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HARDBOARD HAVING A PAPER OVERLAY BONDED THERETO WITH A DRYING OIL USING A BORON TRIFLUORIDE CATALYST

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This invention relates to a process for making artificial board, and to the product of such process, and more particularly relates to artificial boards comprising a hardboard base mat having a paper overlay in which a drying oil, in which a polymerization catalyst is incorporated, provides part of the bond between the base mat and the overlay.

A hardboard having a paper overlay can be made by the method described in Canadian Patent 537,683 dated March 5, 1957, for an invention by Dorland et al. entitled "Artificial Board To Provide a Hardboard Having a Sheet of Paper Integrally United with the Surface of the Hardboard," this Canadian patent corresponding to U.S. Patent No. 2,918,398. A drying oil, such as linseed oil, is usually used to supplement the bonding due to the lignins, hemicelluloses and other natural bonding constituents of the pulp. The paper overlay and hardboard mat, together with the drying oil, are hotpressed, and then the boards are baked to complete the polymerization of the drying oil. The overlay sheet can be coated in the manner described by Canadian Application 759,049, filed September 22, 1958, and entitled "Improvement in Hardboard Overlay," corresponding to Dorland et al. U.S. Patent No. 3,223,579. The paper overlay frequently has wood grain patterns printed on it.

During manufacture of artificial board of the type referred to above, there are a number of rejects resulting from defects such as edge tear, edge peel, or the lifting or separation of the overlay paper from the mat in certain spots. As most of these defects appear at the time of press ejection, they cannot readily be remedied. It is believed that these defects are due to a lack of adhesion between the overlay paper and the board mat during the pressing stage.

One of the objects of this invention is to reduce the occurrence of defects of the type referred to above. A further object of this invention is to improve the physical properties of the board.

It has been found in accordance with this invention that the foregoing can be achieved by incorporating in the drying oil a Friedel-Crafts type catalyst. A particularly effective improvement has been obtained by the use of boron trifluoride.

Various Friedel-Crafts type catalysts may be used, including the halides of aluminium, tin, titanium, antimony, zinc, iron and boron, such as boron trifluoride, aluminium trichloride and stannic tetrachloride. As previously indicated, boron trifluoride is particularly effective, as will become apparent from the examples which follow. Aluminium trichloride and stannic tetrachloride show a significant improvement in bond strength, but the overlay paper is badly discoloured and the post-bake washability is impaired. The boron trifluoride may be used in the form of one of its complexes, such as the ether or the phenol complex and it will be understood, unless otherwise indicated, that where boron trifluoride is specified in the

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specification and claims, this may include the ether or the phenol complex.

The amount of boron trifluoride or other Friedel-Crafts type catalyst can be varied within rather wide limits, preferably about two to ten percent.

The nature of this invention will additionally be apparent from the examples that follow. All of the boards used in the tests described below had a newsprint paper overlay on one surface. The mat was made from a furnish consisting of a 50:50 mixture of softwood and hardwood fibres, employing a defibration technique which, in its essentials, followed the well-known Asplund procedure. The following procedure was used: approximately 2300 g. (on a moisture-free basis) of fibre is slushed with approximately 330 lbs. of water. The pH of the water is adjusted to 5.5 with sulphuric acid. A phenolic based binder in an amount equivalent to 0.85% and a wax size in the amount of 0.75% of the moisture-free weight of the fibres are then added to the mixture. The mixture is stirred for about 15 minutes, after which 0.3% (based on the moisture-free fibre weight) of alum is added. The pH is adjusted to 4.5 with sulphuric acid and the stirring continued for a further period of 15 minutes. A 2 ft. x 2 ft. mat is then formed and cold pressed.

The overlay sheets are prepared by cutting large sheets into the proper size (1 ft. x 1 ft.—as four overlays are usually placed on the laboratory-made experimental boards), and spraying the adhesive oil on the unprinted side of the overlay by means of a spray gun. The amount of oil is determined by weighing the overlay sheet before and after spraying, and is usually maintained at 1.36 g. oil/sq. ft. (equivalent to approximately 3 lb./1000 sq. ft.). The overlay sheets are then placed on the cold-pressed mat, and the mat hot pressed, using a carefully controlled pressure cycle. The temperature of the press plates is maintained at a suitable point within the range 325° F.—385° F., depending on the type of overlay. The pressure cycle used in the hot press is as follows:

- (1) From 0 to 400 p.s.i.g.—in 35 seconds.
 - (2) At 400 p.s.i.g.—for 5 seconds.
 - (3) From 400 p.s.i.g. to 100 p.s.i.g.—in 15 seconds.
 - (4) At 100 p.s.i.g.—for 12 minutes, 35 seconds.
- Total time—13 minutes, 30 seconds.

Where a total press time of 11 minutes is used, the time at p.s.i.g. (stage 4) is reduced to 10 minutes and 5 seconds.

After hot pressing, the boards are baked in an oven at a temperature between 250° F.—300° F. for a period of 3 to 5 hours. In the present series of experiments, the baking was carried out in a draught oven for 4½ hours at 250° F. in all instances. During pressing, however, two press plate temperatures, 325° F. and 350° F., were used.

The boron trifluoride oil was accomplished by adding the specified quantity of the boron trifluoride complex to the oil, followed by gentle stirring.

The sulphurized oils were prepared by adding the requisite amount of flowers of sulphur to a known amount of linseed oil and gently heating the mixture to 180° C. in about an hour. When the temperature reached 180° C., the oil started to froth, and the heating was stopped. The sulphurized oils were very viscous and were of a dark colour. Owing to the high viscosity of the sulphurized oils, they could not be sprayed and were brushed on the overlay.

The maleinized oil (10% maleic anhydride content) was prepared by heating 60 g. of maleic anhydride with 540 g. of linseed oil, in accordance with the following schedule:

- To 200° C.—in 1 hour.
- At 200° C.—220° C.—for 1½ hours.
- To 250° C.—in 1½ hours.
- At 240° C.—250° C.—for 1 hour.

The maleinized linseed was also quite viscous and had to be brushed on the overlay sheets.

Baking in an atmosphere of nitrogen was accomplished by placing 3 in. x 6 in. strips of the unbaked board in a stainless steel bomb (8 in. diameter and 1 ft. in length) provided with inlet and outlet valves and a pressure gauge. After the board strips were in position, the bomb was filled with nitrogen, after flushing out the air in the bomb by a stream of nitrogen for about 15 minutes. The bomb was then placed in a draught oven and heated for 4.5 hours at 250° F.

The paper (overlay) hardboards were submitted to four different tests in order to evaluate the strength of adhesion (and its water-resistance) and the surface properties of the overlay. These tests were:

- (1) Out-of-press dry break tear test.
- (2) Post-bake boil test.
- (3) Post-bake washability test.
- (4) Post-bake wax test.

The details of the tests are given below:

(1) *Out-of-press dry break tear test.*—As its name implies, this test was performed on the boards prior to baking with a minimum of time lag between press release and the performance of the test. In all instances, the tests were performed within two minutes of press release.

For the test, the board was cut in 12 in. x 1 in. strips and the strips were sharply broken in the middle by hand, with the line of fracture perpendicular to the length of the strips. The fracture was initiated on the non-overlay side of the strip, and as the fracture reached the overlay, the two newly-formed strips were sharply pulled away from each other. This resulted in the overlay being peeled off the surface of the strips to a greater or less extent. The extent of the peel was a measure of the strength of the out-of-press overlay bond, being inversely proportional to it.

(2) *Post-bake boil test.*—This test was designed primarily to measure the water-resistance of the overlay bond, but it also furnishes a measure for the bond-strength under the conditions of the test. The test is usually performed on samples of the baked board.

For this test, the board was cut into small squares (1 in. x 1 in.), and the squares put into a beaker of boiling distilled water and the boiling was allowed to continue for one hour. Six to twelve small squares were used for each test. After one hour, the squares were picked up and an attempt was made manually to peel the overlay off the surface of the squares, without disturbing the base board. The portion of the total area of the square exposed was estimated and reported as the "boil test peel value," expressing it as a percentage of the total area. The higher the boil test peel value, the lower was the water-resistance of the overlay bond.

(3) *Post-bake washability test.*—This test measures the surface toughness of the finished woodgrain (overlay) hardboard, and was conducted using a Gardner Straight Line Washability Tester. The procedural details may be found in "Physical and Chemical Examination of Paints, Varnishes, Lacquers, and Colours" by H. A. Gardner and G. G. Sward (p. 396B). (The book is distributed by H. A. Gardner Laboratory, Inc., Bethesda, Maryland, U.S.A.) A strip of the board is given 3000 scrubs by a mechanical brush in the presence of distilled water. If the surface of the board suffers no visible damage after 3000 scrubs, the board is rated as having a satisfactory degree of washability.

(4) *Pick wax test for surface strength.*—This test was performed on the baked board, and the procedure adopted was, in its essential aspects, the same as that recommended by TAPPI (Technical Association of the Pulp and Paper Industry) in standard method T459m-48.

In this test, a series of hard-resin, non-oily waxes is used, numbered in an ascending order in accordance with their adhesive strength. Thus each wax in the series is progressively more adhesive than the next lower one in the numerical order. The wax sticks used in the test were the same as recommended in TAPPI standard method T459m-48.

To carry out the test, the wax sticks were melted under a Bunsen flame at one end, and then placed firmly on the surface of the board. After the wax had cooled to room temperature, the stick was sharply pulled away from the board, the direction of pull being at right angles to the board surface. The highest numbered stick which broken away clean (without leaving any surface damage) from the surface was quoted as the wax number of the board.

The results obtained are set forth in Tables I, II and III herein.

TABLE I.—BOARDS PRESSED AT 325° F.

Experiment No.	Type of Overlay Adhesive Used	Total Press Time, Min.	Out-of-Press Break/Tear	Baking Conditions	Post Bake Boil Test Peel, Percent	Post Bake Wax No.	Post Bake Washability
1	Linseed Oil	13.5	Very poor	4.5 hrs. at 250° F.			
2	do	13.5	do	do	25-50		Excellent.
3	do	13.5	do	do	30-70		Do.
4	Tung Oil	13.5	do	do	5-10	25	Do.
5	do	13.5	do	do	19-23	25	Do.
6	DCO	13.5	do	do	15-40	20	Do.
7	50:50 mixture of tung and linseed	13.5	do	do	10-20		
8	do	13.5	do	do	15-40		
9	do	13.5	do	do	20-50		
10	do	13.5	do	do	10-20		
11	do	13.5	do	do	15-40	26	Do.
12	do	13.5	do	do	25-50	26	Do.
13	Linseed plus 5% BF ₃ Ether	13.5	Good	do	15-40	23	Do.
14	Linseed plus 10% BF ₃ Ether	13.5	Excellent	do	0-5	26	Do.
15	do	13.5	do	do	0-5	26	Do.
16	do	13.5	do	do	0-5	26	Do.
17	do	13.5	do	do	0-5	26	Do.
18	do	13.5	do	do	0-5	26	Do.
19	DCO plus 3% BF ₃ Ether	13.5	Good	do			
20	DCO plus 5% BF ₃ Ether	13.5	Excellent	do	0-5	26	Do.
21	do	13.5	Very good	do	0-5	26	Do.
22	do	13.5	Excellent	do	0-5	26	Do.

Rating of Out-of-Press Break/Tear Test:

1. Very poor. Total peel.
2. Good. Length of peel less than 3 in.

3. Very good. Length of peel less than 2 in.
4. Excellent. Length of peel less than 1½ in.

TABLE II.—BOARDS PRESSED AT 350° F.

Experiment No.	Type of Overlay Adhesive Used	Total Press Time, Min.	Out-of-Press Break/Tear	Baking Conditions	Post Bake Boil Test Peel, Percent	Post Bake Wax No.	Post Bake Washability
1	Linseed oil.	13.5	Very poor.	4.5 hrs. at 250° F.	50-70		
2	50:50 mixture of tung and linseed.	13.5	do.	do.	10-20		
3	do.	13.5	Poor.	do.	15-25		
4	do.	13.5	Very poor.	do.	5-20	26	Excellent.
5	do.	13.5	do.	do.	5-30	26	Do.
6	do.	13.5	do.	do.	15-30	26	Do.
7	do.	13.5	do.	do.	10-25	26	Do.
8	Linseed plus 5% BF ₃ Ether.	13.5	Excellent.	do.	0-5	26	Do.
9	do.	13.5	do.	do.	0-5	26	Do.
10	do.	13.5	Very good.	do.	0-5	26	Do.
11	do.	13.5	do.	do.	0-5	26	Do.
12	do.	13.5	Excellent.	do.	0-5		
13	Linseed plus 10% BF ₃ Ether.	13.5	do.	do.	0-5	26	Do.
14	do.	13.5	do.	do.	0-5	26	Do.
15	do.	13.5	do.	do.	0-5	26	Do.
16	do.	13.5	do.	do.	0-5	26	Do.
17	do.	13.5	do.	do.	0-5	26	Do.
18	do.	13.5	do.	do.	0-5		
19	do.	11.5	do.	do.	0-5		
20	do.	11.5	do.	do.	0-5		
21	Linseed plus 10% BF ₃ Phenol.	13.5	do.	do.	0-5	26	Do.
22	do.	13.5	do.	do.	0-5	26	Do.
23	do.	13.5	do.	do.	0-5	26	Do.
24	do.	13.5	do.	do.	0-5		
25	do.	13.5	do.	do.	0-5		
26	do.	13.5	do.	do.	0-5		
27	Soya plus 10% BF ₃ Ether.	11	do.	do.	10-20		
28	do.	11	do.	do.	10-15	23	Do.
29	do.	11	Very good.	do.	10-20	23	Do.
30	50:50 mixture of tung and linseed emulsified with equal amount of water.	11	Fair.	do.	10-20	26	Do.
31	do.	11	do.	do.	10-20	26	Do.
32	Linseed oil emulsified with equal amount of water.	11	Poor.	do.	10-25	26	Do.
33	do.	11	Fair.	do.	10-25		
34	Unitol BX	11	do.	do.	100		
35	50:50 mixture of Unitol BX and linseed.	11	Fair.	do.	80-100		
36	do.	11	Poor.	do.	90-100	18	
37	50:50 mixture of Unitol BX and linseed plus 10% BF ₃ Ether.	11	Excellent.	do.	0-5	23	Do.
38	do.	11	do.	do.	0-5	23	Do.
39	Linseed plus 10% sulphur.	11	Very poor.	do.	100		
40	Linseed plus 5% sulphur.	11	do.	do.	100		
41	Linseed plus 2% sulphur.	11	do.	do.	80-90		
42	Maleic Linseed	13.5	do.	do.	5-10	23	
43	Zymol	11	do.	do.	10-20		
44	Varsoy	11	do.	do.	10-20		
45	Zymol, thinned with solvent.	11	do.	do.			
46	Varsoy, thinned with solvent.	11	do.	do.			
47	Maleic linseed plus 4% BF ₃ Ether.	13.5	Excellent.	do.	0-5	26	
48	Linseed oil	11	Very poor.	do.	20-25		
49	Tung oil	11	do.	do.	10-15		
50	Laboratory bodied linseed.	11	do.	do.	30-40		
51	Commercially bodied linseed.	11	do.	do.	50-70		
52	do.	11	do.	do.	50-70		
53	do.	11	do.	do.	60-70		
54	Commercially bodied linseed thinned with solvent.	11	do.	do.			
55	Linseed plus SO ₂	11	do.	do.	60-80		
56	50:50 mixture of tung and linseed plus 0.1% Fe drier.	13.5	do.	do.	20-60		
57	DCO plus 0.1% Fe drier.	13.5	do.	do.	20-60		
58	DCO plus 0.05% Co-drier plus 0.3% Pb drier.	13.5	do.	do.			
59	DCO plus 0.10% Co-drier plus 0.6% Pb drier.	13.5	do.	do.			
60	Linseed plus 10% AlCl ₃	11	Good.	do.	0-5	18	Poor.
61	Linseed plus 10% SnCl ₄	11	do.	do.	0-5	18	Do.

Rating of Out-of-Press Break/Tear Test:

1. Very poor. Total peel.

2. Poor. Length of peel between 4 in. and 6 in.

3. Fair. Length of peel between 4 in. and 8 in.

4. Good. Length of peel less than 3 in.

5. Very good. Length of peel less than 2 in.

6. Excellent. Length of peel less than 1/4 in.

TABLE III.—BOARDS PRESSED AT 350° F.

Experiment No.	Type of Overlay Adhesive Used	Aging time of Adhesives	Total Press Time, Min.	Out-of-Press Break/Tear	Baking Conditions	Post Bake Boil Test Peel, Percent	Post Bake Wax No.	Post Bake Washability
1	Linseed plus 5% BF ₃ Ether.	10 min.	11	Excellent.	4.5 hrs. at 250° F.	0-5	26	Excellent.
2	Linseed plus 10% BF ₃ Ether.	10 min.	11	do.	do.	0-5	26	Do.
3	do.	2 min.	11	do.	do.	0-5	26	Do.
4	do.	30 min.	11	do.	do.	9-5	26	Do.
5	do.	1 hr.	11	do.	do.	0-5	26	Do.
6	do.	1 hr.	11	do.	do.	0-5	26	Do.
7	do.	21.5 hrs.	11	do.	do.	0-5	26	Do.
8	do.	21.5 hrs.	11	do.	do.	0-5	26	Do.
9	50:50 mixture of tung and linseed.	10 min.	11	Very poor.	4.5 hrs. at 250° F.	100	<13	
10	DCO	10 min.	11	do.	do.	100		
11	DCO plus 7% BF ₃ Ether.	10 min.	11	Excellent.	do.	10-30		

: Under nitrogen.

The results given in Table I, which refers to boards pressed with a press plate temperature of 325° F., show that when linseed oil, a 50:50 mixture of tung oil and linseed oil, or pure tung oil was used as the overlay adhesive, the "out-of-press" bond was poor. The break tear test showed a total peel in almost every instance. With linseed oil containing 10% BF₃-ether complex, the break tear test showed excellent results, the extent of peel never exceeding ¼ inch. The results were equally good with dehydrated castor oil (DCO) containing 5% BF₃-ether. The post-bake boil test peel values for the "linseed plus 10% BF₃-ether" or "DCO plus 5% BF₃-ether" samples were consistently below 5%, which were significantly lower than the values obtained with uncatalyzed oils (Experiments 1-12). The wax pick test, in general, yielded values as high as 26 for both catalyzed and uncatalyzed oils. As values exceeding 18 are generally considered satisfactory for woodgrain hardboards, the results were considered excellent. The "washability" test also showed excellent results (i.e. board surface was unmarred) in every instance both with and without the catalyst. Thus catalysis by BF₃ was shown to have no ill effects on the surface toughness of woodgrain boards, as measured by the "wax pick" or the "washability" tests.

Experiment 13 needs a special comment. In this instance, the amount of catalyst used was 5% and the oil was linseed. It will be noticed that, in this experiment, the out-of-press break tear showed a peel length between 2-3 inches and a post-bake boil test peel value in the range 15-40%. While the "break tear" was much superior to uncatalyzed oil boards, the "boil test" values were not improved. This brought out the fact that when the press plate temperature is kept low (325° F. instead of the usual 350° F.), the catalyst concentration should be maintained at a level higher than 5% in order to obtain the best results.

The data in Table II (which refer to boards pressed at 350° F.) amply confirm the data presented in Table I. In the instances where oils with no catalysts were used (Experiments 1-7), the out-of-press "break tear tests" showed a uniform rating of "very poor" (total peel). The "boil test" values were, in general, in the range 10-20%, with occasional lower and higher values.

Experiments 8 to 12 list the results obtained with linseed oil plus 5% BF₃-ether. The out-of-press "break tear" values were either "very good" (length of peel less than 2 inches) or "excellent" (length of peel less than ½ inch). The "boil test" values were consistently below 5%.

Experiments 13 to 20 show the results of increasing the catalyst concentration to 10%, still using linseed oil. The "break tear" was uniformly excellent and "boil" values were below 5% in all instances.

Experiments 21 to 26 show the results of using BF₃-phenol complex as the catalyst rather than the ether complex. These experiments showed that the phenol complex was also an effective catalyst for the promotion of bonding characteristics in linseed oil.

Experiments 27 to 29 used soya oil which is a semi-drying oil having rather poor air-drying characteristics. The catalyst used was BF₃-ether in 10% concentration. The results showed that the "break tear" was almost as good as that obtained with linseed plus 10% BF₃-ether. The "boil test" peel value hovered around 10-20%, a range similar to that obtained with mixtures of tung and linseed.

Experiments 30 to 33 were conducted using an emulsion of linseed oil and water in equal proportions. The "break tear" was significantly better than that usually obtained with pure linseed, but much poorer than that obtained with BF₃-catalyzed linseed. The "boil test" values were, however, of the same order of magnitude as that obtained with mixtures of tung and linseed.

Experiments 34 to 39 were performed with Unitol BX (a refined grade of tall oil, manufactured by The Union

Bag-Camp Paper Corporation, New York, U.S.A.), both singly and mixed with linseed oil in equal proportions. When catalyzed with 10% BF₃-ether, Unitol BX showed excellent "break tear" values, but the "boil test" values were rather high (25-50%). However, this defect was remedied by using a 50:50 mixture of Unitol BX and linseed oil, catalyzed by 10% BF₃-ether.

Experiments 40, 41 and 42 were the experiments with sulphur-polymerized linseed oil, and the results obtained were very poor both in respect of "out-of-press break tear" and the post-bake "boil test." Both tests showed total peel. These experiments proved conclusively that polymerization by sulphur was no value in improving the bonding characteristics of drying oils, so far as the paper overlay hardboard process was concerned. As a matter of fact, polymerization with sulphur yielded post-bake bond strength values much inferior to those obtained with oils used without any polymerization aids.

Experiments 43 to 47 show the bonding characteristics of maleinized oils. Experiment 43 used a maleinized linseed oil which was prepared in the laboratory and had a maleic anhydride content of 10%. "Zymol" and "Varsoy" are commercially prepared (sold by Archer Daniels (Midland), Canada Ltd.) maleinized linseed and maleinized soya oils. The viscosity of the maleinized oils were so high that they could not be sprayed but had to be brushed on the overlay. In Experiments 46 and 47, a thinning hydrocarbon solvent was used to obtain spraying consistency. As the results show, maleinization of the oils do not improve their overlay bonding capacity.

Experiments 51 to 55 used bodied linseed as the bonding oil. The oil used in experiment 51 was prepared by heating linseed oil for 12 hours at 250° C. Experiments 52 to 55 used commercially bodied linseed oils. The high viscosity of these oils made direct spraying impossible and they had to be brushed on. In experiment 55, the bodied oil was thinned with a hydrocarbon solvent and then sprayed. The results indicate that "boding" in the conventional sense does not improve overlay bonding characteristics of the oils. (The "boil" figures were actually higher with "bodied" oils than with plain oils.)

Experiment 56 perhaps needs special mention. SO₂ is considered to be an excellent "boding" catalyst for non-conjugated drying oils (such as linseed) as it is thought to introduce conjugated unsaturation in such oils via a process of isomerization. In experiment 56, linseed oil saturated with SO₂ gas was used as the bonding oil. Once again, the data show that no improvement in bonding over plain linseed was obtained.

Experiments 57 to 60 show that the inclusion of the usual metallic driers in the oil, does not improve the bond. In these experiments Nuodex driers were used in the recommended amounts.

The use of other Friedel-Crafts type catalysts, and in particular aluminum trichloride and stannic tetrachloride is shown in experiments 61 and 62. The result how that a significant improvement in bond strength was achieved. However, the overlays were badly discoloured and the "post-bake washability" was found to have been impaired. It therefore follows that these alternative catalysts can be used where such defects are acceptable.

The results in Tables I, II and III show that in respect to the out-of-press bond, the overlays made with oils catalyzed with boron trifluoride showed bond strengths belonging to a different order of magnitude from that obtained with uncatalyzed oils. In addition, an improvement in water resistance was obtained.

The last three experiments in Table III show that BF₃ can induce bonding characteristics in drying oils in atmospheres which are essentially non-oxidative, in sharp contrast to oils with no catalyst present. This agrees well with the fact that the BF₃-catalyzed oils develop a fairly strong bond in the press (where little or no atmospheric oxygen is present), whereas uncatalyzed oils do not.

The catalyzed oils containing the boron trifluoride complexes were found to have the property of instantaneous gelation at a temperature of approximately 300° F. and it is believed that in the press, when the temperature rises to a point substantially above this range, immediate gelation of the oil film on the board surface will occur.

I claim:

1. Artificial board comprising a hardboard base mat, a paper overlay on at least one surface of said hardboard base mat, said paper overlay being bonded to the base mat in part by the natural bonding constituents of the base mat, a polymerized drying oil impregnated in said paper overlay and the adjacent surface of the base mat providing an additional bond between the base mat and the paper overlay, and a boron trifluoride catalyst incorporated in said drying oil in the amount of about two to ten percent by weight of the drying oil; said drying oil being selected from the group consisting of linseed oil, tung oil, and dehydrated castor oil.

2. A process for making an artificial board comprising forming a partially dewatered base mat of wood fibres, said wood fibres being adhered together in the artificial board at least partially by the natural bonding constituents of the base mat, applying a layer of drying oil containing a boron trifluoride catalyst to coat the surface of an overlay sheet of paper, applying the overlay sheet of paper to a surface of the base mat with the coated surface of the paper facing said surface of the base mat, pressing the mat and overlay sheet of paper at a tem-

perature in excess of about 300° F. to provide a hardboard with the paper overlay sheet consolidated with its surface, and baking the sheet of hardboard; said boron trifluoride catalyst being present in the amount of about two to ten percent by weight of the drying oil, and said drying oil being selected from the group consisting of linseed oil, tung oil, and dehydrated castor oil.

3. A process as defined in claim 2, in which the mat and overlay sheet of paper are pressed at a temperature within the range 325° F.-385° F.

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