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Bagless Transfer at the Savannah River Site (U)

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ABSTRACT

Traditional methods of removing plutonium from process gloveboxes in preparation for packaging involves the use of bagout procedures utilizing plastic bags, an organic material not allowed in storage containers per the new DOE 3013 long-term storage criteria. Engineers at the Savannah River Site have developed a system for removing plutonium from a glovebox directly into an all metal, welded, leaktight container free of external contamination. The process, known as bagless transfer, utilizes a Tungsten-Inert-Gas (TIG) welding process to fuse and separate a transfer canister from the glovebox environment while maintaining glovebox and canister integrity. A semi-automated prototype system has been demonstrated at the Savannah River Site and engineers are making preparations to demonstrate the system in radioactive operation in the site's FB-Line Plutonium Facility.

INTRODUCTION

With the end of the cold war buildup, the DOE Complex shifted its focus from producing nuclear weapons, to cleaning up, packaging, and storing excess materials and associated by-products. Old transfer and interim storage methods were re-evaluated in the context of the recent long-term storage criteria. One of the methods used for interim storage of plutonium/uranium products in the past involved the use of a bagout technique. In reviewing interim storage containers, it was found that the plastic bags used in this technique are not suitable for use inside long term storage containers because they release gases that cause container pressurization and associated problems. As the DOE synthesized its long term plutonium storage criteria, plastic bags and other organics were banned from use in future storage processes to prevent these types of problems. In response to these problems and the subsequent long term storage criteria, the DOE sites began to pursue alternate material transferal methods.

* The information in this summary was developed during the course of work under Contract No. DE-AC09-88SR18035 with the U.S. Department of Energy.

EXISTING MATERIAL TRANSFER METHODS

In searching for alternate ways to transfer material, existing transfer methods other than bagout techniques were investigated. Methods using air purge, double door, and a decontamination type processes were considered, but determined to be unsuitable for the task. The air purge technologies are based on air nozzles creating air currents to keep contaminated dust particles from settling in critical seal areas. There are a few companies that offer these systems, but experienced operations personnel did not indicate much confidence in the effectiveness of this method for the intended application. And while the double-door type technologies have been used successfully in

glovebox environments, they rely upon a very intricate and expensive latching and interlock system that would have to be machined into each bagless transfer canister. This type of machine work on each storage container would be very expensive. The method also relies upon rubber seals for the sealing during the transfer. Because these rubber seals would not be allowed inside the storage container, they would be an extra source of waste for each container. Decontamination concepts based on CO_2 crystal cleaning inside enclosures were considered, but were abandoned in favor of a welding and cutting process.

The process involves welding a hollow plug to the transfer container. A cutter is then used to sever the transfer container, completing the transfer while maintaining glovebox integrity. By utilizing commercially available welding and cutting equipment to keep the equipment simple and the costs low, the SRS system can be utilized in many packaging applications across the DOE complex.

SRS BAGLESS TRANSFER PROCESS

The basic bagless transfer process is shown in steps 1-5 of the appendix. The first step in the process is to insert a new canister into the bottom of the glovebox, (step 1). The new canister displaces the remaining portion of the previous canister from the sphincter seal. Next, the material to be transferred is placed inside the container, (step 2). Nuclear materials should be pre-packaged to avoid particulates from disturbing the welding process. A hollow plug is then inserted into the container and the outer container is fused to the inner container via a TIG welding process,(step 3). The container is then cut (using a roller wheel equipped pipe cutter)in the middle of the

welded area, separating the canister from the glovebox while maintaining the integrity of both,(steps 4 and 5). After cutting, the upper portion of the canister remains in the sphincter seal to maintain glovebox integrity, and the bottom portion is a leaktight, all-metal, welded container.

The equipment used is commercially available equipment. The welder is a TIG welder, commonly used for butt-welding pipes. The only modification is a set of specially sized clamps. The pipe cutter is a commercially available 'clamshell' type pipe cutter, modified to use rolling cutter wheels instead of a conventional metal cutting tool. The rolling cutter wheels are used because they do not produce significant chips during the cutting process.

EQUIPMENT

A semi-automated prototype system was demonstrated at the Savannah River Site in June 1994. Engineers at SRS have since built and fully tested a 2nd generation version (Sept 96). The 2nd generation equipment is more compact, controls are process oriented, and has been designed to evacuate & backfill the container with a helium atmosphere prior to welding. During testing, a statistically designed test matrix was used to determine the reliability of the weld process. Drop tests, leak tests, and metallurgical examinations were all included in the test program. The canister easily qualified as an inner container or boundary container per the DOE long term storage standard 3013. The second generation Bagless Transfer Module (see picture 1) is now being installed into the Savannah River Site's FB-Line Plutonium Facility. The unit will demonstrate the technology in radioactive

service in 1997 and will then be used to repackage some nuclear materials for safe future storage.

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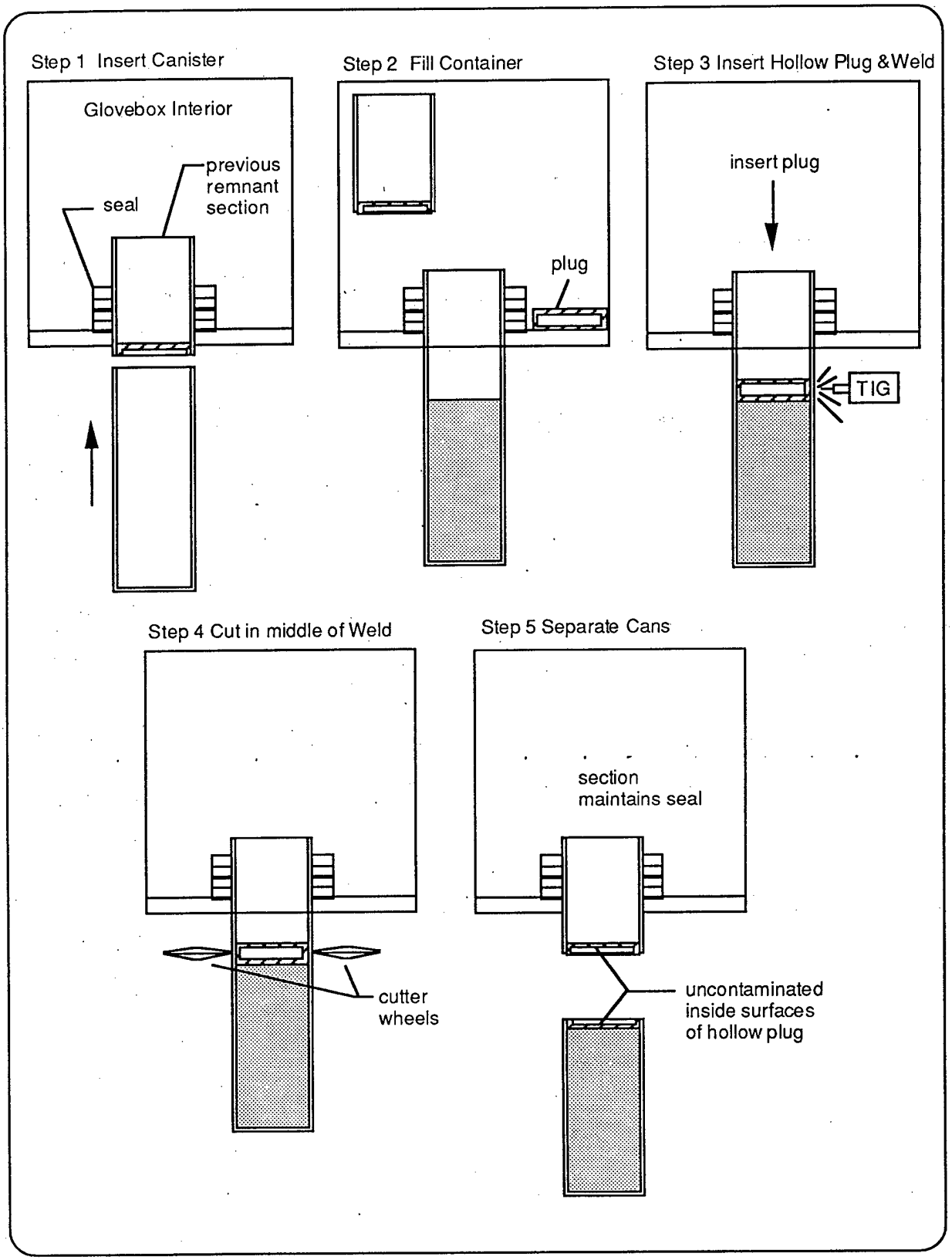
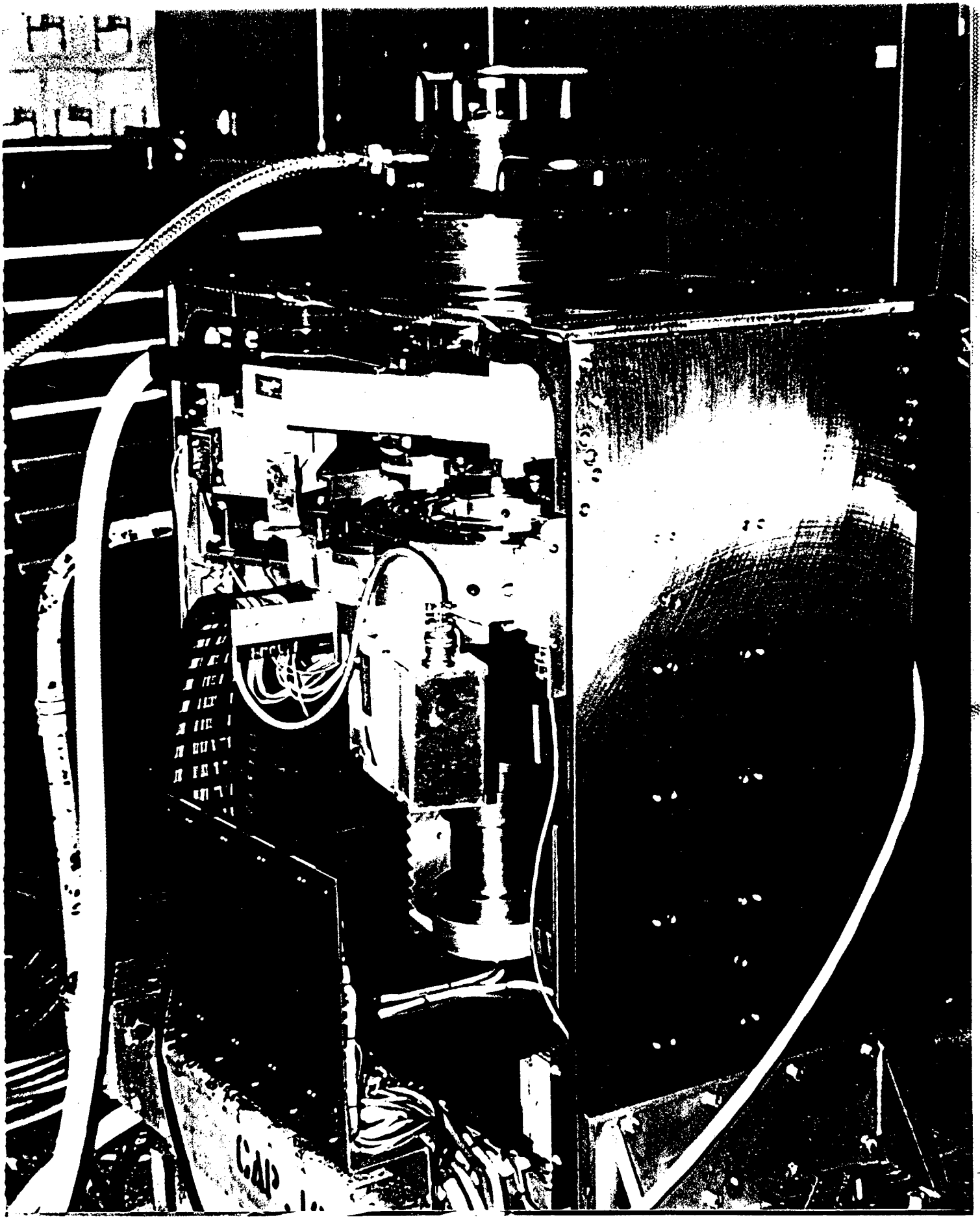
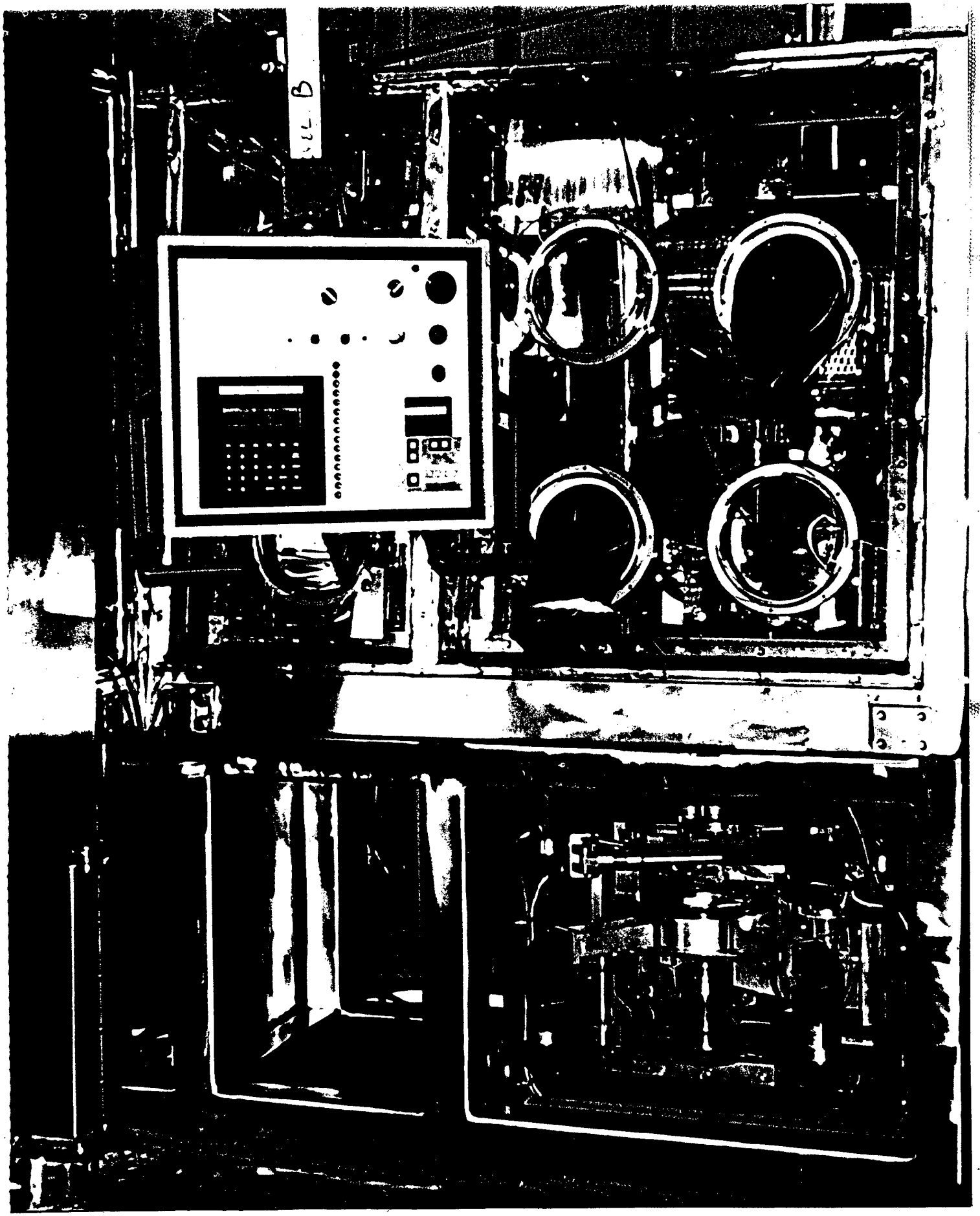
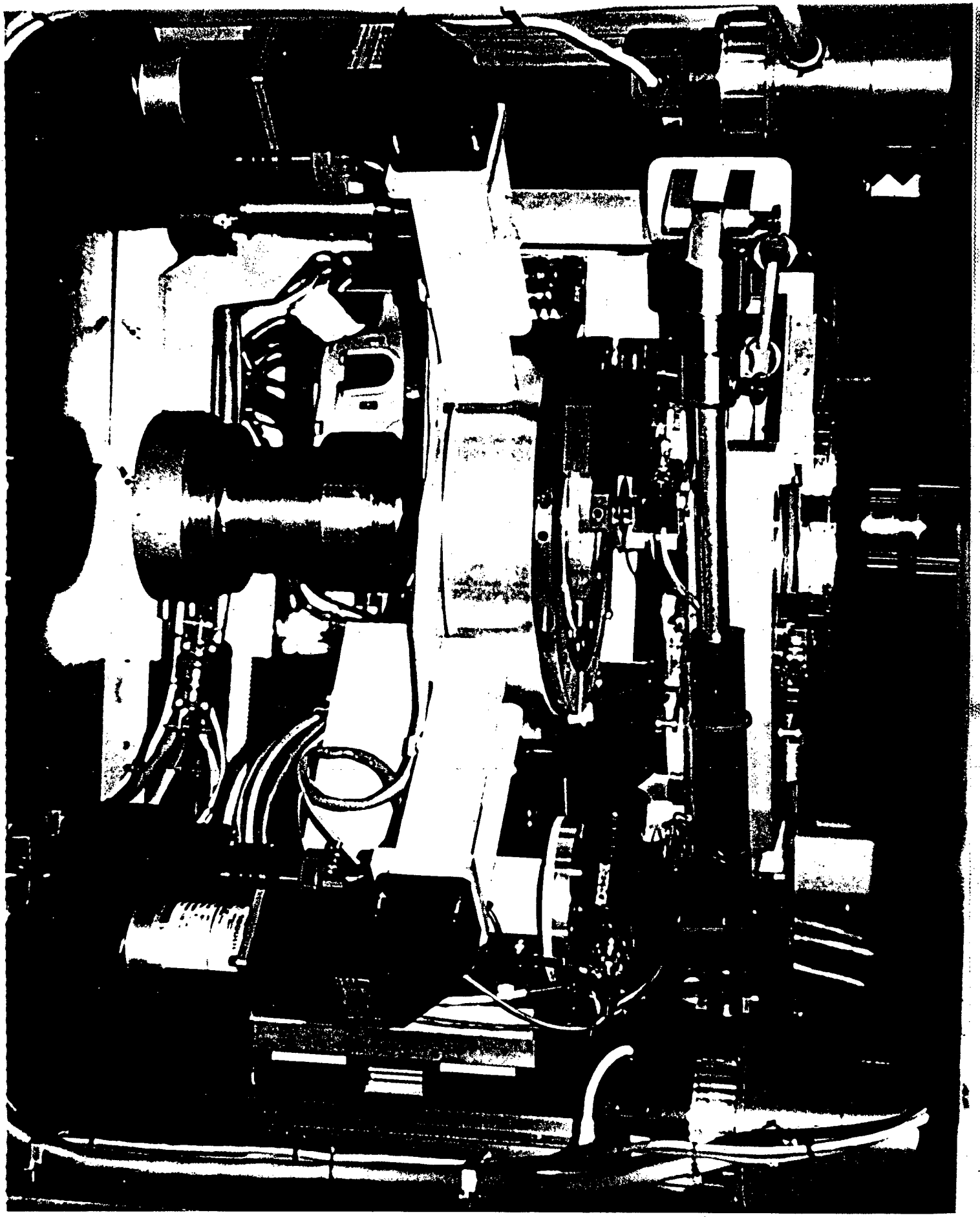
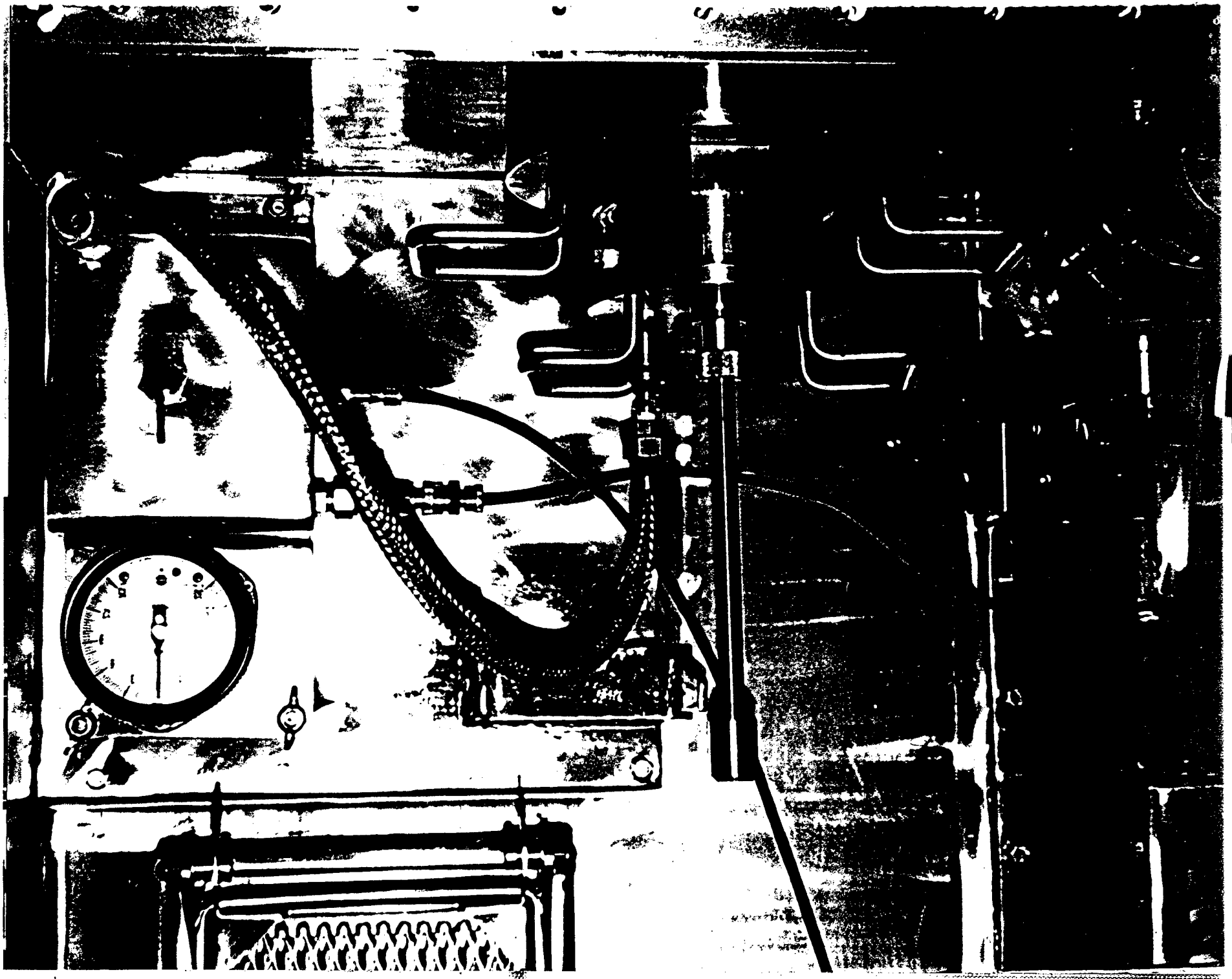
BAGLESS TRANSFER PROCESS

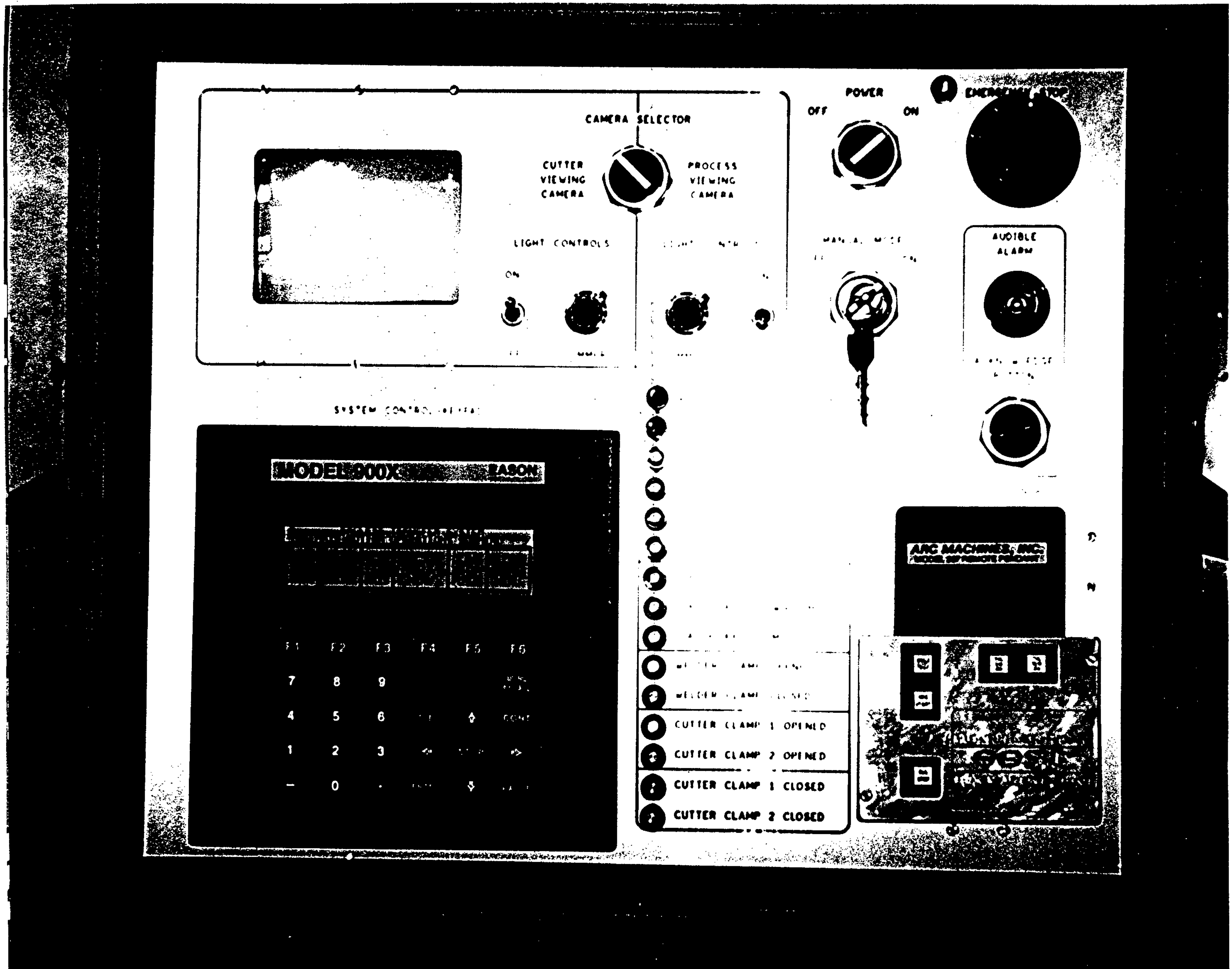








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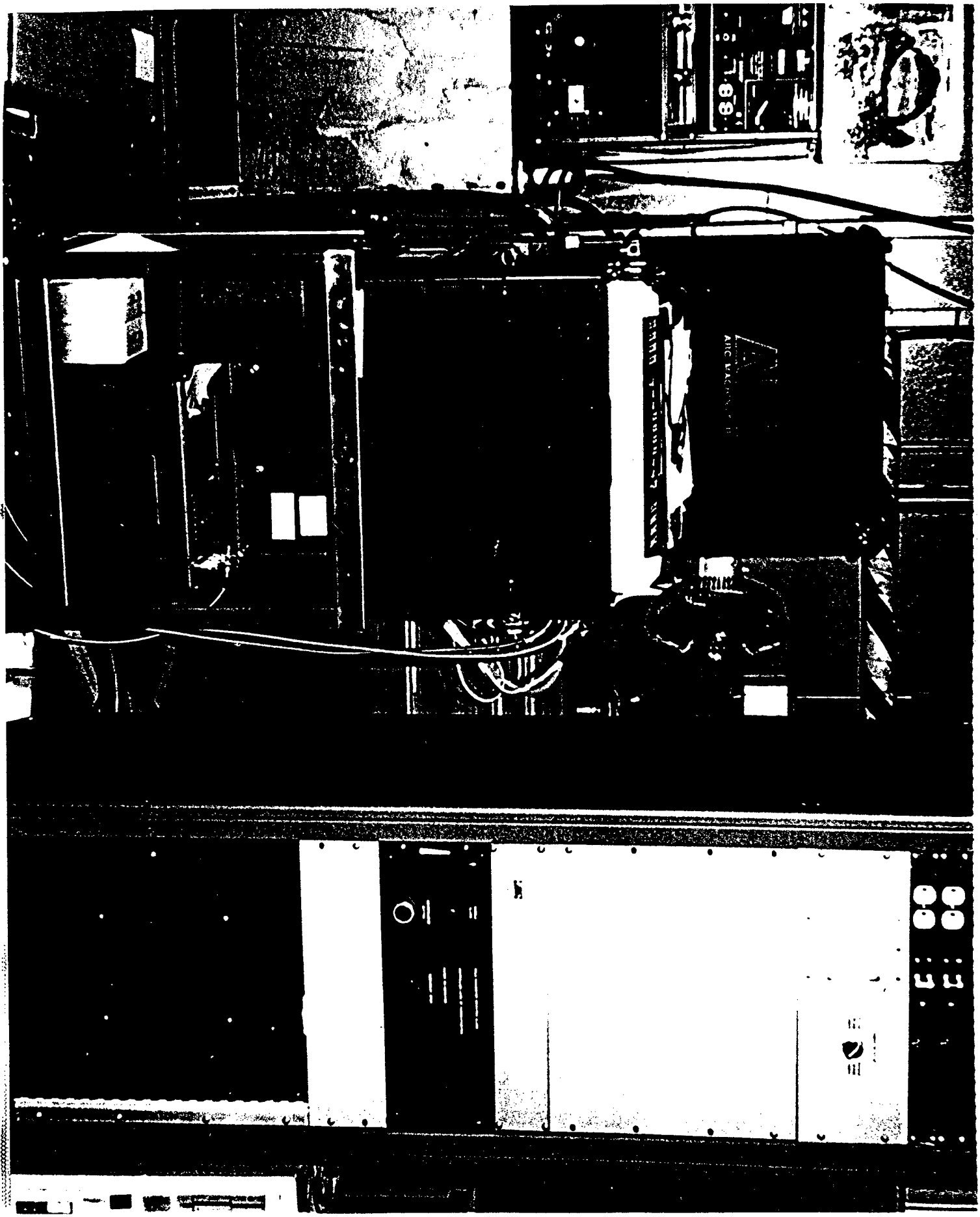

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