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HIGH SPEED DOUBLE RAIL RESTRAINER FOR STUNNING OR RITUAL SLAUGHTER

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SUMMARY

For calf stunning and shackling the double rail conveyor is a superior system compared to the V conveyor restrainer. The system also worked well for sheep. The use of the double rail conveyor should also be investigated for pigs and adult cattle. Some of the advantages of the double rail compared to the V restrainer are: (1) calves enter more easily, (2) stunning is easier and more accurate because the operator can stand closer to the animal, (3) wider range of adjustment for different sized animals, (4) shackling in the restrainer is easier because the back legs are separated and (5) less expensive.

INTRODUCTION

The V restrainer conveyor patented by Regensburger in 1940 was a major innovation in efficient and humane livestock handling. The restrainer replaced cruel and dangerous shackle systems where sensible animals were hoisted by one hind leg. V restrainer conveyors however, do have some problems. Large 200 kg veal calves have difficulty entering the V conveyor restrainer (Lambooy, 1986). Giger et al (1977) reported that holding small baby calves in the V conveyor restrainer is difficult. They cross their legs and fall through the opening between the two conveyors. There are also reports that V restrainer conveyors sometimes cause bloodsplash (Thornton et al, 1979 and Lambooy, 1986). Giger et al (1977) and Westervelt et al (1976) developed a laboratory prototype of a double rail restrainer system where the animal straddles two double rails. The animal is supported under the brisket and belly. Their research demonstrated that calves and sheep would ride quietly on the double rail and stress was reduced. The prototype was a major innovation but some major components needed to be developed for commercial application.

The objective of the project was to develop an economical improved conveyor restrainer system which would operate efficiently under high speed commercial conditions for both stunning and ritual slaughter. To make the double rail concept work under commercial conditions the following items had to be designed and developed: a restrainer entrance which would reliably position the animal's legs on each side of the double rail, a device for rapid adjustment for a wide variety of calf and sheep sizes, compatability with existing shackling systems and a practical humane method for holding the animal's head for ritual slaughter.

MATERIALS AND METHODS

The project was conducted in a commercial calf slaughter plant which processed 150 large, formula fed veal calves or 300 baby calves per hour. Calf weights varied from 23 kg to 225 kg and both large and small calves often were mixed together. Adjustment of the system for the largest to the smallest calves had to be possible within 15 seconds. The new equipment was installed on the slaughter line and the old shackle hoist was removed. The plant was going to be completely dependent on the new equipment.

RESULTS AND DISCUSSION

The system was constructed and has successfully operated for over seven months (Figures 1 and 2). Calves entering the restrainer straddle a stationary bar as they walk down a 1.2m cleated ramp on a 25 degree angle (Figure 3). Cleats on the ramp prevent the calf from slipping. If the calf slips it is more likely to become frightened and back out before it has settled down onto the moving double rail conveyor. The stationary leg positioning bar is 48cm above the entrance race floor and the surface of the cleated ramp. Bars placed at a lower height did not work because the calves had a tendency to step over them and get both legs on the same side. For sheep a lower leg positioning bar would be used. A 1.5m long hold down rack prevents the calves from jumping up. Calves will readily walk into the restrainer and quietly settle on the double rail (Figure 4). Baby calves which are too young to walk unassisted have to be manually placed in the entrance and pushed. The entrance is 45 to 50cm wide for all calves over 90kg and narrowed with bars down to 35cm wide for baby calves. Since the plant slaughters many baby calves a conveyor was installed in the floor to assist in bringing the calves up to the restrainer entrance. If the system was going to be used exclusively with larger calves or sheep a curved single file curved race should lead up to the restrainer entrance (Grandin 1981, 1983).

The moving double rail conveyor itself is 5.48m long. The calves straddle a conveyor constructed from stainless steel segments attached to a chain (Figure 5). The top of the conveyor is even with the floor of the entrance race. The segments form the two double rails. There is a 7.62 x 7.62cm space in the middle of each segment to accommodate the animal's brisket. The total conveyor width is 21.5cm and the moving segments themselves are 19cm wide. Adjustable sides mounted above the moving double rail conveyor adjust the width of the stationary sidesfor different sized calves (Figure 1). The sides are on pivots and the space between the adjustable sides varies from 25cm for baby calves to 51cm for 225 kg. calves. A small chain hoist quickly increases or decreases the space between the adjustable sides. The width is adjusted on the upper part of the animal's body. The animal's legs must have extra space below and slightly above the double rail conveyor to prevent pressure on the leg joints.
Pressure on the leg joints will cause calves to struggle and vocalize. The moving double rail conveyor does not have to be adjusted. The pivoting adjustable sides provided an economical alternative to expensive devices which would be required to adjust the width of the moving conveyor. A V restrainer could be replaced with a double rail with minor modifications of the existing race or shackling system. The animals can be shackled either in the restrainer or on a table. The system would work with either loose shackle trolleys or shackles attached to a conveyor at fixed intervals. In the author's installation a U.S. pig shackling conveyor with shackles attached to the chain was used (Figure 6). The shackles are attached to the animal's leg while it is held in the restrainer. Hook type shackles were replaced with noose-type shackles and the cumbersome tension devices required on cattle V restrainer systems were eliminated (Grandin, 1983).

RITUAL SLAUGHTER

Animals can be ritually slaughtered on the double rail by stopping the conveyor when the animal reaches the end (Figure 7). It works in a similar manner as the V restrainer system described in Grandin (1980). A vertical sliding gate with a U shaped back holder, holds the animal's back down. The head is held by a person (Figure 7). For small

animals holding the head manually is easier and more humane than a mechanical head lifting device. Ritual slaughter has been conducted at the plant's top speed of 150 calves per hour. After the throat is cut, the animal is ejected from the double rail onto a sterilized table conveyor (Figure 8). The table dimensions are 5.48m by 1.2m. A shorter table can be used for stunning only. A delay is built into the system to allow the animal to lapse into unconsciousness on the table before the incline conveyor picks it up. The shackle system and table must be designed to prevent cross contamination between animals. In our installation, table conveyor speed and shackle conveyor speed are synchronized.

Observations of Kosher slaughter indicated that a well trained shochet could cause over 95 percent of the calves to collapse immediately when they were ejected onto the table conveyor. These calves seldom kicked off shackles. When a less skilled shochet first used the system up to 30 percent of the calves retained a righting reflex and some animals walked on the table conveyor. Both carotid arteries were severed in all animals. The less skilled shochet quickly learned to induce immediate collapse by changing his cutting technique. A system which allows the ritual slaughterman to observe the animal's reactions has a great potential to improve the humaneness of ritual slaughter. A single swift hard motion of the knife through the carotid arteries was most effective. Sawing motions through the carotids reduced effectiveness. Sawing motions after the knife had passed through the carotids appeared to have no detrimental effect. These observations may help explain the wide variation in time required to lose consciousness reported by Blackmore et al (1983).

CONCLUSIONS

The double rail restrainer has many advantages over the V restrainer.

1. Stunning was easier and more accurate because the operator can stand closer to the animal. There is no return conveyor to lean over. The distance is 40 to 43cm in a V restrainer and 7 to 18cm in a double rail. A heavy pneumatic stun gun could be used without a balancer.
2. Animals entered with less balking and rode more quietly. Balking is reduced because entering animals do not have to walk through a narrow opening between two moving conveyors. Less than 1 percent of formula fed veal calves attempted to climb on the back of the animal riding in front of them on the double rail. There are no hold down bars over the animals on the conveyor.
3. The double rail restrainer can be easily adjusted for a ten times difference in animal weight. The double rail system has faster and greater adjustment capability than a V restrainer.
4. Shackling an animal in the double rail is easier compared to a V restrainer because the legs are separated and the shackle conveyor can be located closer to the animal's leg. This allows the use of noose-type shackles which are less likely to be kicked off.
5. The double rail conveyor, adjustable side, and entrance is less expensive than a V restrainer because it consists of one conveyor instead of two.

For all calf sizes the double rail restrainer is a superior system compared to a V restrainer. The system also worked well for sheep. The use of the double rail should also be investigated for pigs and adult cattle. Research should be conducted to determine if the double rail will reduce bloodsplash in electrically stunned animals.

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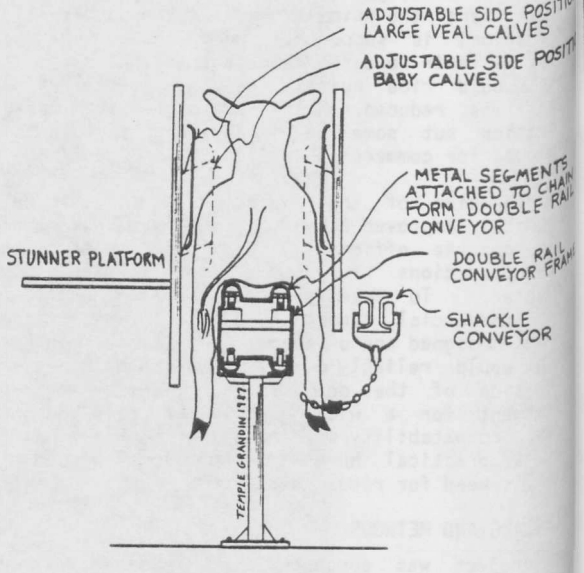


Figure 1. Cross section of double rail restrainer showing the adjustable sides. Shown with shackle conveyor with shackles attached at fixed intervals.

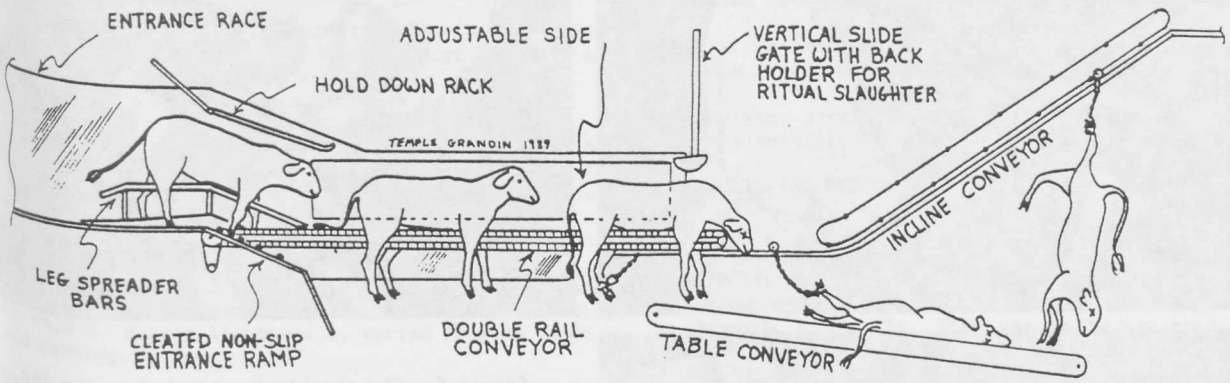


Figure 2. Double rail restrainer system with long table conveyor and back holder gate for ritual slaughter. Shown with loose trolley shackle system.

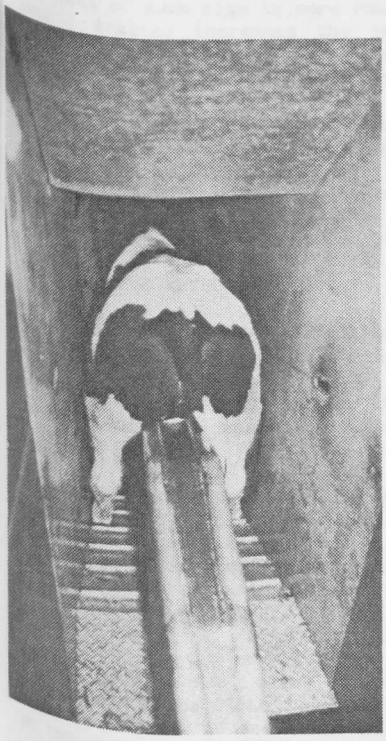


Figure 3. Calf entering the double rail. Animals will readily straddle the stationary leg positioning bar.

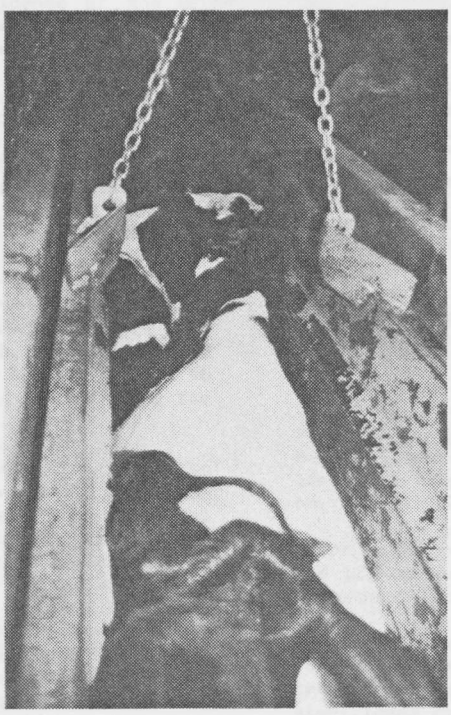


Figure 4. Formula fed veal calves quietly riding on the double rail. The chains are attached to a hoist for adjusting the width between the pivoting adjustable sides.

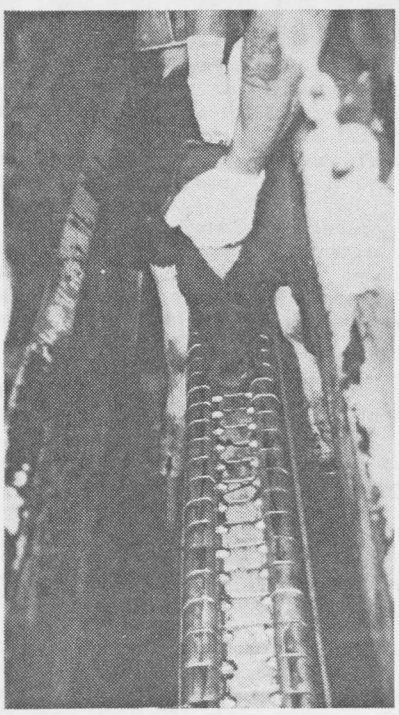
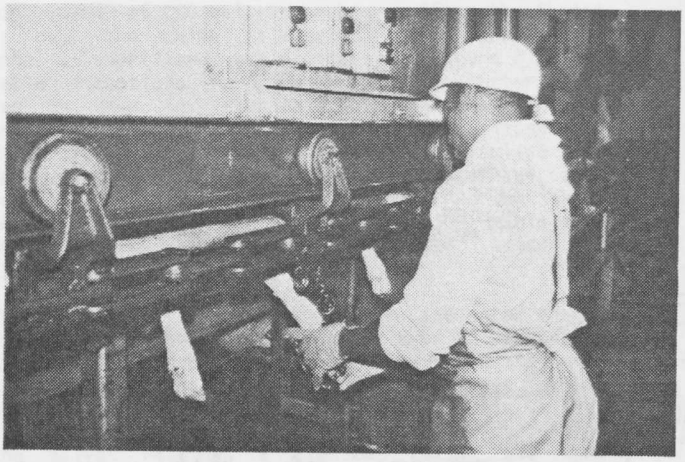
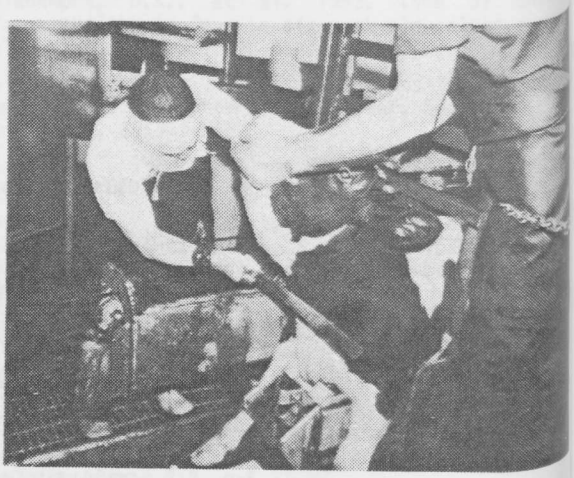


Figure 5. Stunning a calf with a pneumatic stunner on the double rail. Metal segments attached to a chain form the double rails on a single conveyor.





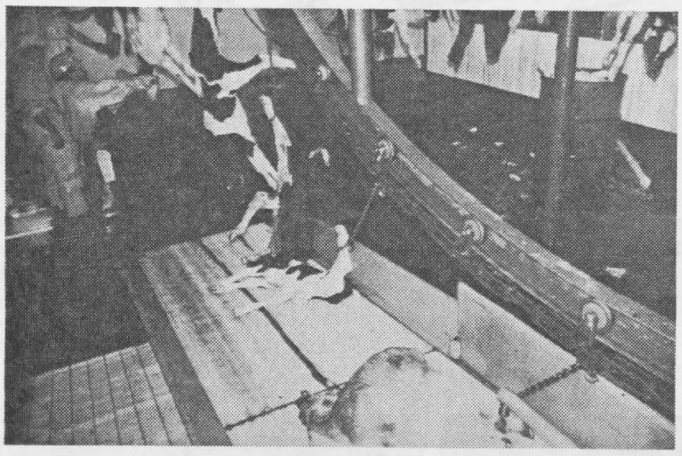


Figure 6. The shackle is attached to the leg while the animal is held in the restrainer. Shackles are attached to the chain at fixed intervals.

Figure 7. The calf is in position for ritual slaughter.

Figure 8. Stunned calves after ejection from the restrainer onto the table conveyor.