TECHNICAL NOTE

A NEW PRINCIPLE OF PELLET FEEDER DESIGN¹

Most current commercial devices dispense dry food pellets by moving the pellets horizontally toward a discharge point. Individual pellets, captured by perforations in a horizontal metal disk, are discharged one by one by stepwise rotation of the disk within the pellet reservoir. In our laboratory, where the average pellet discharge rate is some 20,000 pellets per week, feeders of this type produced occasional problems. Some were electronic; others involved failure always to capture a pellet in each perforation, particularly when the pellet supply was low. But the most common problem was an accumulation of pellet chips and dust under and around the perforated disk, which ultimately jammed the mechanism. Despite weekly cleaning and maintenance, troubles arose at least twice a month, prompting a search for a simpler pellet-feeder design which would be more reliable and require less maintenance. The present pellet feeder employs a vertical rather than horizontal design principle. It has been used extensively in operant conditioning applications for more than a year. More than 200,000 pellets have been reliably discharged from a single feeder without a breakdown. No maintenance, other than a weekly cleaning of the discharge tube, has been required.

An overall view of the pellet feeder is shown in Fig. 1. The pellet reservoir, a cylindrical plastic chamber, 4-in. in diameter and 1.5-in. deep, open at the back, is mounted vertically within a 4.5-in. diameter circular opening in a plastic face plate and against a plastic back plate fitted with a 1-in. bearing for the shaft. Beside this unit is mounted (also on the face plate) a 30 rpm clutch-operated synchronous motor (Hurst PC-DA) with a 2-in. plastic disk secured on the shaft. The disk and pellet chamber are connected via a flat plastic rod $3\frac{3}{8}$ -in. long so that a 180° rotation of the disk produces a 70° oscillation of the chamber, delivering one pellet. One of two pins, mounted on the back of the disk, closes a microswitch after delivery of one pellet. If the normally closed contacts of the microswitch are wired in series with the clutch, the motor stops when the microswitch closes. The clutch is reactivated by an alternate circuit from the response manipulandum through the normally open contacts of the microswitch.

Each pellet, when discharged, falls into a discharge

tube leading to the food cup. Flexible polyvinyl tubing (0.5-in. inside diameter) of a length appropriate to the application, was used. Since the pellet reservoir is mounted vertically, all dust and pellet chips ultimately drop to the bottom and are discharged, a little at a time, with each pellet. Dust and chips can be excluded from the food delivery system by cutting a narrow slit in the underside of the discharge tube.

Fig. 1. Overall view of the vertical pellet feeder showing the pellet reservoir, hopper, and motor drive linkage.

Fig. 2. Detailed view of the interior of the pellet reservoir. A pellet has been captured and is ready for discharge.

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A detailed view of the interior of the pellet reservoir is shown in Fig. 2. Pellets are fed into the chamber through a hopper mounted against the rear side of the back plate, an opening in which allows the pellets to fall into the chamber. When the chamber begins to rotate, the pellets are jiggled by the agitators, curved plastic wedges cemented inside the chamber. A single pellet is captured at the pellet-entry point, a hole in the chamber wall large enough to accommodate one, but not two, pellets. The pellet is carried around the circle of rotation until it falls through the discharge opening. Other pellets carried around within the chamber are pushed aside by the pellet over-ride cemented on the back plate above the discharge opening. Thus, only one pellet is discharged at a time. The next pellet to be discharged is captured at the entry point on the opposite side of the chamber (the drive in this case rotates the chamber in the opposite direction). When a 30 rpm motor drives the pellet feeder, 1 sec of operation (0.5 revolution of the motor) discharges a single pellet. Faster pellet discharge can be achieved with a faster motor, but the 30 rpm speed

has been found to be the best for all reinforcement applications.

The pellet feeder is one of several models built, all utilizing the vertical design principle.² It is simple to construct and the materials, including the motor, cost less than \$35.00. A machinist can build one in a single working day. Its advantage over commercial feeders is the vertical mounting; thus, all dust and chips are discharged with the pellets and do not accumulate to jam the feeder.

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