June 15, 1943. R. G. QUINN 2,321,939

PROCESS FOR COATING FIBROUS SHEETS

Filed July 3, 1940

Fig. I.

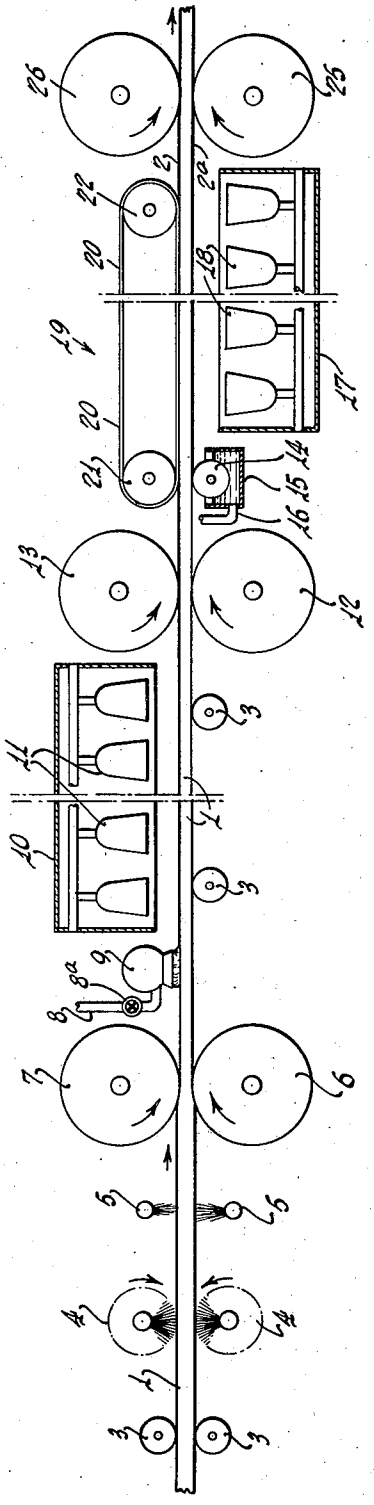


Fig. III.

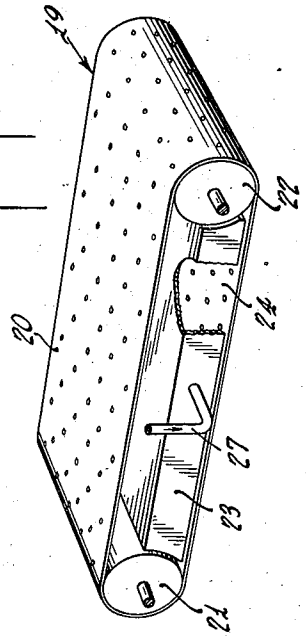
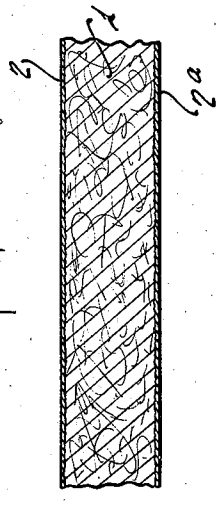


Fig. II.



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PROCESS FOR COATING FIBROUS SHEETS

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Application July 3, 1940, Serial No. 343,716

3 Claims. (Cl. 117—66)

The invention relates to a method of coating a fibrous sheet, such as a board or web.

In the manufacture of sheet products, and especially such products as fibre board, it is desirable to coat the product on both surfaces. Hitherto it has been difficult to coat the under surface of the board or web and still maintain the required efficiency of the operation. This has been due primarily to an inability to support the sheet while the coating of the under side is being dried and hardened.

The invention now provides a method of coating the under surface of a sheet in a continuous operation. This is done by means of a suction conveyor which supports the board or web from the upper side while the coating of the under surface is being solidified.

An object of the invention is to provide an improved method of coating a sheet on both surfaces.

A more specific object of the invention is to provide a method of coating a board or web on the under surface and solidifying such coating while supporting the sheet by a suction conveyor.

Other objects and advantages will appear from the following description and drawing appended thereto.

In the drawing, which illustrates an embodiment of the invention and wherein like reference characters designate like parts:

Fig. I is a diagrammatic side elevation view of an apparatus for carrying out the process of the invention;

Fig. II is an enlarged fragmentary sectional view of a product coated in accordance with the invention;

Fig. III is a perspective view of one type of suction means that may be used in the process of the invention.

The process, in detail, is carried out by forming a fibrous web 1 in any conventional manner, as by felting cellulosic fibres on a sheet forming machine from the usual pulp slurry. The fibres are preferably wood fibres, although any suitable vegetable or mineral fibre may be used.

After the fibres are felted into a web of usual thickness, the web is pressed, rolled, and dried into finished uncoated fibrous sheet. Referring now to Fig. I, in the preferred embodiment of this invention the uncoated fibrous sheet 1 is conveyed from the forming operations by conveyor rolls 3. The sheet 1 may be passed between one or more pairs of revolving brushes 4, which are preferably turning in a direction opposite to the movement of the sheet, so that the dust and loose fibres are removed.

The sheet may then be passed between moisteners 5 which apply a small amount of water to both surfaces of the board. The board, slightly moistened, passes between one or more pairs of hot ironing rolls 6 and 7 which smooth the surfaces as they are dried. These rolls aid in presealing the surfaces prior to coating.

The sheet is now ready for the coating which is applied by any of the usual means, such as sprays, applicator rolls, brushes and the like. Preferably, the coating is applied to the upper surface of the sheet by coating sprayer 9, which is fed by pipe 8. The sprayer may be adjusted by the valve 8a to the speed of the conveyor means so that the desired thickness of coating is obtained. The coating is deposited on the sheet 1 evenly to form the coating 2 (see Fig. II). The smooth and somewhat densified upper surface of the sheet absorbs the coating slowly and to a sufficient extent to bond the coating to the fibrous sheet.

The sheet 1 with the coating 2 on the upper surface is now conveyed under the drier 10. The drier may be of any conventional type although preferably it comprises a plurality of infra-red ray lamps 11 which are located adjacent to and directly above board 1. By way of example, there may be 24 banks of lamps, 6 lamps to the bank, with approximately 75% of them in use when the sheet 1 is moving at the rate of 30 lineal feet per minute.

While it is preferred that the coating be only partially dried or solidified by the infra-red or near infra-red rays, yet the process may be modified so that the coating is substantially dried or solidified when it leaves the drier. Substantial solidification is used to denote the degree of dryness or solidification of the coating which permits handling of the sheet without injury to the coating.

In the preferred operation of the process the coating is dried or solidified by the drier only to a plastic state and the coated sheet then passed between ironing rolls 12 and 13, which are heated in any conventional manner. Roll 13 further dries the coating and, at the same time, smooths and hardens it. The degree of plasticity to which the coating is dried or solidified in the drier 10 is that which will permit the coating to be smoothed and densified without being doctored off by the heated press rolls 12 and 13. Such a

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plasticity is attained by drying the above-mentioned coating to approximately 60% dryness.

Sheet 1 is now passed over coating applicator roll 14 which rotates in reservoir 15. While any conventional means may be used, it is preferred that the coating be applied by an applicator roll which serves as a support to the sheet immediately prior to the drying of the under coating. Reservoir 15 is kept to the proper level by conventional controlling devices, the coating material being supplied to the reservoir by feed pipe 16.

Sheet 1 is conveyed over drier 17 which comprises a plurality of infra-red ray lamps 18, as in the preferred embodiment of drier 10. While passing over drier 17, the board or web 1 is supported by means of suction means 19. In this way the sheet is supported until the coating 2*a* of the under side is sufficiently solidified so that it may be passed between rolls 25 and 26. Coating 2*a* of the under surface may be dried or solidified to the same degree as coating 2. It is preferred that coating 2*a* be only partially solidified by drier 17 and then hardened and smoothed by heated roll 25. Such partial solidification may comprise drying the coating to a plastic state as attained by 60% dryness. However, the coating may be substantially solidified by drier 17 so that further hardening by rolls 25 and 26 are unnecessary should the use of such rolls not be desired.

Sheet 1 is now passed between press rolls 25 and 26, roll 25 being heated so that it may further densify and smooth coating 2*a* where such coating has been only partially solidified by drier 17.

Suction means 19 may be of any construction which will engage the upper surface of sheet 1 and support the sheet by suction while the latter is traveling over drier 17.

By way of example, suction means 19, as shown in Fig. III, may comprise an endless perforated rubber belt 20 which runs over carrier rolls 21 and 22. Preferably, the belt has a suction box 23, positioned between rolls 21 and 22 and over portion 24 of the belt adjacent the upper surface of sheet 1. In this way portion 24 of belt 20 will hold the sheet by means of a suction created in suction box 23, the suction being maintained by the exhaustion of air in box 23 through exhaust pipe 27.

By supporting the board by the upper surface, the coating 2*a* of the under surface is solidified by drier 17 without contact with conveyor rolls or other means of support on the under surface. While any conventional type drier may be used with the suction means 19, it is preferred that a drier of infra-red or near infra-red ray type be used inasmuch as the latter type, by drying the coating faster, permits the suction means 19 to be smaller.

The coating material may be any type paint suitable for a fibrous product coated in the above manner, and which would be dried in the conventional drier. However, certain coatings have been found to be advantageous for fibre board and the like. Preferably, the coating is a water vehicle paint comprising a binder, filler, extender, pigment, plasticizer and water. The binder is preferably urea formaldehyde used either alone or with an alpha protein. The pigment is any one or more of the usual types, such as cadmium sulphide, iron oxides, and the like. The extender may comprise lithopone, talc or diatomaceous earth. The filler is preferably clay. The plasticizer may be China-wood oil, urea or the like.

A coating that has been used effectively is as follows:

	Lbs.
Alpha protein	200
Paraformaldehyde	12
Urea	5
Caustic soda	10
China-wood oil	12
Lithopone	450
Clay	450
Water	2000

Due to the peculiar action of infra-red rays in setting up and hardening certain resins, it is advantageous to include such resins in the coating. When, for example, urea and paraformaldehyde are present in the coating they will be set up by the infra-red rays. Thus, the infra-red rays will have the added function of setting up resins in the coating sensitive to such rays while, at the same time, drying the coating in the conventional sense.

It should be understood that the coatings contemplated in this process are those which are most economical and effective for use on fibrous products. It will be understood that certain changes may be made with respect to one or more of such factors as the speed of the board, the amount of heat applied to the board prior to the coating, the type and amount of coating applied, the number and intensity of the infra-red ray lamps, the distance of the lamps from the board, the length of the drier, and the like, if corresponding changes are made with respect to the remaining factors.

The drying of both coated surfaces of the board at the same time is believed to be assisted by the penetrating characteristics of the infra-red rays, thus making the drying operation more efficient than if the surfaces were dried in separate operations. To facilitate the drying of the coating of the under surface of the board, heated rolls may be placed on either or both sides of rolls 6 and 7 so as to contact the lower surface of the board. In this way, the coating of the under surface dries more quickly and permits the length of the lower infra-red ray drier to be shortened so that the board need not be unsupported for the distance otherwise necessary.

The invention may be used for coating and drying various fibrous sheets, the sheet being preferably in the form of a continuous web, although obviously a succession of separate sheets could be treated. However, best results are obtained when using a fibrous sheet of the nature of fibre board where the thickness of the sheet aids the sheet to sustain itself when passing over the lower drier.

While the preferred embodiment of the invention specifically states the use of infra-red rays, it should be understood that heat rays having a position on the spectrum adjacent to that of infra-red rays may be used.

It should be noted that the initial operations, such as brushing the sheet, moistening both surfaces of the sheet, and presealing the surface by heated press rolls, aid in preparing the surfaces for the coating. The water, applied by moisteners 5, causes rolls 6 and 7 to have a better presealing effect and regulates to some degree the depth to which the coatings are absorbed by the sheet.

The details herein set forth are only for purposes of illustration and the invention is to be limited only by the scope of the appended claims.

I claim:

1. A process for coating rigid fiberboard comprising, supporting the under surface of said board at spaced points while continuously advancing the board therebetween, applying a coating comprising an aqueous dispersion of a thermo-setting resin to the under surface of the board and drying and hardening said coating while the board is advancing from one supporting point to another by heating said under surface, and preventing said board from sagging during the coating and heat-curing treatment by application of suction to the upper surface of said board.

2. A process for coating rigid fiberboard comprising, continuously advancing the fiberboard in a horizontal path over a supporting element and immediately applying to the under surface of the board a coating containing as its bonding agent resins that are sensitive to and polymerizable by infra-red rays, rapidly drying and hardening said coating in an interval of space in which said under surface is out of contact with any supporting element by subjecting the under surface to the heating and curing action of infra red radiation emitted from a source that is spaced from but adjacent to said coated surface, and preventing the board from sagging during the coating and heat curing treatment by application of suction to the upper surface of said board.

3. A process for coating rigid fiberboard comprising, supporting the under surface of said board at spaced points while continuously advancing the board therebetween, applying a coating comprising an aqueous paint dispersion containing urea-formaldhyde resin and a protein to the under surface of the board adjacent the first of said supporting points, drying and hardening said coating while the board is advancing from one supporting point to another by the action of infra-red radiation emitted from a source adjacent to and in spaced relationship with said under surface, and preventing said board from sagging during the coating and heat-curing treatment by application of suction to the upper surface of said board.

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