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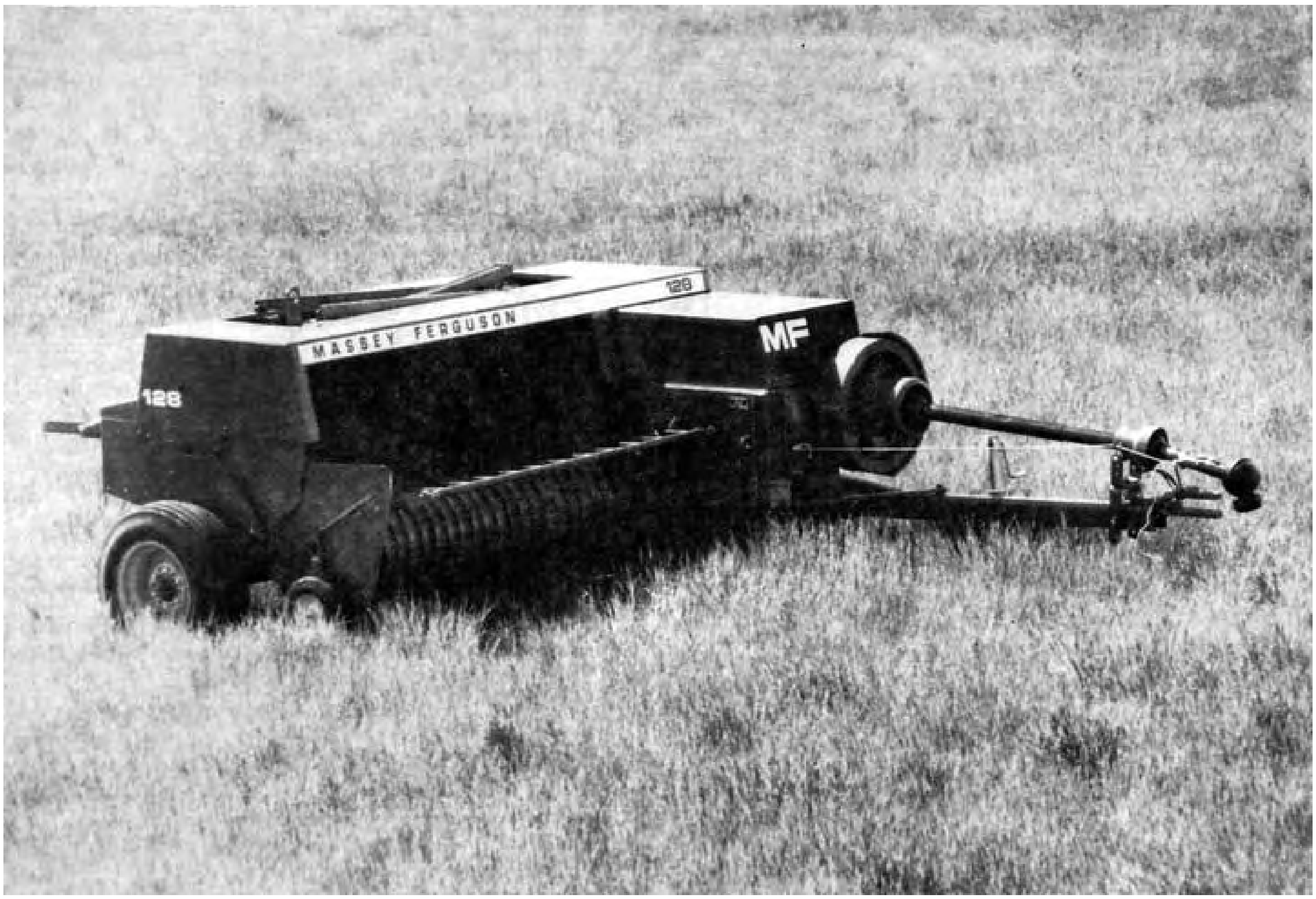
Evaluation Report 134



Massey Ferguson Model 128 Baler

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MASSEY FERGUSON MODEL 128 BALER

MANUFACTURER:
Massey Ferguson Inc.
1901 Bell Avenue
Des Moines, Iowa 50315
U.S.A.

DISTRIBUTOR:
Massey Ferguson Industries Limited
2615 Barlow Trail S.E.
Box 1340, Station T
Calgary, Alberta
T2H 2J1

RETAIL PRICE:
$7,136.00 (April, 1979, f.o.b. Lethbridge, complete with quarter turn bale chute and hydraulic bale density control).

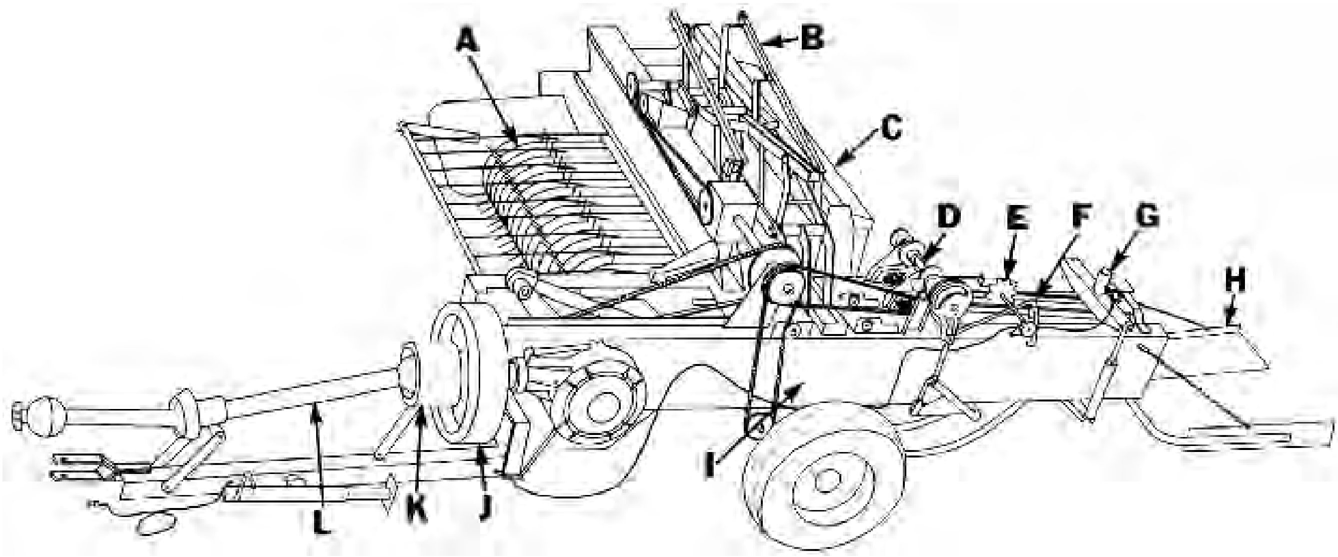


FIGURE 1. Massey Ferguson 128 Baler: (A) Pickup, (B) Packer Fork, (C) Twine Box, (D) Knotter, (E) Metering Wheel, (F) Metering Arm, (G) Hydraulic Bale Density Ram, (H) Bale Chute, (I) Bale Chamber, (J) Flywheel, (K) Slip Clutch, (L) Power Shaft.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Massey Ferguson 128 baler was very good.

Average feedrates varied from 4 to 10 t/h (4.4 to 11 ton/h). Field speeds were usually limited to 10 km/h (6.2 mph) due to bouncing on rough ground and reduced pickup performance at higher speeds. Maximum instantaneous feedrates in excess of 20 t/h (22 ton/h) were measured in heavy uniform alfalfa windrows. Feeding was aggressive in all crops.

The Massey Ferguson 128 was capable of producing firm, well-formed bales. Length of the 356 x 457 mm (14 x 18 in) bales could be adjusted from 560 to 1270 mm (22 to 50 in). Bale length variation, at the 1000 mm (39 in) length setting, was about 155 mm (6.1 in). For a certain length setting, longer bales were usually produced at higher feedrates. Average hay bales weighed from 28 to 32 kg (62 to 70 lb) while average straw bales weighed from 20 to 22 kg (44 to 48 lb). Bale density varied from 191 kg/m³ (11.9 lb/ft³) in heavy alfalfa to 113 kg/m³ (7.1 lb/ft³) in light straw.

The Massey Ferguson 128 was easy to operate and adjust. Knotter performance was excellent with very few field adjustments required.

Average power requirements were usually less than 25 kW (34 hp) but a 40 kW (55 hp) tractor was needed to overcome power take-off power fluctuations and to provide sufficient power on hilly or soft fields.

Leaf loss was usually less than 4%, similar to that of other conventional square balers.

The Massey Ferguson 128 was safe to operate if the manufacturer's safety recommendations were closely followed and normal safety precautions were observed.

Several mechanical problems occurred during the test. Interference between the hitch jack and rear tractor tire caused damage to the jack and mounting bracket. The outer pickup tension spring and eyebolt were lost and the pickup gauge spring broke. The bale chute chain and hook failed and inadequate fastening of the left side of the bale chute in transport position caused bale chute damage.

RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Specifying lubrication requirements for the plunger wrist pin bushing and packer fork crank bearing.
2. Repositioning the hitch jack to eliminate possible interference with the rear tractor tire on left turns.
3. Modifications to prevent the outer pickup tension spring eyebolt nut from loosening.
4. Modifications to prevent bale chute damage during transport.

Chief Engineer: E. O. Nyborg
Senior Engineer: E. H. Wiens
Project Engineer: K. W. Drever

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The plunger wrist pin bushing and packer fork crank bearing lubrication intervals will be added to the next edition of the operator's manual.
2. The hitch jack is on the left side of the tongue because most turning is to the right. We will investigate if a better location is feasible.
3. A jam or lock nut will be added to prevent the pickup tension spring eye bolt from loosening.
4. An anti-bounce device wilt be added to the quarter turn chute. We will also investigate if added transport security is desirable.

GENERAL DESCRIPTION

The Massey Ferguson 128 is a pull type, 540 rpm, power take-off driven, automatic twine tie baler. A floating drum pickup delivers hay to the feed chamber, where it is fed into the 356 x 457 mm bale chamber by a packer fork. Hay is compacted and bales formed by a slicing plunger operating at 80 strokes/min.

The test machine was equipped with an optional hydraulic bale density control, consisting of one hydraulic ram, operated by the tractor hydraulics and controlled from the tractor seat.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Massey Ferguson 128 was operated in a variety of crops (TABLE 1) for 122 hours while producing 19745 bales. It was evaluated for rate of work, quality of work, power consumption, ease of operation, ease of adjustment, operator safety, and suitability of the operator's manual.

TABLE 1. Operating Conditions

Crop	Hours	Number of Bales	Field Area (ha)
Alfalfa	52	8311	58
Alfalfa, Bromegrass	20	3259	21
Bromegrass	7	1320	16
Crested Wheatgrass	7	758	15
Green Feed	1	144	2
Wheat Straw	34	5853	79
Oat Straw	1	100	1
Total	122	19745	192

RESULTS AND DISCUSSION

RATE OF WORK

Average feedrates varied from 4 t/h in light straw to 10 t/h in heavy alfalfa. Average feedrate depended on windrow size and uniformity, crop condition, field surface, available tractor speeds and operator skill. Speeds were normally limited to about 10 km/h, due to bouncing on rough ground and poorer pickup performance at higher speeds.

In heavy, uniform alfalfa windrows, instantaneous feedrates of over 20 t/h were measured. These were peak values, representing maximum baler capacity, which could not be maintained continuously.

Feeding was aggressive in all crops.

QUALITY OF WORK

Bale Quality: The Massey Ferguson 128 was capable of producing firm, durable bales, with square ends, in all crops (FIGURE 2). Average hay bales weighed 28 to 32 kg while average straw bales weighed 20 to 22 kg. Average bale density varied from 191 kg/m3 in heavy alfalfa to 113 kg/m3 in light straw.

Bale Length Variation: As with most conventional square balers, it was difficult to obtain consistent bale length, especially in nonuniform windrows. When set for 1000 mm length, bale lengths typically varied from 925 to 1080 mm.

Bale length is adjusted by positioning the metering arm stop (FIGURE 3). The metering wheel advances the metering arm with each plunger stroke. Bale length uniformity depends on a consistent number of plunger strokes to form each bale. If the metering arm trips at the beginning of the last plunger stroke, rather than at the end of the stroke, bale length is increased by the length of compressed hay delivered during the last plunger stroke. Uniform feedrates are therefore important in reducing bale length variation.

For the same length setting, higher feedrates usually produced longer bales. For example, in a uniform alfalfa field, average bale length was 1020 mm when baling at 5 t/h but increased to 1060 mm at 15 t/h. The same trend was evident in wheat straw with average bale length increasing from 960 mm at 3 t/h feedrate to 1030 mm at 15 t/h.

Leaf Loss: As with most conventional square balers, leaf loss in dry hay was lower than with round balers. Total loss from the pickup and bale chamber was less than 4% in most field conditions. Pickup losses were normally insignificant unless ground speed was very high or windrows were light and poorly formed.

Knotter Reliability and Performance: The knotters tied most twines very well with very few field adjustments. There was no need for changing billhooks when switching from sisal to synthetic twines. Knot strength was about 65% of twine tensile strength with synthetic twines and about 40% of tensile strength with sisal twines.

POWER CONSUMPTION

Power Take-Off Requirements: FIGURE 4 shows typical instantaneous power take-off requirements for the Massey Ferguson 128. Power requirements fluctuated from 0 to 26 kW on each plunger stroke. Due to these wide power fluctuations, average power requirements were less than instantaneous requirements, varying from 5 to 21 kW, over a full range of feedrates. FIGURE 5 shows the average power take-off requirements at various feedrates in alfalfa and wheat straw.

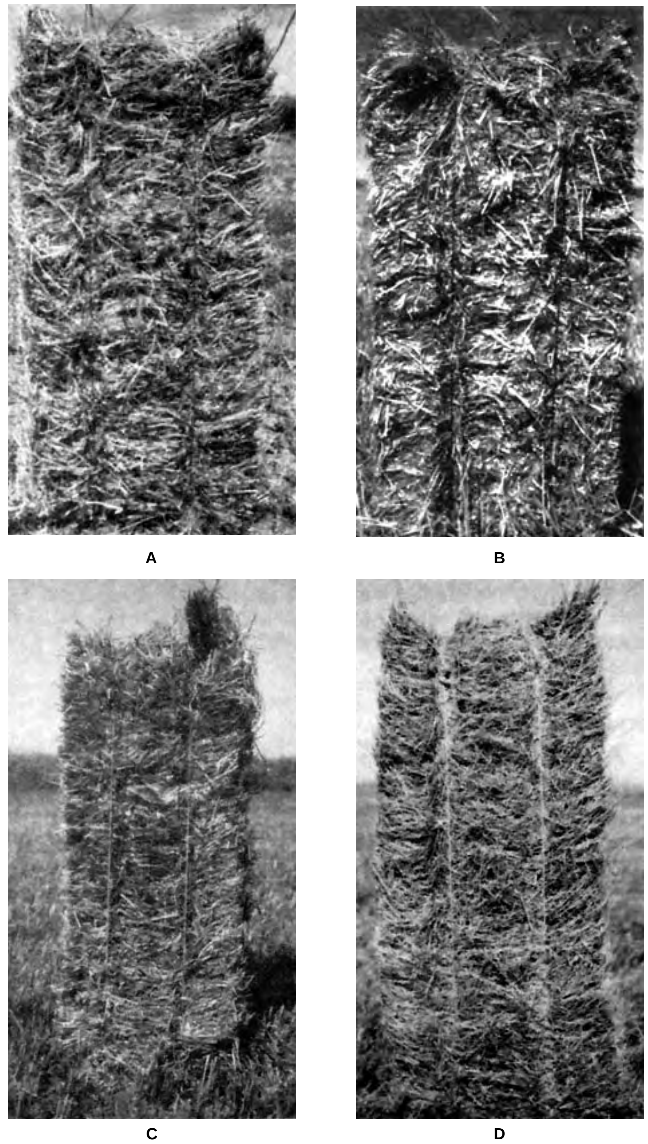


FIGURE 2. Typical Bales: (A) Alfalfa, (B) Straw, (C) Green Feed, (D) Crested Wheatgrass.

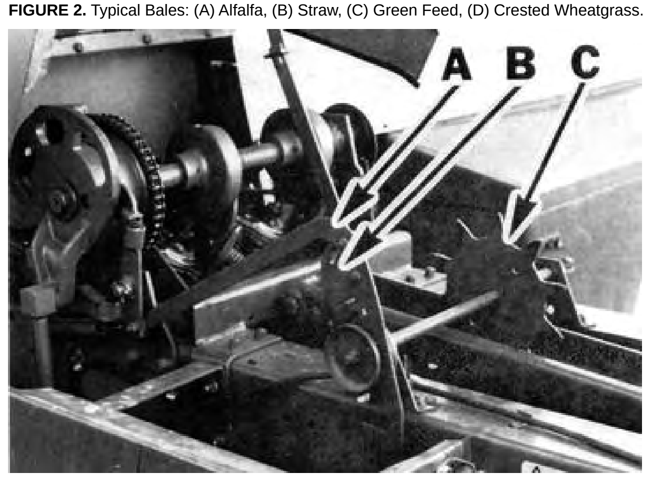


FIGURE 3. Bale Length Adjustment: (A) Metering Arm, (B) Adjustable Stop, (C) Metering Wheel.

Tractor Size: The manufacturer recommended a minimum tractor size of 22 kW. Average power take-off requirements were usually less than 21 kW and power required to pull the baler on level ground was usually less than 5 kW. A 40 kW tractor was, however, needed to fully utilize baler capacity in soft or hilly fields and to overcome the power fluctuations illustrated in FIGURE 4.

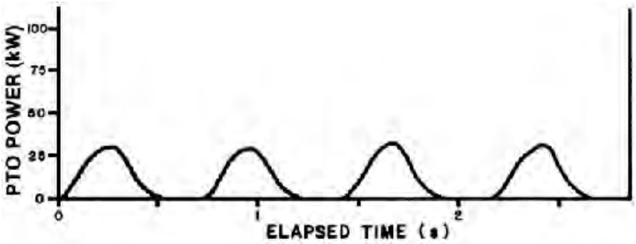


FIGURE 4. Instantaneous Power Take-off Requirements when Baling Alfalfa at 10 t/h Feedrate.

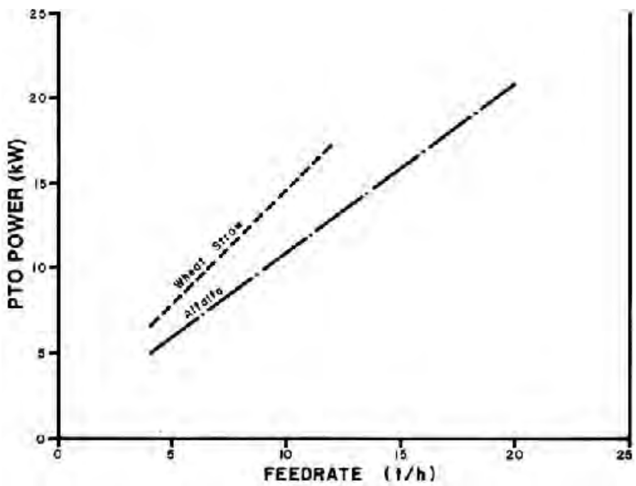


FIGURE 5. Average Power Take-off Requirements when Baling Alfalfa and Straw.

Specific Capacity: Specific capacity is a measure of how efficiently a machine performs a task. A high specific capacity indicates efficient energy use while low specific capacity indicates inefficient operation. The specific capacity of the Massey Ferguson 128 varied from 0.8 to 1.0 t/kW•h in alfalfa and from 0.6 to 0.7 t/kW•h in wheat straw. This compares to an average specific capacity of 0.5 t/kW•h for large round bales in alfalfa. These values represent average conditions and not peak outputs.

EASE OF OPERATION

Hitching: The Massey Ferguson 128 was easily hitched to tractors equipped with a 540 rpm power take-off. The hitch jack was convenient for raising or lowering the hitch tongue. The power shaft pedestal and hitch clevis were adjustable to suit drawbar heights.

Transporting: The hitch tongue could be swung into transport or field position without getting off the tractor. Dismounting the tractor was necessary to fold the bale chute and to raise the pickup. The Massey Ferguson 128 could normally be placed into transport or field position in about two minutes.

The baler towed well behind a tractor or suitably sized truck.

Feeding: Feeding was aggressive and positive in all crops. The pickup was wide enough to accommodate most windrows with minimal trampling by the rear tractor tire. Pickup visibility was excellent from most tractors.

Maneuverabilty: The Massey Ferguson 128 was sufficiently maneuverable for efficient baling. Care had to be exercised on sharp left turns to prevent interference between the hitch jack and the left tractor tire.

Twine Threading: Twine threading was convenient. The operator's manual gave a clear description of twine threading procedures.

EASE OF ADJUSTMENT

Bale Length: Bale length was conveniently adjusted with a wrench. Bale length settings from 560 to 1270 mm were possible. Obtaining a consistent bale length was difficult, since bale lengths varied, depending on windrow uniformity and feedrate.

Bale Density: The optional hydraulic bale density control could be conveniently adjusted from the tractor seat. The pressure gauge, located on the tractor fender, was a convenient indicator for setting bale density.

The bale density control used the tractor hydraulics as a pressure source requiring hydraulics with a "float" position, hydraulics with internal pressure control or single acting hydraulics. The procedure for adjusting pressure was to pressurize the system using the tractor hydraulics and then to loosen the check valve until the desired pressure was obtained with the tractor hydraulic valve in the open or "float" position. Alternatively, if the tractor was equipped with internal pressure control, this could be used to adjust hydraulic pressure. Some experience was required to obtain desired bale density. Density for a given pressure setting varied with different crops and moisture conditions and occasionally pressure dropped as each bale was ejected from the bale chamber.

The bale density control had sufficient adjustment range to produce dense bales in most crops. Normally, twine knot strength was the only factor limiting bale density. In very light windrows or very slippery hay, additional bale wedges had to be installed in the bale chamber.

Feeding System: The packer fork (FIGURE 1) had three settings, which were adequate to produce square, well formed bales in all crops. The packer fork was conveniently adjusted by hand.

Pickup: Pickup height was easily adjusted without tools (FIGURE 6). A wrench was needed to position the pickup gauge wheel.

The pickup windguard was adjustable to suit windrow size. Wrenches were required.

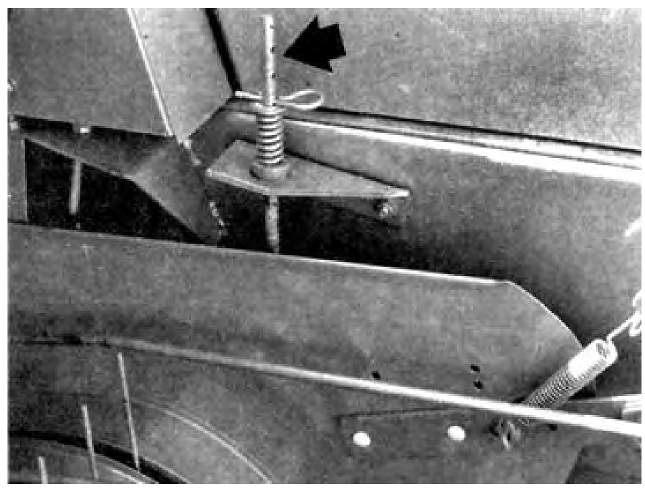


FIGURE 6. Pickup Height Adjustment.

Overload Devices: The drive shaft slip clutch functioned well and required no adjustment during the test. Replacing the flywheel shear bolt was convenient.

Bale Chute: The optional quarter turn bale chute was easily adjusted to place the bales on edge. The bale chute was reversible so bales could be dropped on either the left or right side.

Servicing: The Massey Ferguson 128 had five chain drives, 12 grease fittings and one gear box. The operator's manual recommended chain oiling every 10 hours, lubrication of five grease fittings and servicing the gear box every 50 hours, and lubrication of the five knotter grease fittings and packing the wheel bearings annually. About seven minutes were needed to service the Massey Ferguson 128. Shields made lubrication of the power shaft universal joint grease fittings awkward.

Tool Box: A box located in the twine box was provided for storing small tools and spare shear bolts. The box was of limited use since it quickly filled with hay (FIGURE 7), making small pieces difficult to find.

OPERATOR SAFETY

The Massey Ferguson 128 was safe to operate and service if normal safety precautions were observed. All moving parts were well shielded. As with most power take-off equipment, the power take-off must be disengaged and the tractor engine stopped before adjusting or servicing.

OPERATOR'S MANUAL

The operator's manual was clear, well written and contained much useful information on operation, servicing, adjustments and safety procedures. It did not include a lubrication schedule for plunger wrist pin bushing and packer fork crank grease fittings. It is recommended that lubrication requirements for these fittings be included.

DURABILITY RESULTS

TABLE 2 outlines the mechanical history of the Massey Ferguson 128 during 122 hours of field operation while baling 19745 bales. The intent of the test was functional evaluation. The following failures represent only those, which occurred during functional testing. An extended durability evaluation was not conducted.

TABLE 2. Mechanical History

Item	Operating Hours	Equivalent Bales
Frame Assembly		
-The hitch bolts loosened and were tightened at	6, 120	970, 19,420
-The hitch jack bracket was bent and the jack crown gear broke. The bracket was straightened and the jack repaired at	41	6640
Pickup Assembly		
-The outer pickup tension spring and eye bolt were lost and replaced at	41	6640
-Two pickup teeth were bent while rebaling broken bales and replaced at	69	11,170
-Another broken pickup tooth was replaced at	104	16,830
-Dirt build up, on the pickup drive cam lobe caused the pickup to stop turning. The dirt was removed at	88	14,240
-The pickup gauge spring broke at	104	16,830
Knotter Assembly		
- The bale counter trip arm jammed, breaking the counter. The counter was replaced at	5	810
-The right twine retaining spring was broken and replaced at	20	3240
-The right knotter drive gear roll pin broke and was replaced at	30	4860
-The knotter pillow block bearing mounting bolts loosened and were tightened at	69	11,170
-The needles came out of time, bending the left needle. The needle was straightened and the needles retimed at	76	12,300
-The left knotter knife was sharpened at	93	15,050
Bale Chute		
-Sharp edges on the bale chute were cutting the twine as bales were ejected. The edges were filed smooth at	7	1130
-The bale chute chain had stretched and was replaced at	60	9710
-The right bale chute hook broke and was rewelded at	62	10,030
-The bale chute bent and was straightened at	70, 86	11,330, 13,920
-The left bale chute hinge bolt sheared while operating on rough ground and was replaced at	79, 61	12,790, 13,110
-The inside edge of the bale chute was cracked at	End of Test	
Hydraulic Bale Density Control		
-The pipe fittings to the density control pressure gauge leaked. The leaks were repaired at	Beginning of Test	

DISCUSSION OF MECHANICAL PROBLEMS FRAME ASSEMBLY

Hitch Jack: The hitch jack bracket bent and the crown gear was broke due to interference between the rear tractor tire and the jack on sharp left turns. The jack and bracket were repaired and care was exercised when turning to the left. It is recommended that the manufacturer consider repositioning the jack to prevent possible interference between the jack and tractor tire.

PICKUP ASSEMBLY

Pickup Tension Spring: The eye bolt on the outer pickup tension spring was equipped with only one nut. Field vibration caused the nut to loosen and the spring and eye bolt to be lost. The eye bolt and spring were replaced, and two nuts installed. It is recommended that the manufacturer consider modifications to prevent the eye bolt nut from loosening.

Pickup Gauge Spring: The spring on the pickup gauge spring broke in two places, due to fatigue, after 104 hours of use (FIGURE 8).

BALE CHUTE

Chain and Hook: The bale chute chains deformed (FIGURE 9) and the right bale chute hook failed at the weld. The chain was replaced and the hook rewelded.

Transporting Problems: Occasionally the chain on the left side of the bale chute loosened when transporting, allowing the bale chute to dig in the ground. It is recommended that the manufacturer consider modifications to prevent this occurrence.

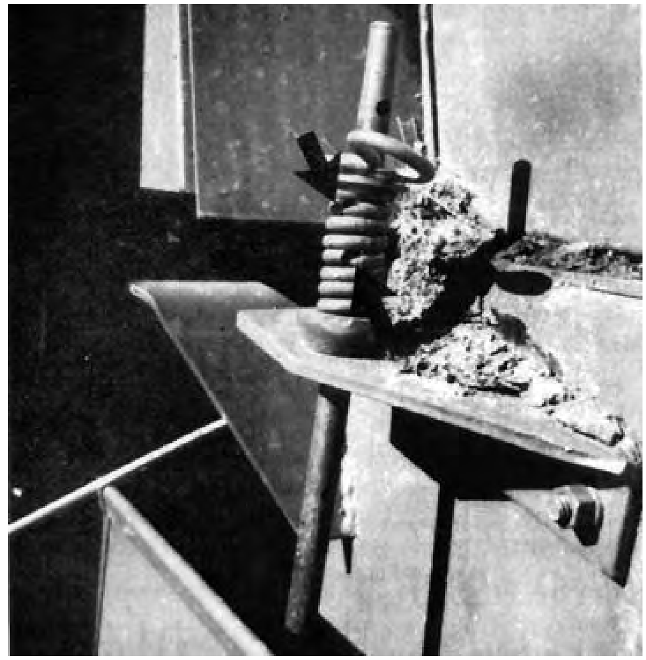


FIGURE 8. Broken Pickup Gauge Spring.

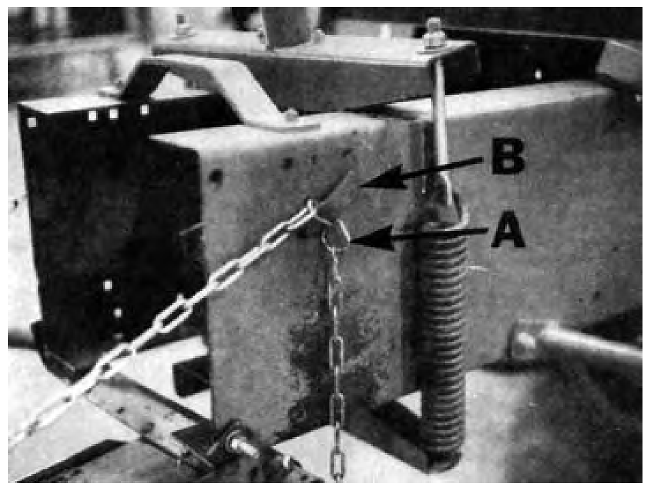


FIGURE 9. Bale Chute Chain Assembly: (A) Deformed Chain, (B) Bale Chute Hook.

APPENDIX I
SPECIFICATIONS

MAKE:	Massey Ferguson 540 rpm Power Take-off Baler
MODEL:	128
SERIAL NUMBER:	601242
OVERALL DIMENSIONS:	
-- width	2950 mm
-- length	6075 mm
-- height	1500 mm
-- ground clearance	230 mm
WEIGHTS: (field position)	
-- left wheel	853 kg
-- right wheel	472 kg
-- hitch	161 kg
TOTAL	1486 kg
TIRES:	
-- left	9.5L x t 5, 6-ply rib implement
-- right	9.5L x 15, 6-ply rib implement
-- pickup gauge	3.00 x 12 semi pneumatic
PICKUP:	
-- type	cam actuated drum pickup
-- height adjustment	adjustable rod
-- width	1730 mm
-- number of tooth bars	6
-- number of teeth	126
-- tooth spacing	75 mm
-- speed	74 rpm
FEEDING MECHANISM:	
-- type	packer fork
-- speed	80 strokes/min
PLUNGER:	
-- strokes per minute	80
-- length of stroke	762 mm
BALE CHAMBER:	
-- width	457 mm
-- height	356 mm
-- range of bale lengths	560 to 1270 mm
-- bale density control	compression bars (primary) side wedges (secondary)
TWINE CAPACITY:	6 balls
DRIVES:	
-- number of chain drives	5
-- number of gear drives	2
-- number of universal joints	3
SAFETY FEATURES:	
-- power take-off	slip clutch
-- flywheel	shear bolt
-- plunger	safety stop
SERVICING:	
-- grease fittings	(every 50 hours) 7 (annually) 5
-- chains	(oil every 10 hours) 5
-- gearbox	1
-- wheel bearings	2

OPTIONAL EQUIPMENT:
- -- plunger face extension
- -- remote pickup lift
- -- swinging wagon hitch
- -- tail gate and wagon loading chute
- -- quarter turn bale chute*
- -- hydraulic bale density control*
- -- bale thrower

*supplied on test machine

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

(a) excellent	(d) fair
(b) very good	(e) poor
(c) good	(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 conversions may be used.

1 hectare (ha)	= 2.47 acres (ac)
1 kilometre/hour (kin/h)	= 0.62 miles/hour (mph)
1 tonne (t)	= 2204.6 pounds (lb)
1 tonne/hour (t/h)	= 1.10 ton/hour (ton/h)
1 tonne/hectare (t/ha)	= 0.45 ton/acre (ton/ac)
1000 millimetres (mm) = 1 metre (m)	= 39,37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.20 pounds mass (lb)
1 kilogram/cubic metre (kg/m³)	= 0.06 pounds mass/cubic foot (lb/ft³)
1 tonne/kilowatt hour (t/kW•h}	= 0.82 tons/horsepower hour (ton/hp•h)

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