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MANUFACTURE OF CORRUGATED PAPER-
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corporation of DelawareNo Drawing. Application December 5, 1941,
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This invention relates to the manufacture of corrugated paperboard and similar materials, and it is directed particularly to an improved silicate adhesive composition which is adapted to use to unite together the plies from which such structures are fabricated.

One of the steps in a typical paper laminating operation involves the pressing of the sheet after the adhesive has been applied and the plies have been arranged in laminated relationship. In the usual case, as in the manufacture of corrugated paperboard, this operation is conducted by passing the advancing web over a series of heated platens and pressing the web against the platen by means of one or usually a plurality of rollers. In this operation the laminations are united and the heat dries the adhesive. As a practical matter the pressure rollers contact a continuously traveling belt which in turn engages the upper face of the laminated web while the lower face is moving across the platen surfaces.

In the manufacture of corrugated paperboard and similar substances the adhesive is applied profusely in order to insure that the peaks of the corrugations may be stuck properly to the facing sheets. But the difficulty is that as the web passes between the platen and the presser units some of this adhesive oozes from the edges of the web and drips onto the hot platen surface. After a period of time these accumulated drippings build up into mounds or ridges along the edges of the sheet and these accumulations, under the relatively intensive heat of the platen, dry to a hard and almost rock-like condition.

From time to time it is necessary to stop the machine in order to permit an operator to remove these hardened drippings because after a while they accumulate to such a degree that the edges of the sheet of the web are torn and the marginal portions scuffed. Still more important, the platen must also be cleaned whenever the machine is readjusted to manufacture a strip of greater width because otherwise the surface of the sheet of the paperboard is likely to be scratched so badly as to render it imperfect.

In a typical boxboard plant this operation of cleaning the platen is a considerable nuisance. The worst of the drippings are chipped off by hand and it is then necessary to scrape and polish the metal surface to restore it to its original condition. The chief difficulty resides in the fact that the silicate sticks to the platen very firmly and the cleaning operation is therefore very slow and tedious—much like the job of scraping paint off of sheet metal. Moreover, in many mills

which make different widths of stock on order, it is not unusual for the corrugating machine to be adjusted two or three times a day and each time it is necessary to clean the platen lest scratches mar the surface or the edges of the web. This procedure is routine even though each time the machine is readjusted a web of smaller width is made. Since the strength of the paperboard is of paramount importance the difficulty cannot be avoided by using lesser quantities of adhesive.

To lessen the nuisance and the time wasted in these cleaning operations, the principal object of the present invention has been to provide silicate adhesive compositions which adhere less firmly to the hot platen of a corrugating machine but which are unimpaired, as to adhesive value, in respect to the plies of paper which are bounded together.

Briefly, I have discovered that this result may be obtained in a simple and inexpensive manner by incorporating in a conventional liquid silicate adhesive a small amount of a so-called foaming agent which, when heated to the temperature at which a platen normally is operated, causes the silicate to dry in the form of a friable, porous mass instead of in the form of the usual hard, solid, rock-like structure. I have also discovered that the introduction of such an agent into the silicate composition does not in any manner impair the adhesive qualities of the silicate with respect to the paper stock, especially when the temperature at which the foaming agent decomposes is somewhat higher than the temperature attained by the paper stock in passing over the platen of the facing machine but lower than the platen temperature. At the high temperature at the platen surface the silicate dries to a porous and friable condition and is easily removed by one or two passes of a suitable scraping tool. The foaming agent thus is enabled to reduce any drippings caught upon the platen to a friable condition by which they may be easily detached therefrom, but is innocuous with respect to the properties of that adhesive uniting together the plies of paper. In the preferred practice, the material introduced into the adhesive silicate in accordance with the present invention is a substance having the property of either decomposing or liberating a gas in the silicate at a temperature of from 250° to 350° F., the temperature at which a platen or a paperboard machine usually is operated.

There is a wide variety of substances of this general type. Usually they are organic in nature, typical materials being ammonium laurate,

triethanolamine, potassium cocoanut oil soap, or aromatic monosodium sulphonate derived from petroleum oil, alkyl aryl sulphonates or alkali metal salts thereof. It is not usually desirable or necessary to add more than approximately 1% of the agent selected for the purpose so as to avoid interfering with the bonding properties of the adhesive; a typical mixture well suited for the purpose comprises only about .04% of foaming agent. It is also undesirable to employ an agent which decomposes or liberates gas at a temperature substantially below the temperature attained by the paper in passing the platen, otherwise the silicate adhesive in the web may reach a porous condition thus impairing its glue strength.

The term "silicate" as used throughout this specification designates the compositions conventionally used as silicate adhesives, that is, aqueous solutions of silicates in which the molecular ratio of Na_2O to SiO_2 lies within the range of approximately 1:2.5 to 1:4.0.

The term "foaming agent" as used throughout this specification is intended to designate a material which is capable of producing a condition of friability in globules or masses of liquid silicate which are dried at high temperature either by a leavening action, by decomposition, or otherwise, and does not necessarily connote a sudsing action.

In preparing the compositions the agent is introduced and mixed with the silicate in the desired percentage as previously indicated. The material is then ready for use as an adhesive. It is also to be observed that the foaming agent should be a material which does not react with the silicate and also preferably should be a material miscible therewith.

When drippings of silicate have accumulated on the drying platen of a corrugating machine they may be removed in but a fraction of the time required to effect all silicates which do not have the friability which is characteristic of dried masses of silicate produced when the materials of the present invention have been subjected to the platen temperature.

Having described my invention, I claim:

- 10 1. A silicate composition adapted to be used in the manufacture of corrugated paperboard and the like, which composition comprises a liquid adhesive silicate having incorporated therein a small percentage of aromatic mono sodium sulphonate derived from petroleum oil which is capable when heated to a relatively high temperature of causing the silicate mass to dry in the form of a friable, porous condition, but which composition is capable of drying at room temperature to a film of unimpaired adhesive strength.
- 20 2. In the art of producing corrugated paperboard on a machine having heated platens the improvement which consists in employing an adhesive for uniting facing layers to the corrugated paper layer, which adhesive is a silicate composition having incorporated therein a small percentage of aromatic mono sodium sulphonate derived from petroleum oil as an organic foaming agent which is not decomposed by heat at a temperature lower than the temperature at which the platens are operated but which is decomposed at a temperature corresponding to the platen temperature to liberate a gas and thereby render the adhesive which drips upon the platens porous and friable when it is dried, whereby the adhesive drippings may be easily removed from the platens.

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