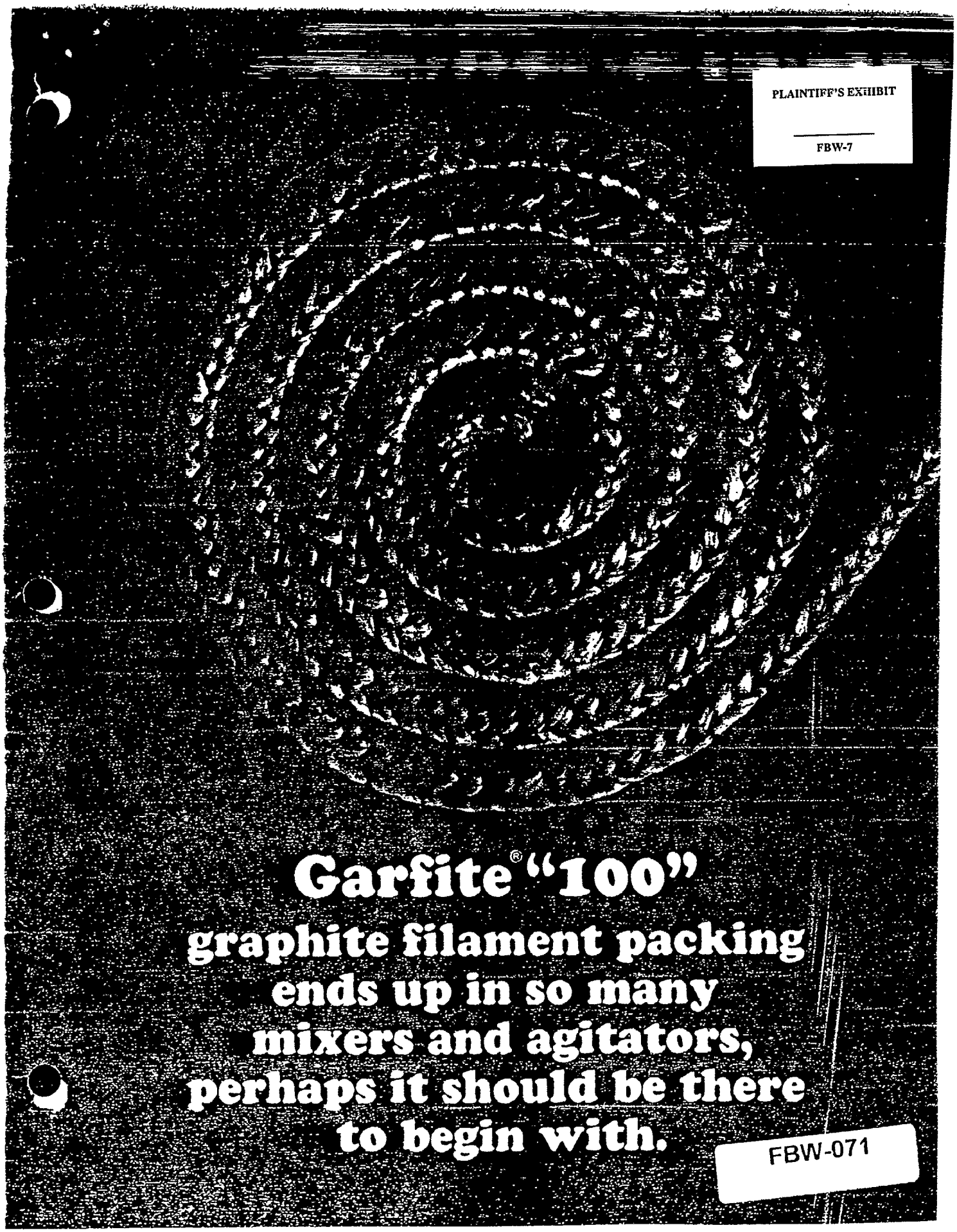

PLAINTIFF'S EXHIBIT
FBW-7
Garfite® "100"
graphite filament packing
ends up in so many
mixers and agitators,
perhaps it should be there
to begin with.
FBW-071

Technical report

GARFITE "100" graphite filament packing* contains graphite yarns which are 99% pure.

Inherent Lubricity

GARFITE "100" packing has the natural lubricity of graphite, which gives it exceptional dry run capabilities. Unlike other packings, no grease or oil is added as a lubricant. These are easily and usually squeezed or leached out in service, causing constant reduction in volume, leakage, and eventual dry-out. With GARFITE "100," the basic packing material is the lubricant.

Low Coefficient of Expansion

The coefficient of expansion of GARFITE "100" packing is compatible with that of ferrous metals. Therefore, fewer gland adjustments are required. This temperature stability is particularly advantageous where fluctuating temperatures occur.

High Heat Conductivity

The thermal conductivity of GARFITE "100" is greater than that of other conventional soft packings. This means that heat generated at the shaft is rapidly transferred away to the housing, where it is dissipated.

Chemical Compatibility

GARFITE "100" packing is inert to most chemicals. Principal exceptions are strong oxidizing agents, dichromates, fuming nitric acid, and hot fuming sulphuric acid. It remains stable in the atmosphere to 650° F. and in steam to 1200° F.

Construction

GARFITE "100" packing contains graphite yarns which are 99% pure. The material can be worn away, but a new and identical sealing surface is presented. The wear characteristics can be compared to the brushes in an electric motor and carbon or graphite bushings; that is, a slow rate of wear but no degradation of the GARFITE "100" or its natural lubricity. GARFITE "100" packing is available in both cut rings and spools. Popular sizes from ⅛" to 1" are available from shelf stock. Special OEM dimensions on inquiry.

Benefits

The results obtained with GARFITE "100" are: greatly extended packing life, lower maintenance costs, less downtime, lower leakage rates (therefore, reduced product loss), less shaft and bearing wear, lower operating temperature, fewer gland adjustments, and greater reliability.

Consider that last item especially as you review the following. Consider what GARFITE "100" packing might mean to the reliability and salability of your units.



FBW-072

*U.S. Patent No. 3400095

Performance report

These are but a few of the many outstanding experiences that industry has reported since GARFITE "100" packing has been in use.

Nitrogen

In the production of polyether, a mixer is used with a 3½" shaft, at 84 rpm, 120°C., and 35 psi. Packing is 7 rings of ⅝". Nitrogen blanket is used to prevent any leakage of the flammable polyether. Conventional packing had to be adjusted every few days and changed every 2 or 3 weeks, despite regular pressure gun lubrication. Even with this attention, there was constant loss of nitrogen. The loss was enough so that the pressure of the blanket dropped an unsatisfactory amount during the five-day batch period.

GARFITE "100" graphite filament packing was installed. After a full month, without any external lubrication, *there was no detectable loss on the pressure gauge.* A second mixer, with 5" shaft running at 125 rpm, has also been converted to GARFITE "100" packing. It, too, has been sealed successfully.

Ammonia and Steam

Working in ammonia and steam, a top-entering mixer's 2½" shaft runs 100 rpm at 375°F., with vessel pressure of 425-450 psi. The sleeve takes seven rings of ½" packing. Conventional packing required an external lubrication system in which a nitrogen bottle pressurized a water bottle feeding the lantern ring. Since nitrogen pressure was controlled by a hand valve, the system was subject to error. Conventional packing had to be changed every month, and the 316 SS sleeve every two months.

The lubrication system was disconnected and GARFITE "100" packing installed. No leakage is permitted. When the GARFITE "100" packing was inspected *after two months, it showed no sign of deterioration, so the same set was reinstalled,* with no change in packing performance. And after nine months, the original set was still working fine.

Not only was there no wear on the shaft, but it appeared to have been *polished* by the packing. Five other mixers have since been upgraded with GARFITE "100."

H_2SO_4-NO-H_2 Mixture

A 20% H_2SO_4-NO-H_2 gas mixture is sealed in a mixer with a 6" shaft running 180 rpm at 200°F. 15/16" coil packing is used. The mixer runs continuously, 7 days a week. Conventional packing lasted 3 months, with several adjustments.

The problem area was the frictional heat caused by overtightening the packing to seal a gas. But not with GARFITE "100" packing. *It has been in service for 6 months,* and without additional adjustments.

Odor Additive

A distinctive odor additive, used to make natural gas leaks detectable, is processed in a mixer with a 1¼" shaft running 600 rpm (200 sfpm) at 250°F. Packing is 6 rings of ⅜". Product cannot be contaminated by packing lubricant. No leakage from mixer can be tolerated due to the strong odor of the product.TFE filament packing had to be changed with every batch of product. GARFITE "100" *packing has been in service for over 2 months.* No contamination, no odor.

Hydrogenation

Batch operations in a hydrogenation process include a 2" shaft mixer combining hydrogen, methanol, and toluene vapors at 2000 psi, 465°F., and 280 rpm. Unit has water-cooled stuffing boxes, and was equipped with two lantern glands for shaft lubrication. Conventional packing was lasting from a few days to a few weeks, at best.

One set of packing, made up of two Garlock No. 633 rings with a center ring of GARFITE "100," was installed in the bottom of the box. One 1⅜" lantern ring was installed for oil lubrication, followed by another set of two No. 633 rings and eight GARFITE "100" rings. GARFITE "100" *packing sets have already served over nine months, and are still in use.*

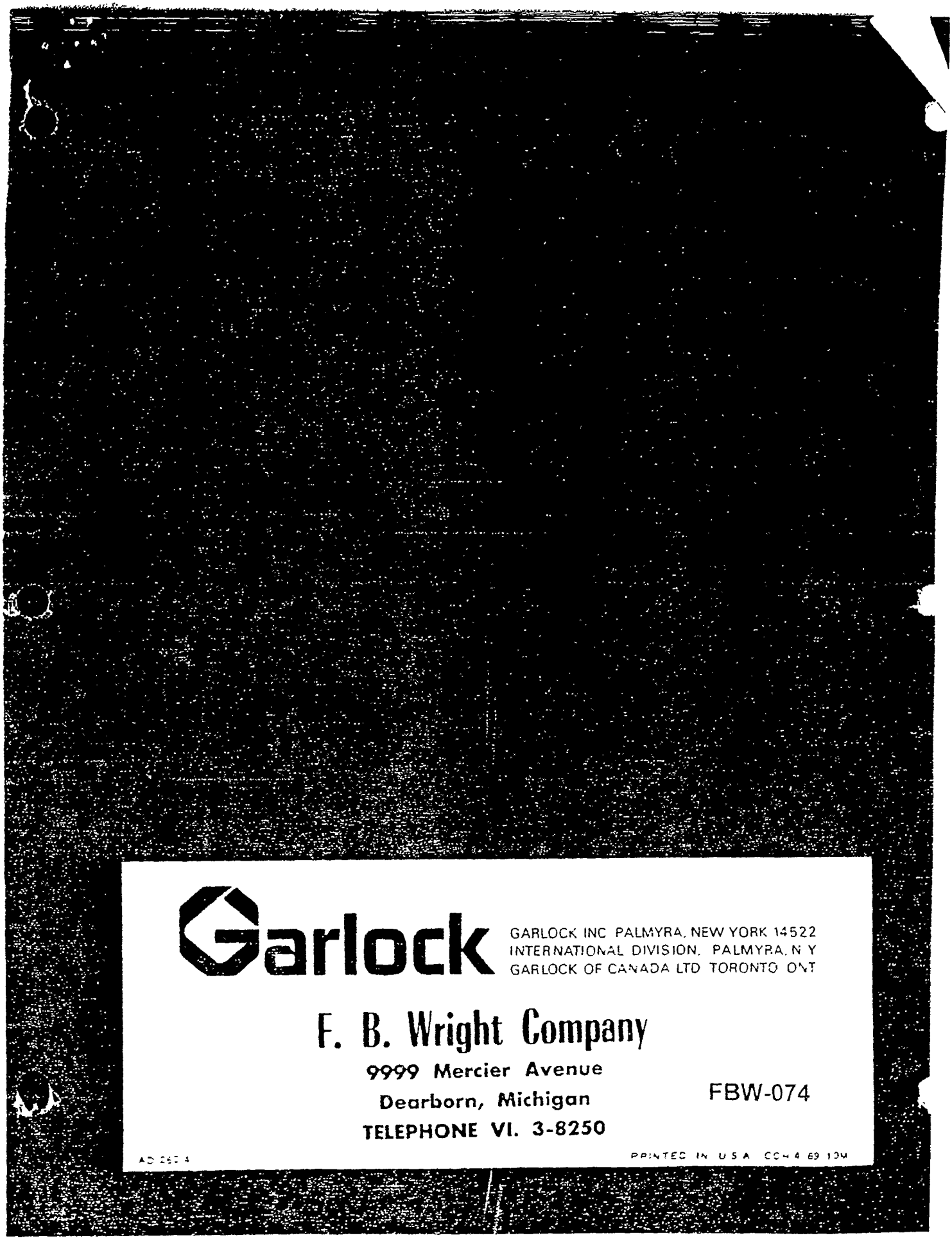
Maleic Anhydride and Steam

Maleic anhydride and steam are mixed at 80 rpm on a mixer with 316 SS shafts 4¾" in diameter. Operating temperature is 375°F. Mixer pressure is 50 psi. In the stuffing boxes, conventional packing failed after only 10 days. GARFITE "100" packing was installed in July; still running without leakage, in October.

GARFITE "100" graphite filament packing ends up in so many mixers and agitators, perhaps it should be there *to begin with.* For further details on the potential applications in your original equipment, contact your Garlock representative or write to: Garlock Inc., 410 Main Street, Palmyra, N. Y. 14522.

FBW-073

Garlock INC.



Garlock

GARLOCK INC PALMYRA, NEW YORK 14522
INTERNATIONAL DIVISION, PALMYRA, N Y
GARLOCK OF CANADA LTD TORONTO ONT

F. B. Wright Company

9999 Mercier Avenue
Dearborn, Michigan
TELEPHONE VI. 3-8250

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