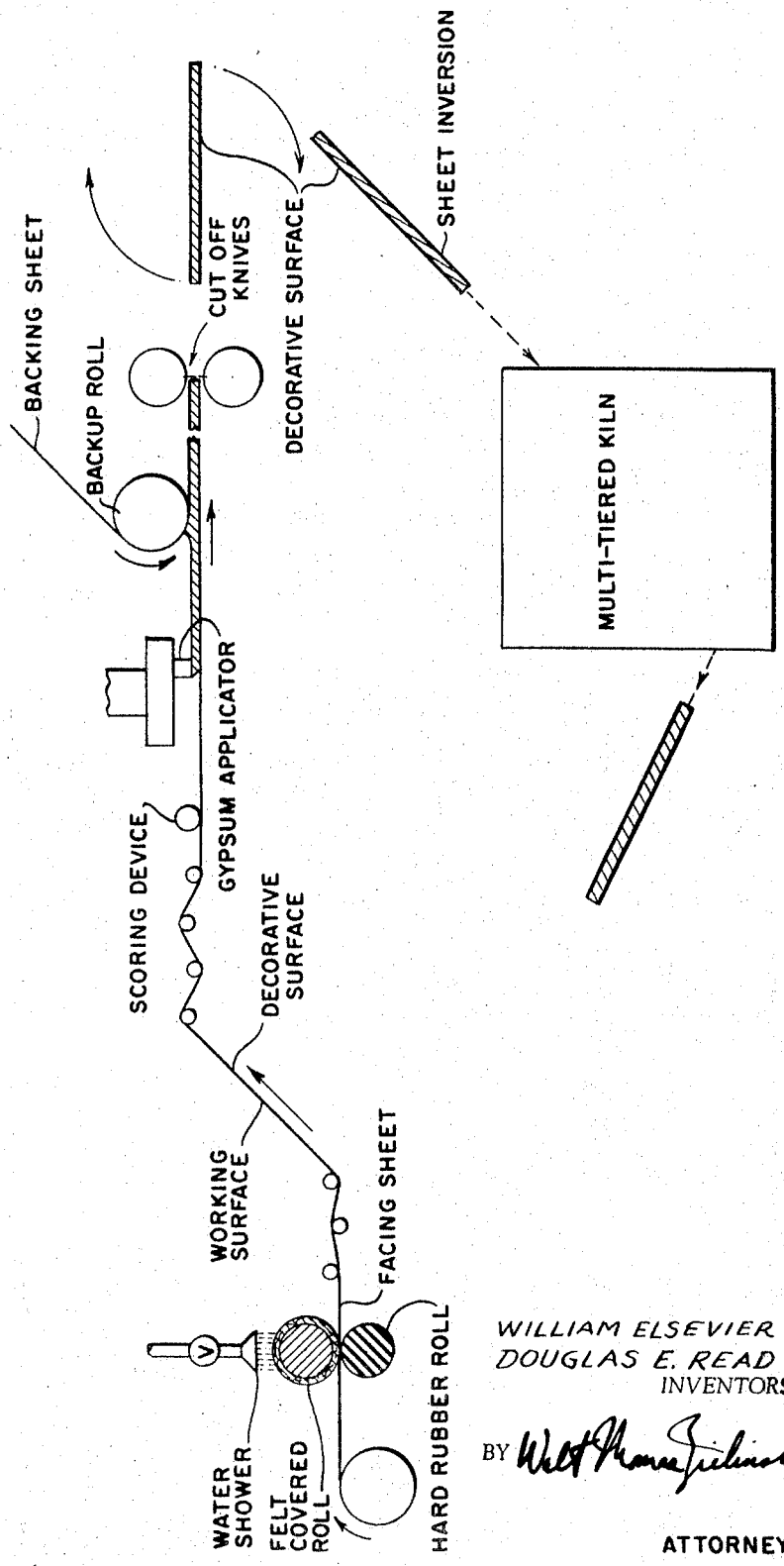
Aug. 26, 1969 W. ELSEVIER ET AL 3,463,685

PROCESS FOR PRE-TREATING FACING SHEETS FOR GYPSUM BOARDS

Original Filed June 19, 1962



WILLIAM ELSEVIER
DOUGLAS E. READ
INVENTORS

BY Walter Thomas Jielinski

ATTORNEY

United States Patent Office

3,463,685

Patented Aug. 26, 1969

3,463,685

PROCESS FOR PRE-TREATING FACING SHEETS FOR GYPSUM BOARDS

William Elsevier, Chickasaw, Ala., and Douglas E. Read, Hawkesbury, Ontario, Canada, assignors to International Paper Company, New York, N.Y., a corporation of New York

Continuation of abandoned application Ser. No. 203,575, June 19, 1962. This application June 26, 1967, Ser. No. 649,060

Int. Cl. B32b *13/04*; B28b *5/02*

U.S. Cl. 156—44 2 Claims

ABSTRACT OF THE DISCLOSURE

In the manufacture of gypsum-core plaster boards, Fourdrinier paper facing sheets are pre-treated with water to provide smooth facing surfaces which are free of dimpling and easy to paint. The pre-treatment consists of wetting out the facing sheets with 70° F. to 212° F. water in an amount and for a time sufficient to penetrate the facing sheet. While the facing sheet is still wet, a gypsum slurry is deposited on the working surface of the facing sheet, a backing sheet is applied, and the composite board is dried.

This is a continuation of application Ser. No. 203,575, filed June 19, 1962, now abandoned.

The present invention relates to the manufacture of paper. More particularly, it relates to the production of improved facings for gypsum-core plaster boards.

It is known to use paper facings and backings for gypsum-core plaster boards. In the process of their manufacture, the facing paper web is travelled horizontally with its working surface, as distinguished from its outer or decorative surface, upward and a slurry of the gypsum material or mud is flowed onto such surface. The backing paper, in the form of a travelling web, is then laid down upon the upper surface of the gypsum slurry in a parallel relation to the facing web.

It is also known to use multi-ply cylinder paper sheets as the facings and backings of the plaster boards. See, for example, U.S. Patent 2,806,811. However, such papers have certain inherent disadvantages as facings of gypsum-core plaster boards. They tend to be heavy and coarse, being derived from mixtures of waste paper and the like. They often delaminate and the decorative surfaces they afford the facings often present esthetical problems even after they have been covered with enamel paint or the like.

Accordingly, it is an object of the present invention to provide facing materials for gypsum-core plaster boards which do not contribute materially to the weight of such boards, which provide relatively smooth decorative surfaces for such facings, and, preferably, which can be painted by the professional or amateur without an initial primer or size coating. These and other objects of the present invention will be further developed hereinafter.

It has now been found that papers having a surprising suitability and utility as facings in the manufacture of gypsum-core plaster boards can be made on the Fourdrinier paper machine. These papers can be single or with a secondary sheet. Preferred examples of such Fourdrinier facing papers have a caliper between about 9.5 to 10.5 points (one point being 0.001 of an inch), have a moisture content of about 5.0% to 8.0% of the weight of the paper at the time of manufacture, have a tensile strength of at least about 85.0 pounds per inch of width in the machine direction and about 40.0 pounds per inch in the cross machine direction, have a porosity of between about 100 to 300 seconds per

100 cc. of air in the Gurley densometer test, and have a smoothness on the finished side of about 150 in the Gurley smoothness test. At the same time, having all these properties which are highly desirable for such facing material, these papers have basis weights of from about 40 to 44 pounds per 1000 square feet as contrasted with the typical 70-pound basis weight cylinder sheet which has heretofore been used as such a facing material. The papers of the invention are made on the Fourdrinier paper machine following specifications in conformity with or like those set forth in Table I:

TABLE I

Wet end furnish:

Pulp (bleached):		
Pine	percent	65
Hardwood	do	35
Sizing	lb./ton	9–50
Alum	do	9–50
Canadian standard freeness		530–550

Size press pickups, lb./ton	Felt surface	Wire surface
Starch	20	15
Clay	24	0
Borax	2	

Calender pickups, lb./ton	Felt surface	Wire surface
Starch	10	
Polyvinyl alcohol	4	
Wax emulsion	1.7	
Mold inhibitor	2.5	

One problem in the manufacture of gypsum-core plaster boards from a Fourdrinier facing sheet is the so-called "dimpling" of the facing material just prior to the progression of the faced and backed plaster board beyond the backup roll (see the attached figure). Such "dimpling" is not readily measurable, but it is highly noticeable under a high intensity, low angle light and esthetically disturbing, particularly when the facing is eventually painted by the ultimate consumer or construction worker. It is an irregularity in the decorative surface of the facing which causes light to be reflected therefrom nonuniformly and, therefore, gives the impression to the eye of an undesirable patterning in or on such surface. This defect has not been considered heretofore, because it has not been observed on the cylinder sheet which has been used hertofore as the facing sheet. However, where the conditions under which the papers of the present invention may be utilized in the manufacture of gypsum-core plaster boards cannot be adequately controlled, such dimpling may noticeably arise and be in the finished product.

It has also been found, however, that dimpling of the papers of the present invention as they are combined with the aqueous gypsum slurry which ultimately forms the core of the plaster board can be substantially eliminated by wetting out the paper web of the facing material prior to the distribution thereon of the aqueous slurry. By "wetting out" is meant that such paper web is wholly penetrated by the aqueous medium therefor, but that no free water is permitted to accumulate on either surface of such web prior to the application thereon of the gypsum mud.

Experiments have shown that the reduction of dimpling in the papers of the present invention, when they are used in the manufacture of plaster boards, is a function of the quantity and temperature of the water used in the wetting out and the residence time during which the water is applied to the working surface of the facing paper. Thus, the higher the temperature of the water, the lesser the quantities of water and the lesser the residence time that will be required. This is reflected in

Table II which shows a number of temperatures employed, degrees of water penetration achieved, and residence times needed for some laboratory test runs.

TABLE II

70° F. temperature:
50% by weight of sheet of paper
0.71 lb. per 4 x 8 ft. panel
0.021 lb. per square foot of panel
8 passes with roller at 1.2 lb./inch nip pressure [1]

100° F. temperature:
35% by weight of sheet of paper
0.50 lb. per 4 x 8 ft. panel
0.015 lbs. per square foot of panel
4 passes with roller at 1.2 lb./inch nip pressure [1]

135° F. temperature:
30% by weight of sheet of paper
0.40 lb. per 4 x 8 ft. panel
0.012 lb. per square foot of panel
3 passes with roller at 1.2 lb./inch nip pressure [1]

212° F. temperature (boiling water):
25% by weight of sheet of paper
0.35 lb. per 4 x 8 ft. panel
0.011 lb. per square foot of panel
2 passes with roller at 1.2 lb./inch nip pressure [1]

[1] Laboratory values cited to show relative residence times.

The water added in the wetting out procedure is evaporated out of the facing material with the water which was the carrier of the aqueous slurry of gypsum. In this, the porosity of the facing material of the present invention and the fact that the facing material can be a single ply lends appreciable assistance to the evaporation and drying out of the plaster board.

It is believed, but not asserted as fact, that the wetting-out step of the present invention is effective because it permits a relaxation of the built-in tensions in the new papers thereunder, such tensions being the causes of the undesirable dimpling effect.

For a better understanding of the invention, reference should be had to the attached schematic diagram and the following example:

Example I

A paper having a basis weight of 42 lbs. per 1000 square feet and made in accordance with the specifications of Table I on the Fourdrinier paper machine is fed, as the facing sheet, into the production line of a gypsum-core plaster board plant. Such paper has a caliper of 10.00 points, a moisture content of 6.0% of its weight at the time of manufacture, a tensile strength of 100 lbs. per inch of width in the machine direction and 54 lbs. per inch of width in the cross machine direction, a porosity of 200 seconds per 100 cc. of air in the Gurley densometer test, and a smoothness on the decorative surface (i.e., the finished side) of 150 in the Gurley smoothness test.

The facing sheet is led into the nip of two rollers, the upper one being felt jacketed and the lower one being covered with hard rubber. Such rollers are adapted to provide a squeeze or nip pressure on the facing sheet.

Above the felt jacketed roller, a shower is positioned so as to distribute a controlled amount of water uniformly across the uppermost surface of such roll and to provide a puddle of water across the facing at the nip. The temperature of the water in the shower is 135° F. and the speed of the facing sheet into and out of the nip is from about 90 to 100 feet per minute. The water added thereby to the facing sheet is about 35% by weight of the paper.

A slurry is flowed from the gypsum applicator onto the upturned working surface of the facing sheet. The gypsum slurry contains calcium sulfate hemi-hydrate, water, starch, foam, set-accelerating reagents, fibers, etc. Immediately, thereafter, a cylinder backing sheet is laid down on the upper surface of the slurry.

The resulting product, i.e., that emerging from the kiln, was found to have substantially no dimples on the decorative surface of its facing sheet when a test for such dimples was run. The test consisted of an examination of the decorative surface of the finished gypsum-core plaster board under a high intensity, low angle light.

What is claimed is:

1. In the manufacture of gypsum-core plaster board, the process comprising the step of horizontally travelling a Fourdrinier paper facing sheet having a decorative surface and a working surface, the step of wetting-out the facing with water in an amount from about 50% to 25% by weight of the facing sheet, at a temperature in the range of about 70° F. to 212° F. and for a time sufficient to penetrate the facing sheet without permitting an accumulation of water on either surface, and the step of flowing an aqueous slurry of gypsum onto the working surface.

2. The process of claim 1 wherein the facing sheet has a basis weight of from about 40 to 44 lbs. per 1000 square feet, a caliper of from about 9.5 to 10.5 points a moisture content of from about 5.0% to 7.0% of the weight of the paper at the time of its manufacture, a tensile strength of at least about 85 lbs. per inch of width in the machine direction and at least about 40 lbs. per inch of width in the cross machine direction, a porosity of from about 100 to 300 seconds per 100 cc. of air in the Gurley densometer test, and a smoothness on the decorative surface of about 150 in the Gurley smoothness test.

References Cited

UNITED STATES PATENTS

2,286,942	6/1942	Tuten	162—123
2,310,216	2/1943	Crandell	161—270 X
2,330,810	10/1943	Crandell	162—147 X
2,581,076	1/1952	Camp	161—270 X
2,806,811	9/1957	Von Hazmburg	161—257
2,918,398	12/1959	Dorland et al.	162—132
3,017,305	1/1962	Dailey	161—259 X
3,054,717	9/1962	Turner	162—123

ROBERT F. BURNETT, Primary Examiner

W. W. SCHWARZE, Assistant Examiner

U.S. Cl. X.R.

117—60, 152; 162—123