PLAINTIFF'S EXHIBIT USM-174

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Report No. 595

Date December 20, 1949

REPORT TO THE DIRECTOR OF RESEARCH FROM Acoustical LABORATORY

SUBJECT: Supplementary Inorganic Binders for Thermacoustic

REQUESTED BY: F. L. Marsh

WHAT IS WANTED: Binder for Thermacoustic that will retain its bonding properties at high temperatures.

WHY WANTED: To prevent bond failure of Thermacoustic during a fire.

REPORT: CONCLUSIONS

1. Thermacoustic when fired at 2000°F loses all bonding properties except that contributed by the felting action of the fibers.
2. Bond by felting action alone is poor.
3. The addition of sodium silicate to Thermacoustic results in good bonding, even after being exposed to temperatures up to 2000°F.
4. Sodium silicate tends to make the product more brittle.
5. Portland cement slightly aids bonding of Thermacoustic to a metal surface after firing.
6. Limpet and Spray-Kote both exhibit fair bonding after being exposed to high temperatures
7. The effect high humidities have on a sample of Thermacoustic containing sodium silicate is presently being studied.

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RECOMMENDATIONS

It is recommended that sodium silicate should be added as an additional binder to Thermacoustic when another fire test is run, since the sole organic binder presently being used will burn out at the higher temperatures.

DISCUSSION

Procedure

The following samples of Thermacoustic were sprayed on sheet metal plates 4" x 4" in order to study the characteristics of the bonding agents at high temperatures.

1. Thermacoustic blank.
2. Thermacoustic containing 3% Bentonite Clay.
3. Thermacoustic containing 3% gray Portland Cement.
4. Thermacoustic containing sodium silicate type N.*
5. Limpet.
6. Spray-Kote (Sprayed Insulation Co., Newark, N. J.)

* 5% solution in the spraying water.

When dry each sample is placed against the mouth of the laboratory Burrell Furnace and fired according to the standard time-temperature curve.

Time-Temperature Curve (ASTM, E-119-41)

Time	Temperature °F
5 min.	1000
10 min.	1300
30 min.	1550
1 hr.	1700
2 hrs.	1850
4 hrs.	2000

After each test, the samples were checked for -

1. Surface.
2. Bond within material.
3. Bond to metal.

Results

Each sample after firing had a crusty surface that crushed into a powder. This crust was due to sintering and fusion at the higher temperatures. Below the surface the material retained most of its fiberous characteristics, while at the metal surface all of the characteristics were retained.

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Both the Thermacoustic blank and the Bentonite sample were very easily dislodged at the metal surface, and within the fibers. Actually its bond was due only to the fiber felting action, since the organic binder had burned out.

The Portland Cement sample displayed a better metal bond, but the inter-fiber bond was no better than that stated above.

The addition of sodium silicate resulted in a good bond for both the fibers, and at the metal surface.

Both Limpet and Spray-Kote were rated fair for bond of fibers and to metal.

The use of sodium silicate made the product slightly more brittle, consequently the surface is harder and the product breaks more easily. The advantage, however, of sustained bonding at higher temperatures seem to over ride the disadvantages of increased brittleness.

A sample of Thermacoustic containing sodium silicate is presently in the humidity cabinet in order to study the effects that high humidity has on this product.

F. M. Stumpf

F. M. Stumpf
Research Department

FMS/mm

W. L. Chrisler

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Data

Material	Surface	Bond Within Fibers	Board To Metal
Thermoacoustic blank	Crusty	Poor	Poor
Thermoacoustic containing 5% Bentonite Clay	Crusty	Poor	Poor
Thermoacoustic containing 3% Gray Portland Cement	Crusty	Poor	Fair
Thermoacoustic containing sodium silicate	Crusty	Good	Good
Limpet	Crusty	Fair	Fair
Spray-Kote	Crusty	Fair	Fair

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