

Evaluation Report

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Hesston 5200 Round-Up Multiple Bale Mover

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

Hesston 5200 Round-Up Multiple Bale Mover

Manufacturer:

Hesston Corporation, Farm Equipment Division
Box 545
Hesston, Kansas 67062
U.S.A.

Distributor:

Hesston Industries Limited
920-26 Street North East
Calgary, Alberta
T2A 2M4

Retail Price:

\$4,235.00 (April, 1977, f.o.b. Saskatoon)

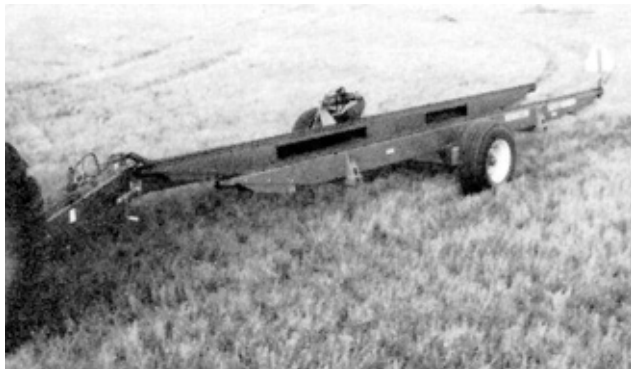


Figure 1. Hesston 5200 in Transport Position.



Figure 2. Hesston 5200 in Loading Position.

Summary and Conclusions

The functional performance of the Hesston 5200 Round-Up multiple bale mover was very good for retrieval of large round bales from the field and transport to the storage area.

The Hesston 5200 handled firm bales effectively. Four large round bales could easily be loaded but if the average bale weight was greater than 680 kg (1500 lb), the manufacturer's maximum load rating for the wagon could be exceeded. If bale length was greater than 1500 mm (5 ft) considerable overhang occurred with four bales on the bed rails. Operator experience was required for bales to be loaded and unloaded in a continuous, uniform and orderly manner.

The Hesston 5200 towed very well, when fully loaded, at speeds up to 29 km/h (18 mph). The swing tongue facilitated safe road transport and ease of maneuvering in confined areas.

The overall durability was very good but was reduced by the repeated stretching of the bed rail chains.

In average field conditions it took an experienced operator four minutes to load four bales, while unloading and positioning four bales in the storage area took about two minutes. Field efficiency depended primarily on the transport distance and the speed at which the towing tractor could safely operate during transport. For example, in one field of alfalfa and bromegrass it took from 20 to 25 minutes to load, unload and transport four bales and return to the field. This included 0.4 km (0.25 m) of field transport and 0.8 km (0.5 m) of road transport.

No safety hazards were apparent when the mover was operated according to normal recommended procedures.

Recommendations

It is recommended the Manufacturer consider:

1. Modifying the bed rail chain assembly to reduce excessive chain stretching.
2. Providing more aggressive lugs on the bed rail chains to improve feeding.
3. Placing the SMV sign in a permanent location.
4. Lengthening the bed rails to accommodate four bales of 1700 mm (5.7 ft) length.
5. Modifications to prevent the wagon load rating from being exceeded with four bales, as many hay bales weigh more than 680 kg (1500 lb).
6. Modifying the tongue to improve hitching convenience.

Chief Engineer: E. O. Nyborg

Senior Engineer: L. G. Smith

Project Engineer: T. G. Strilchuk

The Manufacturer States That

With regard to recommendation number:

1. We plan to add chain supports under the long span of the rail chains, inside the rails. This will be incorporated as an in-line change on our next production run. This should alleviate some stretching during operation.
2. We plan to incorporate an in-line change in future production of the 5200 to change the lug assembly from welded wire to a solid lug. This improves the lug strength and eliminates bending. The solid lugs are designed to be aggressive enough for positive loading, but not so aggressive as to cause twine carry-over at the end sprockets on the mover rails.
3. We do not presently plan any changes in the location of this sign.
4. It is our recommendation that the 5200 Round-Up Mover be utilized to load bales with a maximum diameter of 1830 mm (72 in) and a maximum length of 1600 mm (63 in). With 1700 mm (67 in) bales, we recommend loading only three bales per load.
5. We do not plan any changes; however, Hesston offers a "Heavy Bale Kit" to load heavier bales up to 900 kg (2000 lb) that do not exceed the 1600 x 1830 mm (63 x 72 in) dimension. When such bales are loaded, we recommend that the 2700 kg (6000 lb) maximum load weight be observed by loading three bales per load instead of the normal four bale capacity. To design the 5200 Round-Up Mover to accommodate more capacity would require increasing the cost both to us and to the retail customer. We do not wish to tax all of the customers to accommodate a few customers needs.
6. It is our Engineering Department's recommendation that we use the ball-socket type hitch of the 5200 Round-Up Mover for certain applications such as when there can be negative tongue weight during operation, when there is a relatively high drawbar or when there is relatively high tongue weight. These are common to the 5200 and we therefore utilize the ball-socket hitch for tongue stability. A clevis type hitch can be more convenient for hook-up, but we feel there are good reasons for using the ball-socket type hitch on the 5200 Round-Up Mover.

Additional comments are as follows:

1. In this report it is stated that "Individual tire loads, under operating conditions, exceeded the Tire & Rim Association standard maximum rating for the 11L x 15, 10 ply tire by 18%". We have contacted our tire vendors regarding our application and loads, and they have approved the useage of their tires for this application.

General Description

The Hesston 5200 Round-Up multiple bale mover (Figures 1 and 2) is a self-loading, tilting bed, two wheel trailer for use with 38 kW (50 hp) tractors, or larger, equipped with dual hydraulics. Bales are picked up on the left side of the tractor.

The main frame consists of a solid axle with an offset, two section, pivoting tongue, which swings outward hydraulically for loading and inward for transport.

The bale bed can hold up to four large round bales. It consists of two 6400 mm (21 ft) chain rails spaced at 940 mm (3 ft). The transfer chains are hydraulically driven and the bed may be tilted either forward or rearward for loading or unloading.

Complete specifications are found in Appendix I.

Scope of Test

The Hesston 5200 was operated in typical prairie fields (Table 1) for 110 hours while moving about 475 large round bales.

It was evaluated for ease of operation, quality of work, operator safety and suitability of the operator's manual.

Table 1. Operating Conditions

Crop	Hours	Field Topography	Field Condition
Native Grassland	28	Gently rolling	Rough, Occasional stones
Wheat Straw	24	Gently undulating	Slightly ridged
Sweet Clover	18	Moderately rolling	Smooth
Alfalfa, Bromegrass and Crested Wheatgrass	40	Gently rolling	Rough, Occasional stones

Results and Discussion

EASE OF OPERATION

Hitching: The Hesston 5200 was equipped with a self-aligning ball-socket hitch (Figure 3) necessitating the use of a two piece clevis bolted to the top of the tractor drawbar. This arrangement was very stable, minimizing movement at the hitch point, but made hitching rather complicated. A clevis as an integral part of the hitch tongue would improve hitching convenience.

Loading: The Hesston 5200 is placed into field loading position (Figure 2) by hydraulically swinging the tongue outward by engaging the appropriate tractor hydraulic lever after positioning a selector valve with a pull rope. Bales are approached from the end with the centre of the rails aligned with the bale axis. The rails are hydraulically tilted downward until the front skid shoes touch ground. Being certain that the tractor forward speed is matched with rail chain speed, the rail chains are engaged as the carrier advances beneath the bale. The rail chains must be stopped as soon as the rails are visible in front of the bale. The bed is then raised to

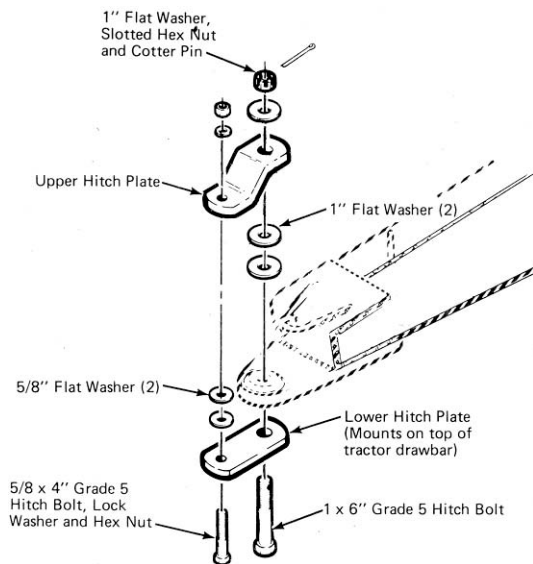


Figure 3. Arrangement for Hitching Hesston 5200 to Tractor.

clear the ground for travel to the next bale. Successive bales are loaded in the same manner (Figure 4) with the bale on the ground butted against the bale on the mover. Proper bale and rail alignment is essential for good loading. Slight misalignment can be corrected by butting the approached bale with the bale on the front of the load.

Operator experience was required before bales could be loaded non-stop. Starting and stopping the rail chains at the correct time was critical. Starting them too soon or stopping them too late left gaps between bales resulting in room for only three bales on the bed. Starting the chains late caused the oncoming bale to skid on the ground and could damage the twines at the bottom of the bale resulting in lost tension. Skidding was sometimes necessary before the chains would grasp a bale. More aggressive rail chains would be desirable.



Figure 4. Approaching the Fourth Bale.

Bales could also be loaded from the rear by backing the tractor and running the rail chains in reverse. This was convenient for picking bales at field edges or loading bales which had already been placed in rows. Rear loading was easiest with the hitch in transport position.

Picking bales down hill would sometimes up-end the oncoming bale. Up-ended bales could be returned to their original position by using the tilting bed.

Bale damage during loading was insignificant with an experienced operator. Loading poorly formed or untied bales resulted in slight hay loss during pickup.

The Hesston 5200 had a 6 400 mm (21 ft) bed length. It could load four 1500 mm (5 ft) bales if the bales were butted tightly. Some round balers produce 1700 mm (5.7 ft) long bales. The mover could only load three of these bales without excessive overhang. A longer bed length is desirable to accommodate four longer bales. The manufacturer's maximum load rating for the wagon was 2725 kg (6000 lb). This meant that if the average bale weight was more than 680 kg (1500 lb), the load rating was exceeded with four bales. Since many hay bales weigh more than 680 kg (1500 lb) it would be desirable to increase the load rating of the wagon.

The Hesston 5200 loaded on the left side of the tractor. This meant that the operator faced left away from the tractor hydraulic controls, although this did not seriously hinder operator performance. Left side loading meant that the mover could be used with a truck (Figure 5) equipped with hydraulic system, as the driver had visibility for loading. This could be advantageous for long distance hauling although at least a one-ton truck with special equipment would be required.



Figure 5. Operating the Hesston 5200 With a Truck.

Transporting: When fully loaded, the bed is raised (Figure 6) and the tongue is hydraulically swung into transport position (Figure 7). For travel on public roadways the tongue swing lock pin and bed tilt lock pin should be installed. The SMV sign must also be inserted into a bracket at the rear of the left rail. If the load was long and there was bale overhang, the sign could not be inserted. All overhang had to be at the front of the rails to permit sign insertion. The load also could not be moved rearward without bending the sign bracket (Figure 8) if it was not removed before unloading. It was necessary for the operator to decide if the overhang over the front was excessive for safe transit on public roads. A permanently installed SMV sign should be attached at the rear of the mover to eliminate this problem.



Figure 6. Mover Fully Loaded With Bed Levelled.



Figure 7. Moves Fully Loaded in Transport.



Figure 10. Bales Uniformly Spaced In a Row.



Figure 8. Bent SMV Sign Bracket.



Figure 11. Rows of Bales Placed Closely Together.

The Hesston 5200 towed well in both smooth or rough fields and trailed well on roadways at speeds up to 29 km/h (18 mph). Side clearance was ample for narrow roadways as in transport position the mover trailed directly behind the tractor. Loss during transport was insignificant, even with ragged or untied bales.

Placement: After removal of the bed and tongue lock pins and the SMV sign, the mover is ready for unloading. With the rails tilted rearward the rail chains are engaged as the tractor advances in low gear. This method was very successfully used to set tight rows (Figure 9) It was found easiest to align rows by leaving the mover in transport position when unloading from the rear.



Figure 9. Individual Bales Butted Tightly Together.

If preference was to space the bales during unloading, visibility was poor when unloading from the rear and it was difficult to advance the mover to achieve the desired spacing. Uniform bale spacing could be achieved (Figure 10) by placing the hitch in loading position, tilting the bed forward and unloading from the front so that the bales being placed on the ground were in full view.

Depending on operator preference, any row spacing could be obtained. With an experienced operator, rows could be tightly placed together (Figure 11).

QUALITY OF WORK

The Hesston 5200 was very effective in picking large round bales, transporting them and placing them in a storage yard. Both the quality of work and rate of work were very dependent on operator experience.

Bale and twine damage was insignificant as long as the rail chain speed was matched with forward speed during loading or unloading. Losses of hay during loading and transport were insignificant.

The Hesston 5200 placed bales in same orientation as they were picked. This left the weathered outer shell relatively undisturbed to shed moisture, and resulted in negligible increased spoilage due to handling.

Table 2 gives an indication of expected work rate with an experienced operator. This table gives the average time, based on five trips, to load, transport and place a load of four large

round brome-alfalfa bales from a rough field yielding 2.2 t/ha (1 ton/ac). Each one-way trip involved 0.4 km (0.25 m) of travel from the field to a grid road and 0.8 km (0.5 m) of road travel. As can be seen, even for a short haul, most time is spent in transport rather than in loading or unloading.

Table 2. Average Rate of Work

Travel to Field (1.2 km)	6.8 Min
Load Four Bales	4.0 Min
Travel to Storage Yard (1.2 km)	7.3 Min
Unload Bales	1.9 Min
Round Trip	20 Min

OPERATOR SAFETY

The Hesston 5200 was safe to operate when the manufacturer's safety instructions are followed. Bystanders should not be close to the tongue and rails during operation. Maintenance should not be performed with a partial or full load. Large bales can cause severe injury.

The towing tractor should be sufficiently heavy and be equipped with good brakes, for road transport with a full load. The manufacturer recommends a minimum 38 kW (50 hp) tractor for safe road transport.

As mentioned previously, the method of attaching the SMV sign to the Hesston 5200 was unsatisfactory. A permanently affixed sign is required as normal operation involves transport on public roads.

Individual tire loads, under operating conditions, exceeded the Tire and Rim Association Standard maximum rating for the 11L x 15, 10-ply tires by 18%. This could be hazardous when operating the mover at high road speeds.

OPERATOR'S MANUAL

The operator's manual clearly outlined set-up, operation, adjustment and maintenance procedures. It was well written and easy to understand.

Durability

Table 3 outlines the mechanical history of the Hesston 5200 Round-Up multiple bale mover during 110 hours of operation while moving about 475 large round bales. The intent of the test was evaluation of functional performance. The following failures represent only those which occurred during functional testing. An extended durability evaluation was not conducted.

Table 3. Mechanical History

<u>Item</u>	<u>Hours</u>	<u>Number of Bales</u>
The rail chains stretched and required tightening at	5	36
This recurred at	14, 28, 76 and 97	112, 156, 364 and 408

Links were removed from the rail chain to permit sufficient tightening at 59 and 103 228 and 444

Discussion of Mechanical Problems

Rail Chains: The rail chains stretched during operation resulting in chain jumping at the drive sprocket. Stretching occurred continuously during the test requiring drawbolt adjustment or link removal.

The welded wire chain lugs on the rail chains also bent when picking bales on hard soil.

**APPENDIX I
SPECIFICATIONS**

Model: Hesston 5200 Round-Up Multiple Bale Mover

Serial Number: RU52-00599

Pickup Side: Left

Dimensions:

-Length	8300 mm (327 in)
-Width (road)	2400 mm (96 in)
(field)	3370mm (133 in)
-Bed Height	686 mm (27 in)
Length	6400 mm (252 in)
-Bed Rail Width	940 mm (37 in)
-Ground Clearance	254 mm (10 in)
-Tires	2, 11L x 15, 10 ply

Hydraulics:

-Tongue Cylinder	
Bore	76 mm (3 in)
Stroke	203 mm (8 in)
Retracted length	514 mm (20.25 in)
Port size	2, 1/2 NPTF
-Bed Cylinder (by customer)	
Bore	90 mm (3.5 in)
Stroke	203 mm (8 in)
Retracted length	514 mm (20.25 in)
Port size	2, 1/2 NPTF

Weight: (unloaded)

- Left Wheel	331 kg (730 lb)
- Right Wheel	524 kg (1155 lb)
-Hitch	143 kg (315 lb)
TOTAL	998 kg (2200 lb)

Load Capacity: 2725 kg (6000 lb)

Tractor Requirements:

-Manufacturer Recommended Minimum Size	37 kW (50 hp)
-Hydraulics	Dual
-Minimum Hydraulic System Pressure	13,300 kPa (2000 psi)

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

- (a) excellent
- (b) very good
- (c) good
- (d) fair
- (e) poor
- (f) unsatisfactory

APPENDIX III

METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI Units. For comparative purposes, the following conversion may be used:

1 hectare (ha)	= 2.47 acres (ac)
1 kilometre/hour (km/h)	= 0.62 miles/hour (mph)
1 tonne (t)	= 2204.6 pounds (lb)
1 tonne/hectare (t/ha)	= 0.45 ton/acre (ton/ac)
1 metre (m) - 1000 millimetres (mm)	= 39.37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds (lb)
1 kilopascal (kPa)	= 0.15 pounds/square inch (psi)



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