TECHNICAL NOTES

A Mechanical Animal-powered Cow Spacer

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Abstract

The low-cost, practical, easy-to-build, low-maintenance mechanical animal-powered cow spacer described spaces animals that are moving single file through a chute. The spacer unit can be used successfully in conjunction with an automatic electronic weighing/identification system for obtaining accurate daily weight data on individual animals.

With the integration of electronic and mechanical devices, accurate, automatic data acquisition systems are used in agriculture research with animals. Filby et al. (1979) reported that weight data were lost because cows bunched together as they moved over the weighing platform. To control the tendency for cattle to follow each other (Grandin 1980) and alleviate bunching, we developed a low-cost, practical, easy-to-build, low-maintenance device to space individual animals as they move single file through a chute.

The mechanical animal-powered cow spacer is one component of an automatic electronic weighing/identification system now used to monitor individual weight changes of cattle grazing semidesert rangeland on daily basis (Anderson et al. 1981). The cow spacer would also be effective in commercial operations in which automatic spacing of animals is desirable.

The Animal Spacer

Components of the mechanical animal-powered cow spacer and spring-loaded hinged side gate, hereafter called "the spacer," are shown from a top view in Fig. 1. *a* through *i* and from an entrance view Fig. 2. *a* through *j*. The device is powered entirely by a moving animal, and maintenance is minimal once the spacer is installed and adjusted in the chute (Fig. 3). The spacer prevents bunching of animals ahead of the spacer.

The animal, as it walks single file through the chute leading to the electronic weighing platform, must pass between two half gates (Fig. 1a) before reaching the bars that activate the spacer (Fig. 1b). The bars are attached by mechanical linkage (Fig. 1c) to the two half gates. As the animal walks forward and pushes against the bars, they are displaced sideways and the two half gates shut behind the animal. The action of the closing half gates stops further forward movement of the next animal in line and may even cause the next animal to move backwards in the chute. When the half gates are closed, a spring-loaded dead-bolt mechanism (Fig. 1*d*) is activated to lock the two half gates shut preventing the next animal in line from moving through the spacer. The first animal, now well

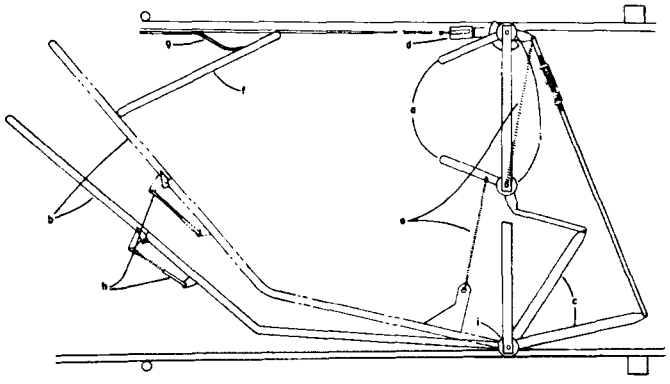

Fig. 1. *Top view of the mechanical animal-powered cow spacer and spring-loaded hinged side gate with components identified. The letters refer to the following materials; [a] half gates, [b] bars, [c] mechanical linkage, [d] spring-loaded dead-bolt mechanism, [e] spacer linkage springs, [f] spring-loaded hinged side gate, [g] leaf spring mechanism, [h] spring-loaded mechanism bars, and [i] graphite-impregnated nylon bearings.*

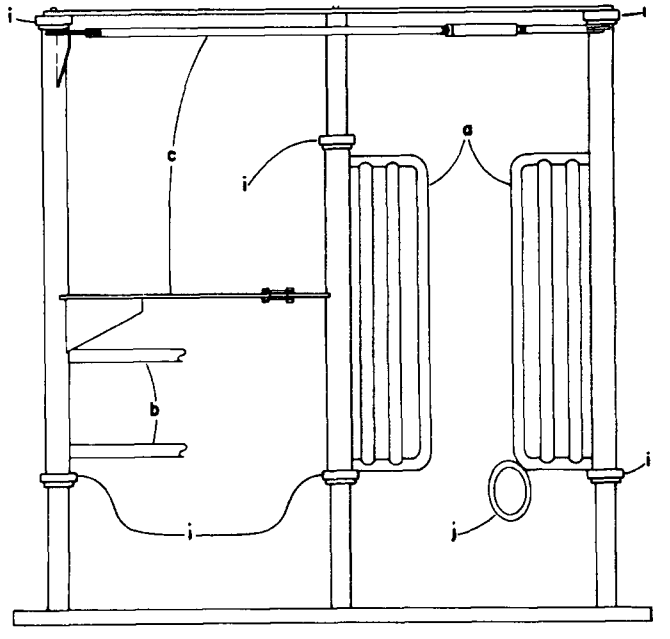

Fig. 2. *Entrance view of the mechanical animal-powered cow spacer with components identified. The letters refer to the following materials; [a] half gates, [b] bars, [c] mechanical linkage, [i] graphite-impregnated nylon bearings, and [j] steel ring.*

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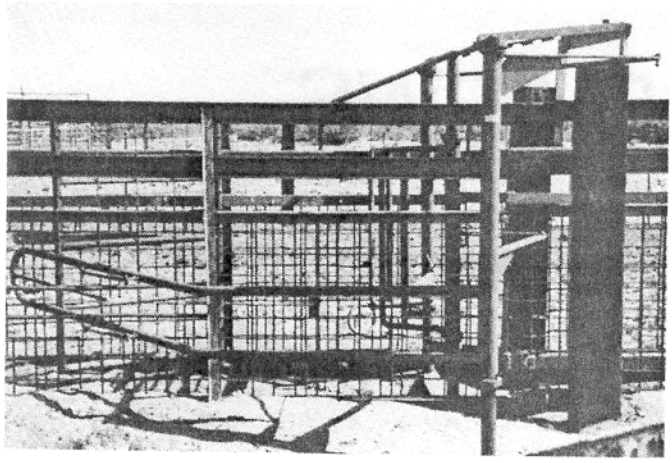

Fig. 3. *Side view of the mechanical animal-powered cow spacer installed in a chute.*

beyond the spacer, is free to walk onto the weighing platform. As the animal steps onto the scale platform, a photo beam is broken. This event activates a solenoid that controls two compressed air rams that close and secure a wire mesh gate in front of the animal to allow adequate time for an accurate weighing of the individual animal.

The front gate of the scale functions in the operation of the spacer. The scale and spacer are connected via a cable linkage. The spring-loaded dead-bolt is attached to a turnbuckle and cable (Fig. 1*d*), and the opposite end of the cable is attached to the wire mesh gate located in front of the scale. To prevent cattle from interfering with the movement of the cable along the inside of the chute, we enclosed the cable in a pipe, 1.3 cm in diameter, and welded the pipe to the side of the chute.

After air is vented from the rams, the spring-loaded wire mesh gate opens part way. As the animal pushes through the wire mesh gate, tension is put on the cable and the spring-loaded dead-bolt latch is released. Spacer linkage springs (Fig. 1*e*) contract and the two half gates open, allowing another animal to proceed down the chute for weighing.

Discussion and Application

Several on-site adjustments are necessary for proper operation of the spacer. Differences in animal size and weight (fill) do not prevent proper functioning of the spacer. For effective separation of thin cows as well as large bulls, the separator's bars must be displaced sideways to allow the spring-loaded dead-bolt to lock. Adequate displacement of the bars is ensured by a spring-loaded, hinged side gate (Fig. 1*f*) opposite the mechanism bars that compensates for differences in animal width by forcing animals to move into the mechanism bars. Wide animal compress the leaf spring mechanism (Fig. 1*g*). For proper function of the spacer, the leaf spring mechanism on the hinged side gate must be weaker than the springs on the mechanism bars (Fig. 1*h*).

As a safety feature, the mechanism bars are spring-loaded (Fig. 1*h*). If any animal following another through the chute does not stop with the action of the two half gates closing and continues on through the spacer, the springs on the mechanism bars are weak enough so the half gates will not lock and wedge the animal's neck. The two half gates are hinged on graphite-impregnated nylon bearings (Fig. 1*i* and Fig. 2*i*) that are packed in grease to give minimum resistance when an animal pushes on the mechanism bars.

The turnbuckle attached between the spring-loaded dead-bolt and the cable (Fig. 1*d*) provides an adjustment on the distance the wire mesh gate must open before the dead-bolt releases. If the separator is not used in conjunction with an electronic scale that requires a front gate, the cable could be attached to a spring-loaded chute stop or similar device that could be activated by a passing animal.

To prevent the detained animal from bringing its head up between the two locked half gates, we welded a steel ring (Fig. 2*j*) to one of the half gates. Without the steel ring, the animal could bring its head up between the two half gates wedging them locked, thus preventing the dead-bolt from operating properly.

Beef cattle previously accustomed to using bayonet gates (Anderson and Smith 1980) adapt to the spacer within a week or less. Because the activating mechanism bars are only 43 cm above the floor of the chute, some animals could jump over rather than push open the mechanism bars. A solid panel placed over the chute immediately in front of the mechanism bars would discourage animals from jumping over the bars.

A distinct advantage of the spacer is that it does not require an external power source and once the unit is adjusted in place, only minimal labor is required to keep the spacer operational. The unit is used successfully at the Jornada Experimental Range to space cattle that range in weight between 120 and 500 kg before they are automatically and electronically weighed. With the spacer each animal can be weighed during unattended automatic operation without risking the loss of data that can result when two or more animals get on the scale platform at a time.

Drawings and a list of materials (PSL No. 013610) for constructing the mechanical animal-powered cow spacer are available at a nominal cost from the Physical Sciences Laboratory, New Mexico State University, P.O. Box 3-PSL, Las Cruces, New Mexico 88003.

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