufacturing of laminated building boards, it is known to coat surfaces with rollers if thin films of viscous liquids are desired. It is also known to atomise the adhesive in a spray gun relying upon compressed air to shear the liquid. In the manufacture of some panels, for example coolroom panels, it has been found that a uniform film of adhesive between the contacting surfaces of the different layers is not necessary, with resulting economy of adhesive. Moreover, the cost of providing a continuous supply of compressed air is an appreciable factor in production costs. The degree of atomisation which results from airless spraying is not necessary either, although this obviates the need to supply compressed air.

In one broad aspect this invention provides a method of bonding a laminate to a substrate comprising:

- (a) feeding a laminate and a substrate into a laminating roll press such that the laminate comes into contact with the substrate at a first roll;
- (b) locating at least two spray heads adjacent to the surface to be sprayed; each spray head discharging one of at least two viscous liquids;



- (c) metering the liquid to each spray head, to ensure the liquids discharged from the at least two spray heads are discharged in a predetermined and exact ratio to one another;
- (d) ejecting the liquid from each spray head toward the surface by application of gas pressure in order to achieve partial mixing of the liquids ejected from the spray heads at the surface by producing partial overlapping of the liquids in a spatter distribution on the surface.
- (e) completing the mixing of the at least two component adhesive at the first roll where the laminate comes into contact with the substrate such that the mixed adhesive is distributed between the laminate and the substrate.

Preferably the spray heads are traversable over the surface to be sprayed, the connections to the metering pump and gas supply being by flexible conduits.



Even though this method of adhesive application simplifies the use of multi-pack adhesives, the problem with applying such adhesives to laminating surfaces in the manner described remains. Due to the bulk of the spraying apparatus and the methods by which the laminate is applied to the substrate, a physical limit is imposed as to the minimum distance which may be achieved between the point of application of the adhesive and the point where the laminate comes into contact with the substrate.

Subsequently, it has been found that if the two pack adhesives are totally mixed at the point of application to the surface, by the time the laminate has been brought into contact with the substrate the adhesive has undergone considerable chemical reaction, thus by the time the laminate/substrate sandwich has reached a reasonable contact point, usually between the first and second rolls of a laminating roll press, the adhesive has reacted beyond what is known as the tack time of the adhesive, being the stage at which the best adhesion between the two surfaces may be obtained, resulting in poor adhesion between the laminate and the substrate.

As it is necessary for adhesion of the surfaces to commence between the first and second rolls of a laminating roll press and end between the third and fourth rolls, it is critical that the total mixing of the two pack adhesive take place substantially at the contact point of the laminate and substrate.

To achieve this result, it is necessary to mix only sufficient of the ingredients at the time of application to the

surface to commence the chemical reaction, as the chemical reaction initially causes foaming of the adhesive thus producing a mechanism to establish complete mixing of the adhesive at the contact point between the laminate and substrate.

As foaming commences, the adhesive expands. Subsequently as the foamed adhesive reaches the contact point between the laminate and the substrate a foaming mixer is created which causes the adhesive components to mix totally and form a thin layer of adhesive between the laminate and the substrate. By mixing the adhesive components at this point the adhesive bonding between the laminate and the substrate will commence between the first and second rolls of the laminating roll press and finish between the third and fourth rolls as required.

This method of mixing is particularly useful with two pack polyurethane although similar results can be achieved with any multi-pack adhesives.

It has further been found that by heating the laminate to a temperature of between 20°C and 60°C, limiting the maximum feed rate of the laminate and substrate to 2-3 meters per minute, using polyester and iso-cyanate in ratios of between 50%:50% to 70%:30% and pressurised air pressure of 1-2 bar, optimum adhesive bonding between the laminate and substrate may be achieved.

Thus it can be seen that substantial inventiveness has been applied to overcome the secondary problems associated with applying viscous liquids to solid surfaces with respect to the adhesive bonding of laminated panels.

One embodiment of the device is now described with reference to the accompanying drawings in which -
FIG. 1 is a plan of the apparatus set up for spraying a two-component glue.
FIG. 2 is a front view of the same apparatus.
FIG. 3 is a diagrammatic section of a spray head and a fragment of the apparatus.

Referring now to Figs. 1 and 2, sheet steel 2 about 1500 mm wide is fed continuously by nip rolls not shown into a laminating machine which is not illustrated but is also described in one co-pending application no. PF 3854. Adhesive must be applied to the vertical surface of the steel as the latter feeds slowly past the spreading apparatus. The apparatus has a vertical post 4 supported on a pedestal 6. Two horizontal rails 8 support a LH and RH pair of mutually parallel vertical guides 10 fabricated from angle iron. A crosshead 12 rises and falls in the guides under the influence of a double acting ram 14 with a stroke of about 140 mm.

Two spray heads 16 are clamped to brackets 18 on swivel mounts 20. Each head end is spaced from 10 to 50 mm from the surface of the steel 2, the most preferred spacing being 40 mm and the sprays from each head are arranged to partially converge at the surface of the sheet 2. Referring now to FIG. 3 each head has an outer tube 22 with a nozzle 24 and an inlet 34 for one component of the adhesive which is supplied by a metering pump (not shown) through coiled flexible conduit 26 at 2 to 3 psi. The other component is supplied to the remaining head at 0.5 psi due to lower liquid viscosity.



Coiled flexible conduit 28 conveys compressed air at about 0.5 psi to inner tube 30 which ends in a nozzle 32 set just behind the nozzle 24.

5 In use, under steady conditions the components are ejected from each spray head toward the surface to be sprayed and coincide so as to partially mix on the surface of the steel in a zig zag pattern imposed by the ram.

The total mixing of the components caused by the rolling foam mechanism previously described.

10 The advantages of this embodiment have been found to be as follows:

1. The device is economical in the use of air.
2. Satisfactory mixing of components is achieved where mixing is necessary.
- 15 3. Satisfactory distribution of the sprayed components is possible with improved contact area in the finished product.

It will be obvious to those skilled in the art that modifications and variations to the present invention may be made within the scope and spirit of the present invention. As
20 such, it is the intention of the present invention to include such modifications and variations as would be obvious.

The claims defining the invention are as follows:

1. A method of bonding a laminate to a substrate comprising:
 - (a) feeding a laminate and a substrate into a laminating roll press such that the laminate comes into contact with the substrate at a first roll;
 - (b) locating at least two spray heads adjacent to the surface to be sprayed; each spray head discharging one of at least two viscous liquids;
 - (c) metering the liquid to each spray head, to ensure the liquids discharged from the at least two spray heads are discharged in a predetermined and exact ratio to one another;
 - (d) ejecting the liquid from each spray head toward the surface by application of gas pressure in order to achieve partial mixing of the liquids ejected from the spray heads at the surface by producing partial overlapping of the liquids in a spatter distribution on the surface.
 - (e) completing the mixing of the at least two component adhesive at the first roll where the laminate comes into contact with the substrate such that the mixed adhesive is distributed between the laminate and the substrate.
2. The method of claim 1 wherein adhesion of the adhesive to the laminate and substrate surfaces occurs between the first and second rolls of the laminating roll press.
3. The method of claim 1 or claim 2 wherein the strength of adhesion of the adhesive to the laminate and substrate substantially finishes increasing between third and fourth rolls of the laminating roll press.



4. The method according to claim 1 wherein each liquid forms one component of a multi-component adhesive.

5. The method of any one of the preceeding claims wherein partial mixing of the liquids on the surface is caused by ejecting the liquids along divergent paths which cause the liquids to partially intersect at the surface.

6. The method according to any one of the preceeding claims wherein the distance between the surface to be sprayed and the at least two spray heads is 10 to 50 mm.

7. The method of bonding a laminate to a substrate according to any one of claims 1 to 6 wherein the laminate and substrate feed rate is between 2-3 metres per minute.

8. The method of bonding a laminate to a substrate according to any one of claims 1 to 7 wherein the two component adhesive is polyester and iso-cynate.

9. The method of bonding a laminate to a substrate according to claim 8 wherein the polyester and iso-cyanate are mixed in the ratios of 50% polyester - 50% iso-cyanate to 70% polyester - 30% iso-cyanate.

10. The method of bonding a laminate to a substrate according to any one of claims 1 to 9 wherein partial mixing of the at least two component adhesive creates a foam which is drawn into a point of contact between the laminate and substrate such that a foaming roll is formed which aids in mixing of unmixed components of the at least two component adhesive.

11. A method of bonding a laminate to a substrate according to any one of claims 1 to 10 wherein the laminate is heated to between 20°C and 60°C.

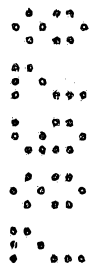
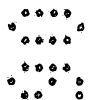


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12. A method of bonding a laminate to a substrate substantially as herein described.

DATED this 1st day of November, 1990.

AUSTEC HOLDINGS PTY LTD
By Its Patent Attorneys
ARTHUR S. CAVE & CO.



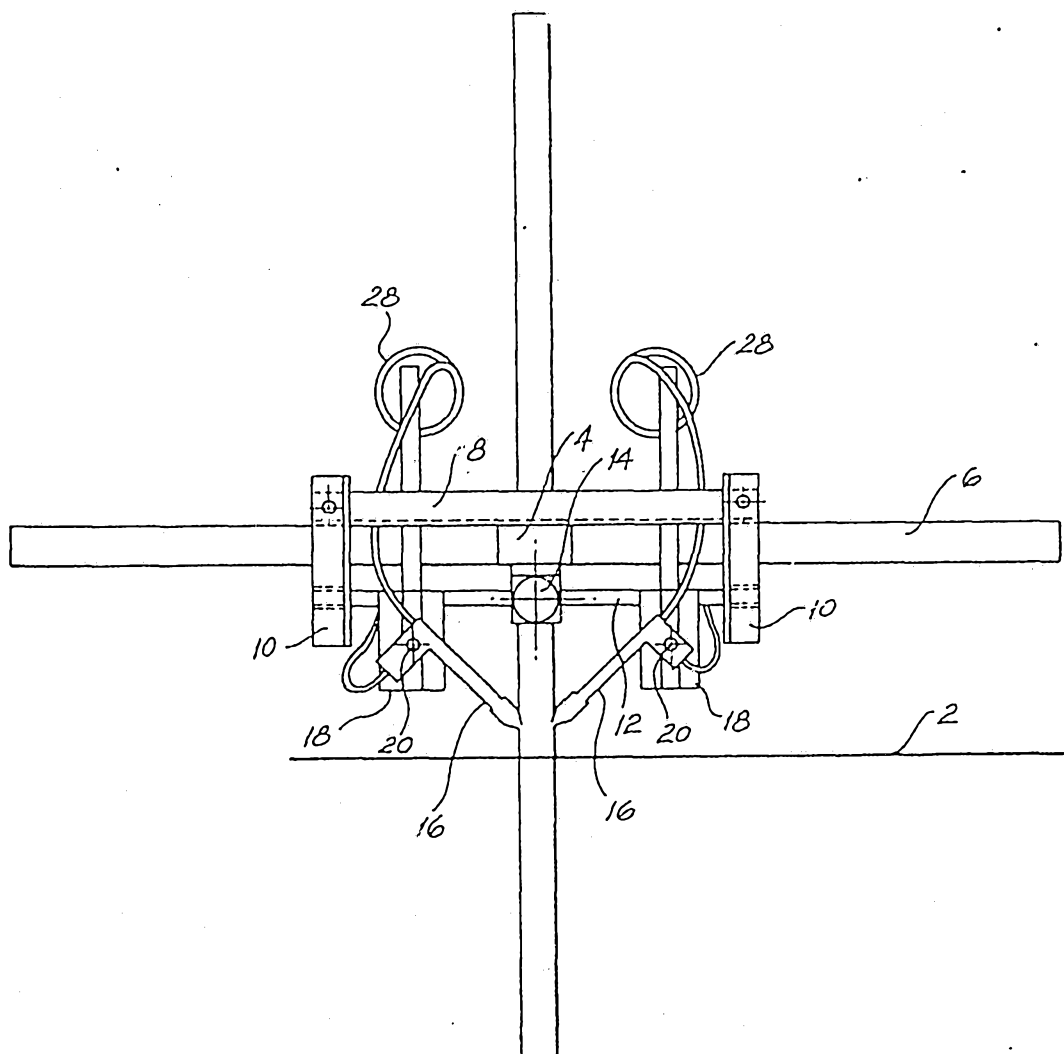


FIG. 1

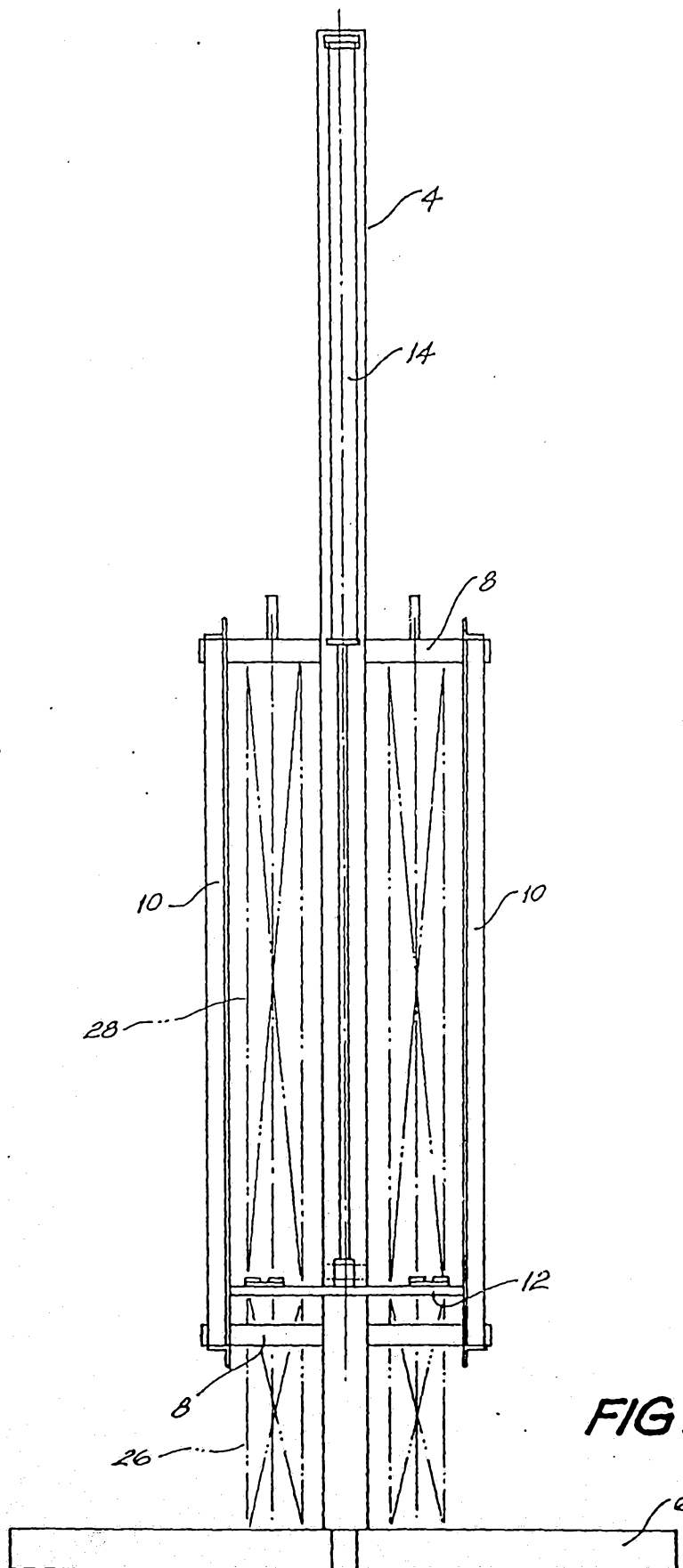


FIG. 2

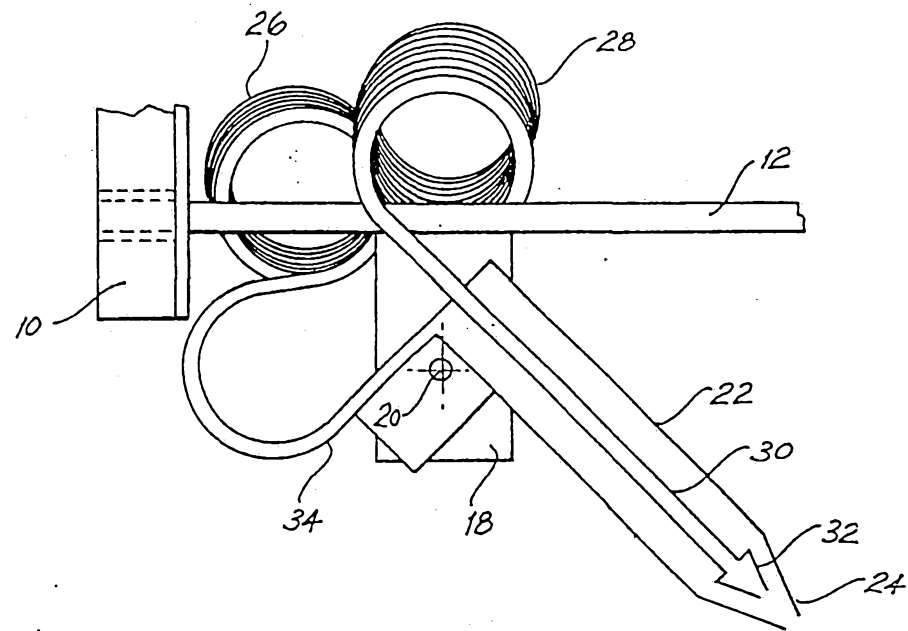


FIG. 3