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EVALUATION OF KLINCHER LOCKNUT  
IN HOSE COUPLING SUBJECTED TO FIRE AND VIBRATION

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## INTRODUCTION

During the conduct of tests on dash 16 hose assemblies with fixed end fittings, it was noticed that in nearly every test of more than two minutes duration the aluminum nut loosened from the steel simulated bulkhead fitting. On the first few occasions, it was assumed that the test operator neglected to tighten the nut properly. In subsequent tests, deliberate checks were made to ascertain that the nut was properly tightened. Loosening of the nut continued in many of the tests in which a dash 16 aluminum nut was involved. Because of this, the Klincher Locknut Corporation, Indianapolis, Indiana, developed a nut similar to their locknut to replace the presently used nut on reusable fixed-end fittings.

This report presents the results of a series of tests conducted to determine whether the loosening of a MIL-H-5511-16 hose assembly from a steel fire wall fitting in the event of fire and vibration can be prevented by the use of a Klincher locknut in place of the AN-818-16D nut commonly used on this type of assembly.

## EQUIPMENT AND PROCEDURE

The tests were conducted on a bench intended for subjecting hose assemblies and end fittings to fire and vibration while circulating oil under pressure. The assemblies were 24 inches long, mounted so as to form a 90-degree bend with one end fixed and the other end (the one subjected to fire) vibrated at 2000 cps through an arc which imparted 5/32-inch lateral and nine degrees torsional displacement. The oil flow through the dash 16 assemblies was 5 gpm at 200 degrees F and 35 psi. Figure 1 shows an assembly fitted with Klincher locknuts, installed, ready for test.

The flame was produced by a gun type conversion oil burner consuming approximately nine liters of kerosene per hour. The resulting flame was at a temperature of 2000 degrees F and approximately ten inches wide and six inches high. The burner was placed four inches from the assembly to be tested and the flame passed equally above and below and extended well beyond it. Figure 2 shows a test in progress.

Tests were conducted in much the same manner as those of standard MIL-H-5511-16 assemblies except that the portion of the hose and the coupling shell subjected to the fire were well wrapped with asbestos tape so that these portions of the assembly would withstand the fire for more than three minutes. Thus, only the nut and the steel fitting to which it was attached were subjected to the fire. This was done because the main purpose of these tests was to determine whether the Klincher locknut used in place of the AN-818 nut in the dash 16 size would become loosened by the

fire and vibration. Since the effectiveness of the Klincher locknut is dependent upon the face of the nut being forced against a mating surface, a backup nut was provided to accomplish this purpose. This backup nut is considered as part of the assembly.

## RESULTS AND DISCUSSION

Prior to conducting tests on the Klincher locknut, approximately 70 fire tests were conducted on dash 16 assemblies incorporating an AN-818-D nut. Many of these tests had a duration of 1/2 to one minute. Such tests were generally too short to result in loosening of the nut. Also there were many runs of durations from one to three minutes. Few of the runs were over three minutes in duration. Early in this test program the loosened nut was considered a nuisance, and since the purpose of the test was to determine the fire resistance of the hose and coupling rather than the nut, mention of the fact in the log book was not assured. In order to overcome this undesirable loosening of the nut in subsequent tests, it was generally over-torqued. Only when loosening of the over-torqued nuts persisted, even though the assemblies were subjected to fire without vibration, did this fact present itself as a reality. During this period of testing, 12 notations of loosening of the dash 16 nuts were made in the log book. Prior to conducting tests on the dash 16 Klincher locknut, a few tests were conducted on the AN-818-16D nut assembled on MIL-H-5511 hose and the results indicated that when properly torqued on a steel simulated fire wall fitting this nut would loosen consistently within one to three minutes under the above test conditions.

The tests conducted on assemblies incorporating the dash 16 Klincher locknut ranged from 5 to 15 minutes. Six tests were conducted and each test was concluded when failure of the hose or end fitting occurred. In no case did the Klincher locknut become loosened throughout the conduct of the tests.

## CONCLUSION

On the basis of the tests conducted, it is concluded that a MIL-H-5511-16 hose assembly incorporating a Klincher locknut in place of the AN-818-16D nut will not loosen from a steel fire wall fitting in the event of fire and vibration.

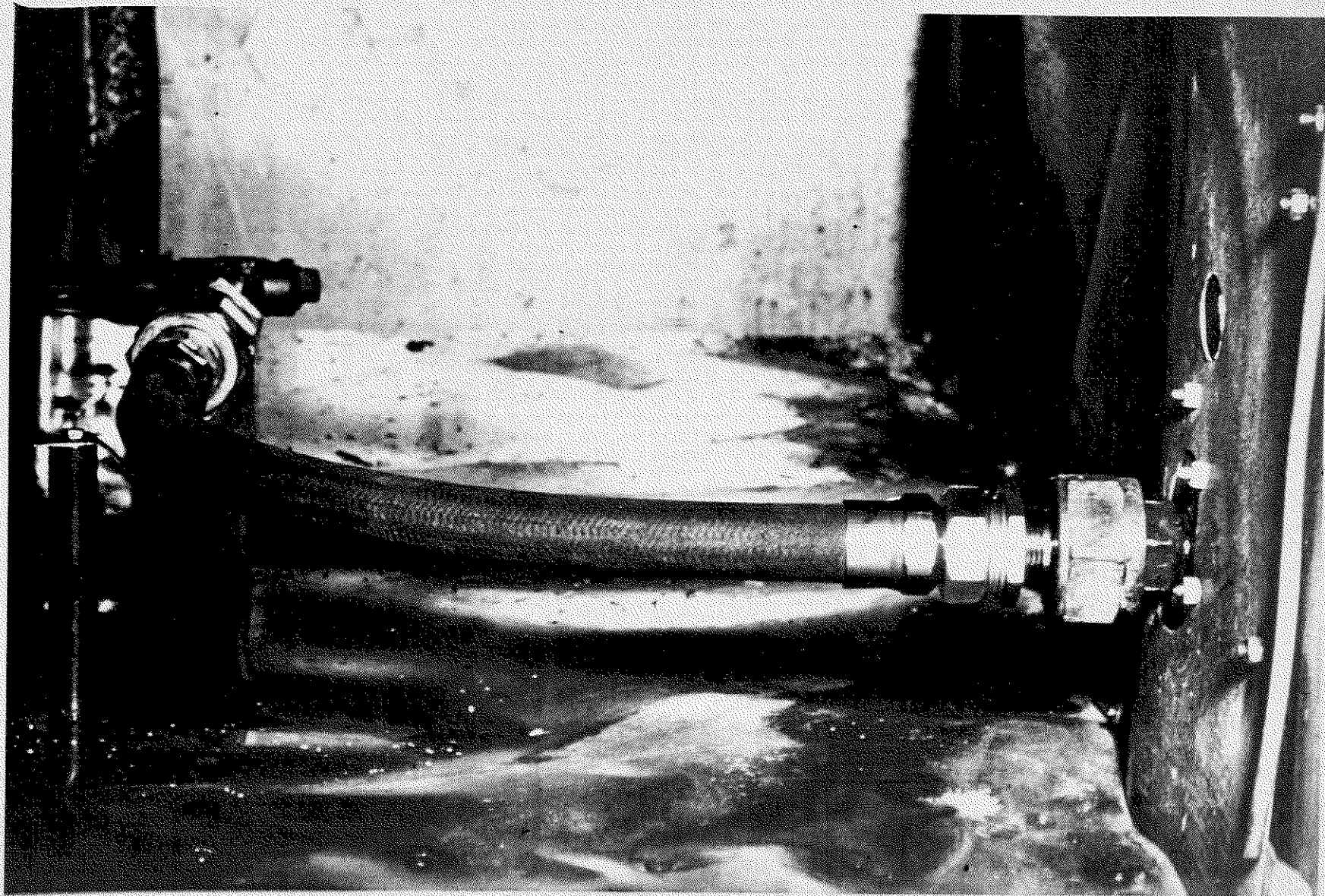


FIG.1 HOSE ASSEMBLY MADE UP WITH KLINCHER LOCKNUT

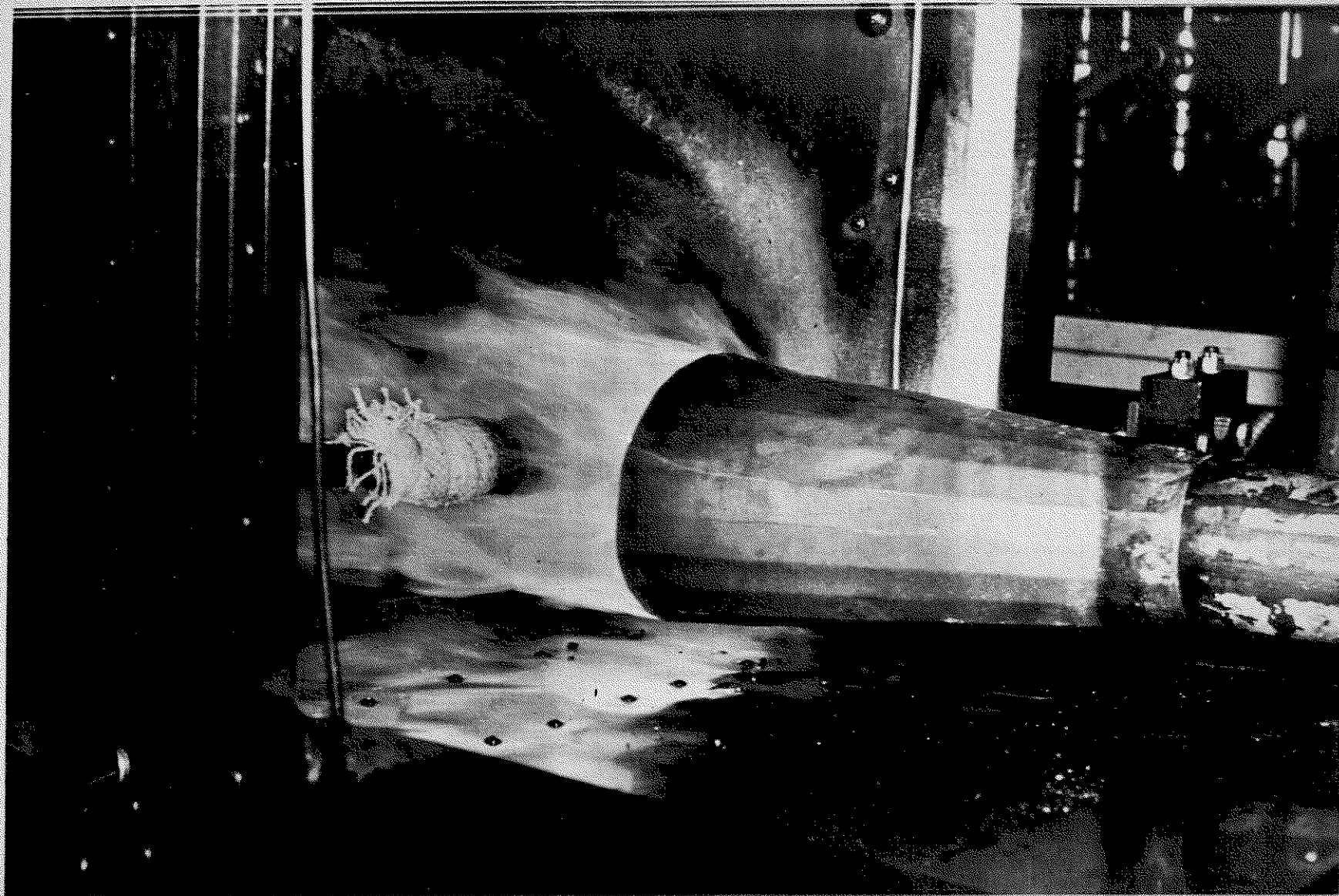


FIG.2 FIRE TEST IN PROGRESS (NOTE PROTECTIVE WRAPPING ON BODY OF HOSE)