THE TIMOTHY SEED BUMP MILL

The bump mill is a very practical machine for the final cleaning of timothy seed. It makes a total separation of weed seeds, including ox-eye daisy, winter-cress, cockles, cinquefoil, sorrel, buckhorn, Canada thistle, sow thistle, false flax, couch grass, cultivated grasses, alsike and other clovers, and cultivated seeds from timothy seed. When adjusted and skillfully operated it makes the separation without missing weed seeds and without waste of good timothy seed. It does the work so thoroughly and so economically that it is an absolutely essential piece of equipment wherever timothy seed is milled in quantity.

The Perigon bump mill consists of two identical bumping heads assembled right and left hand with respect to feeding and delivery of seed and frame mounting. The two heads are positioned opposite each other in suspension by flexible wooden hangers, are balanced and interconnected to each other by a system of adjustable toggle linkage so that the motion of the two heads is kept in unison. Positioned between the two heads is a movable buffer block held in place by vertical guide rails and an adjusting screw. The impact surfaces of this buffer block are faced with resilient material for rebound and sound control. Integral with the toggle linkage is a cam and spring mechanism which when rotated by the built-in electric motor activates the bumping heads.

The bumping heads, together with the buffer block, activating mechanism and electric motor, are assembled within a cradle frame which is tiltably suspended within the main frame and can be inclined transversely from the horizontal through an arc from zero to about 15 degrees of incline. The bumping heads are suspended within the cradle frame at a constant angle of 2 1/2 degrees longitudinal inclination from the horizontal. The combination of the two inclinations provides a compound inclination of the separating plates which is important to the separating action and is variable by tilting the cradle frame by means of the control screw provided near the centre of the machine on the delivery side.

The two bumping heads each consist of thirty superimposed decks, which in turn consist of twelve individual 9 by 3-inch plates positioned over a common collecting pan which deposits collected material into an exit duct near the impact end of the heads. From there it is discharged through flexible pipes at the bottom of the heads. There are a total of 720 separator plates, each functioning as an individual. Twenty-four vertical feed manifolds positioned on the receiving side of the heads divide the feed uniformly between the 720 plates. Each manifold supplies seed to a tier of thirty plates located one on each deck. Feed beaks projecting below the adjustable manifold apertures enter the interstices between the decks. The length of these beaks and size of the manifold apertures are proportioned to match the natural angle of repose characteristic of the seed and thereby control the flow so effectively that as little as 1/6000 part of an ounce of seed can be fed to each plate at each bump, yet the area of the manifold aperture can be large enough to pass considerable foreign material without choking. A foot valve in each manifold provides means for flushing foreign material from the manifolds and can also be adjusted to provide a continuous bleed to prevent the bump action from packing the seed in the manifolds if such tends to occur. Feed to the manifolds is through flexible tubes from stationary bins mounted on top of the main frame.

In operation, separation is brought about by generating a motion of the heads, which causes the rotund timothy seeds to roll by gravity on the surface of the plates in the direction approximately parallel with the transverse axis of the machine, while the recurring impact of the heads against the buffer block causes the less rotund and irregular shaped weed seeds to skid over the surface of the plates in a direction angular to the longitudinal axis. At each impact of the heads an additional portion of seed is fed to the plates, a portion of weed seeds is deposited off the plates into the collect pans below, and a portion of timothy rolls over the side of the heads and collects in the seed delivery trough at the base of the decks.

The amount of seed fed to the plates, the frequency of the bumps per minute, severity of the bumps, length of stroke, and the angle of incline of the cradle frame are factors which the operator must determine by experience and skill in order to obtain maximum performance. Convenient, easily manipulated means for control are provided in the Perigon design. The opposed head design utilizes the energy of the impact to start the return of the heads for the next stroke, thereby intensifying the impact bump and eliminating the dissipation of energy in the form of shock to the building. It is essential that both heads be adjusted to precisely the same relation to the buffer block so that they will contact at exactly the same time and with the same force, or equal performance will not exist. During each revolution of the cam the follower arm is released and re-engaged. When contact with the cam ceases the heads respond to the spring tension, approach and impact the buffer block, then rebound away. Speed of cam rotation, length of stroke and spring tension must be so synchronized with respect to each other that the cam will re-engage the follower before the rebound is entirely spent, so that the contact will be smooth and over-riding rather than collision. When correctly adjusted, operation will be quiet and smooth, and when wrongly adjusted it will be noisy and rough.

Large wing nuts on the threaded spring connecting rods provide easy means for adjusting the spring tension to obtain the exact amount of bump needed to get good separation. Increasing the spring tension steps up the agitation of the seed on the plates, causing the timothy to roll and move along faster. It also causes more seed to be fed to the plates from the seed manifolds on each bump without other change of feeding adjustments. Overdoing the spring tension and using too much bump will cause over-feeding of the plates and will also cause weed seeds to roll instead of skid and result in missing of weeds. It may also cause good timothy to be bumped off the plates along with the weed seeds, resulting in waste of good timothy seeds. For that reason it is important for the bump mill operator to use good judgment regarding the amount of spring tension to be used.

By reason of the bumping heads being inclined at 2 1/2 degrees in the frame the distance between the heads is greater at the top than at the bottom, and the buffer block is a truncated wedge of 5-degree angle. This provides the method of changing the length of stroke, which is done by raising the block for longer stroke and lowering it for shorter stroke. The movement of the block is guided by the vertical guide rail members of the frame, which engage in grooves in the block. Wing nuts on a threaded rod attached to the top side of the block provide quick and convenient means for adjusting the block position and locking at the selected point.

In operation when any considerable change is made in the position of the spring tension, a corresponding change of the block position and vice versa is required to keep the timing of the cam and follower re-engagement within the range of quiet operation. A strong spring tension snaps the heads back to the block in less time; so the block should be raised to lengthen the stroke to a point where the time of the motion will remain the same. If it is desired to slacken the spring tension, a shorter stroke will again keep the timing in order. For the separation of weeds that roll very easily on the plates, and are therefore hard to separate, a soft bump and short stroke will usually give the best results because it avoids over-agitation of the seed on the plates. When working with seeds that are not so difficult to separate, capacity can be increased by using a harder bump and longer stroke.

The tilting cradle frame should be used as the principle adjustment to compensate for difference in quality of varying lots of seed that are encountered. For difficult to separate weeds, the incline should be nearer the horizontal position. This keeps the timothy on the plates longer so that more bumps will take place during the travel down the plates. When timothy seeds go off the plates with the weed seeds, the

cradle frame should be inclined more to the point where the timothy will roll along the plates toward the side of the heads instead of going across with the weeds. This clears the timothy over the plates faster, and the greater inclination of the manifolds changes the angle of the feed beaks with relation to the aperture and automatically increases the feed proportionately, thereby increasing the capacity of the machine. When overdone this will also cause missing of weeds.

It is desirable, possible and practical to operate over a wide range of varying seed quality and conditions by means of the three controls just referred to, the spring tension, length of stroke and the tilting cradle frame, with cam rpm and the sliding tongues regulating the manifold feed apertures being kept at the same constant setting. The sliding tongues are provided as a means to equalize the feed on each tier of plates rather than for varying the capacity of the machine or compensating for seed quality and condition, and once they are correctly set need seldom be changed.

The motor pulley is variable in pitch by adjusting one flange of the sheave and may be used to vary the rpm of the cam. Normally an rpm of 120 to 130 will give good results. If in case of difficult lots of seed a spring tension and stroke length is desired that is incompatible with quiet operation, the cam rpm may be increased or decreased as required for quiet running. If blast tailings or other poorly developed seed is to be cleaned there are some times when a change of cam rpm is helpful, and it has been found that a range from 100 to 150 rpm can in certain cases be used to advantage. Also, in the case of very light and poorly developed timothy, there may at times be an advantage in changing the feed aperture by means of the sliding tongues in the manifolds. A bump mill operator should strive to acquire the greatest possible skill at adjusting the machine, as this will enable him to salvage seed that would otherwise be useless, which can at times be very profitable use for a bump mill.

A preferred method of installing a bump mill is to have a large supply and large receiving bins for clean seed and rejected material connected by spouting for either gravity flow or elevators so that the machine can be left running twenty-four hours per day.

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