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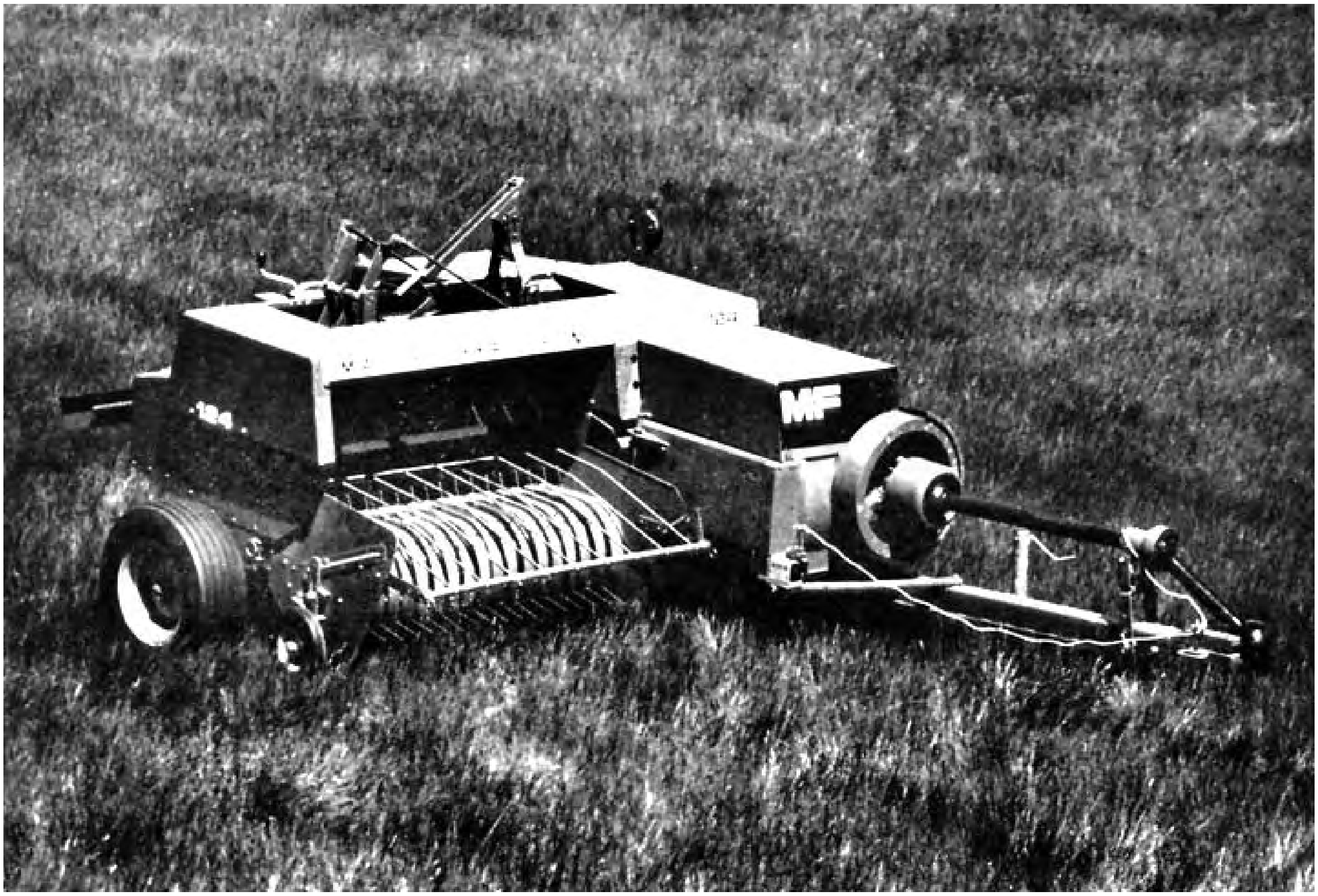
Evaluation Report 235



Massey Ferguson Model 124 Baler

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

MASSEY FERGUSON MODEL 124 BALER

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

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

RETAIL PRICE:
$7455.50 (July, 1981, f.o.b. Lethbridge, complete with quarter turn bale chute, pick-up gauge wheel, bale counter and bale chamber wedges).

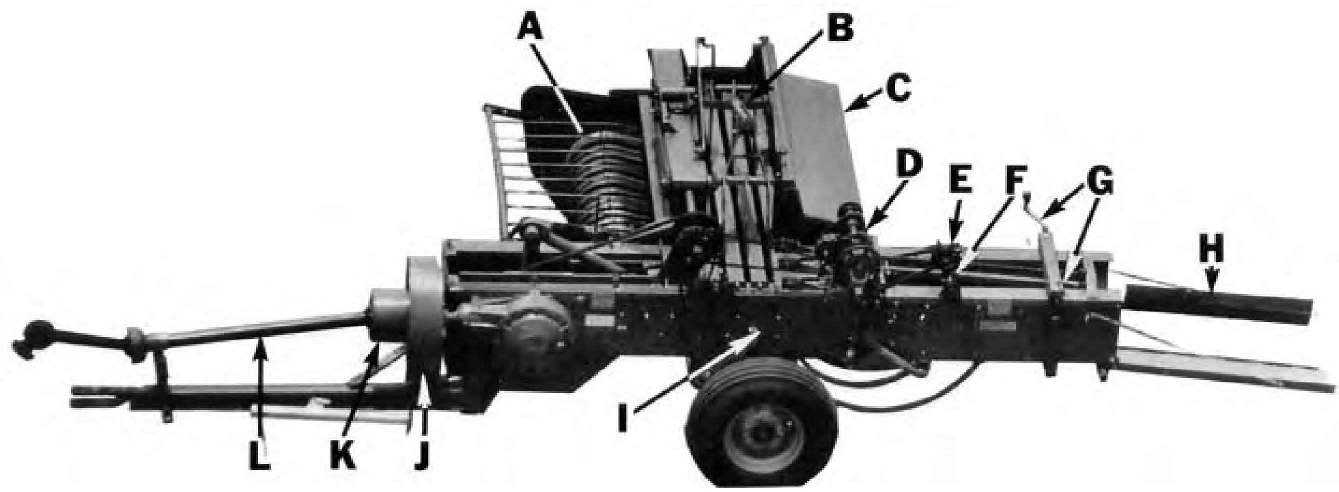


FIGURE 1. Massey Ferguson 124 Baler: (A) Pickup, (B) Packer Fork, (C) Twine Box, (D) Knotters, (E) Metering Wheel, (F) Metering Arm, (G) Bale Density Adjustment, (H) Quarter Turn Bale Chute, (I) Bale Chamber, (J) Flywheel, (K) Slip Clutch, (L) Power Shaft.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Massey Ferguson 124 baler was very good.

Average feedrates varied from 3 to 8 t/h (3.3 to 8.8 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 15 t/h (16.5 ton/h) were measured in heavy uniform alfalfa windrows. Feeding was aggressive in all crops.

The Massey Ferguson 124 was capable of producing firm, well formed bales. Length of the 356 x 457 mm (14 x 18 in) bales could be adjusted from 558 to 1270 mm (22 to 50 in). Bale length variation, at the 1000 mm (39.4 in) setting was about 100 mm (3.9 in). For a certain length setting, longer bales were usually produced at higher feedrates. Average hay bales weighed from 22 to 35 kg (48 to 77 lb) while average straw bales weighed from 20 to 25 kg (44 to 55 lb). Bale density varied from 142 to 235 km/m³ (8.5 to 14.1 lb/ft³) in hay and from 127 to 143 kg/m³ (7.6 to 8.7 lb/ft³) in straw.

The Massey Ferguson 124 was easy to operate and adjust. Knotter performance was good with most twines if the knotters were adjusted to the manufacturer's specifications. Little or no adjustment was required when changing from sisal to synthetic twine.

Average power requirements were usually less than 21 kW (28 hp) but a 40 kW (54 hp) tractor was needed to overcome power take-off power fluctuations and to provide sufficient power in hilly and soft fields.

Total leaf and stem loss was usually less than 3%, similar to that of other conventional square balers.

The Massey Ferguson 124 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. A weld failed on both the hitch and knotter frame. The metering arm slipped on the metering drive wheel. Three billhook gear roll pins broke and loose nuts and bolts were a frequent problem.

RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Providing an adequate means of securing the bale chute in transport position.
2. Providing improved lubrication access to the rear power shaft universal joint.

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Project Engineer: R. K. Allam
Project Technologist: P. A. Bergen

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. An improved means of securing the bale chute will be investigated.
2. Improved lubrication access to the rear power shaft universal joint will be included on all later model balers.

NOTE: This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX III.

GENERAL DESCRIPTION

The Massey Ferguson 124 is a pull-type, 540 rpm, power take-off driven automatic tie baler. A floating drum pickup delivers hay to the feed chamber where it is fed into the 356 x 457 mm (14 x 18 in) bale chamber by a packer fork. Hay is compacted and bales formed by a slicing plunger operating at 80 strokes per minute.

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

SCOPE OF TEST

The Massey Ferguson 124 was operated in a variety of A crops (TABLE 1) for 120 hours while producing 21,065 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
Alfalfa	20	3390
Alfalfa, Bromegrass	24	3650
Bromegrass	12	1795
Greenfeed	3	380
Wheat Straw	36	7345
Barley Straw	25	4505
Total	120	21,065

RESULTS AND DISCUSSION

RATE OF WORK

Average feedrates varied from 3 t/h (3.3 ton/hr) in light alfalfa-bromegrass to 8 t/h (8.8 ton/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 (6.2 mph) due to bouncing on rough ground and poorer pickup performance at higher speeds.

In heavy, uniform alfalfa windrows, instantaneous feedrates in excess of 15 t/h (16.5 ton/h) were measured. These were peak values representing maximum baler capacity, which could not be maintained continuously.

Feeding was aggressive in all crops. Feed rate was usually limited by slippage of the power take-off slip clutch or shearing of the flywheel shear bolt. In very dry conditions, feed rate was limited by pickup and packer fork performance.

QUALITY OF WORK

Bale Quality: The Massey Ferguson 124 was capable of producing firm, durable bales with square ends in all crops (FIGURE 2). Average hay bales weighed 22 to 35 kg (48 to 77 lb), while average straw bales weighed 20 to 25 kg (44 to 55 lb). Average bale density varied form 142 to 235 kg/m^3 (8.5 to 14.1 lb/ft^3) in hay and 127 to 145 kg/m^3 (7.6 to 8.7 lb/ft^3) in straw.

Bale Length Variation: As with most conventional square balers it was difficult to obtain consistent bale length, especially in non-uniform windrows. When set for 1000 mm (39.4 in) length, bale lengths typically varied form 950 to 1050mm (37.4 to 41.3 in).

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 crop, average bale length was 900 mm (35.4 in) when baling at 5 t/h (5.5 ton/h), but increased to 950 mm (37.4 in) at 10 t/h (11 ton/h). The same trend was evident in wheat straw with average bale length increasing from 1045 mm (41.1 in) at 3 t/h (3.3 ton/h) feedrate to 1170 mm (46.1 in) at 10 t/h (11 ton/h).

Leaf and Stem Loss: As with most conventional square balers, leaf loss in dry hay was lower than with round balers. In most field conditions total loss from the pickup and bale chamber was less than 3%. Pickup losses were insignificant unless ground speed was very high or windrows were light and poorly formed.

Knotter Reliability and Performance: The knotters, when properly adjusted, performed well with most twines. Little or no adjustment was required when switching from sisal to synthetic twines. If, for some reason, the twine had to be rethreaded, several misties would occur until the twine was properly held by the twine retainer.

POWER CONSUMPTION

Power Take-off Requirements: FIGURE 4 shows typical instantaneous power take-off requirements for the Massey Ferguson 124. Power requirements fluctuated from 0 to 33 kW (0 to 44 hp) on each plunger stroke. Due to these wide power fluctuations, average power requirements were less than instantaneous requirements, varying from 7 to 21 kW (9 to 28 hp) over a full range of feedrates. FIGURE 5 shows the average power take-off requirements at various feedrates in alfalfa and wheat straw.

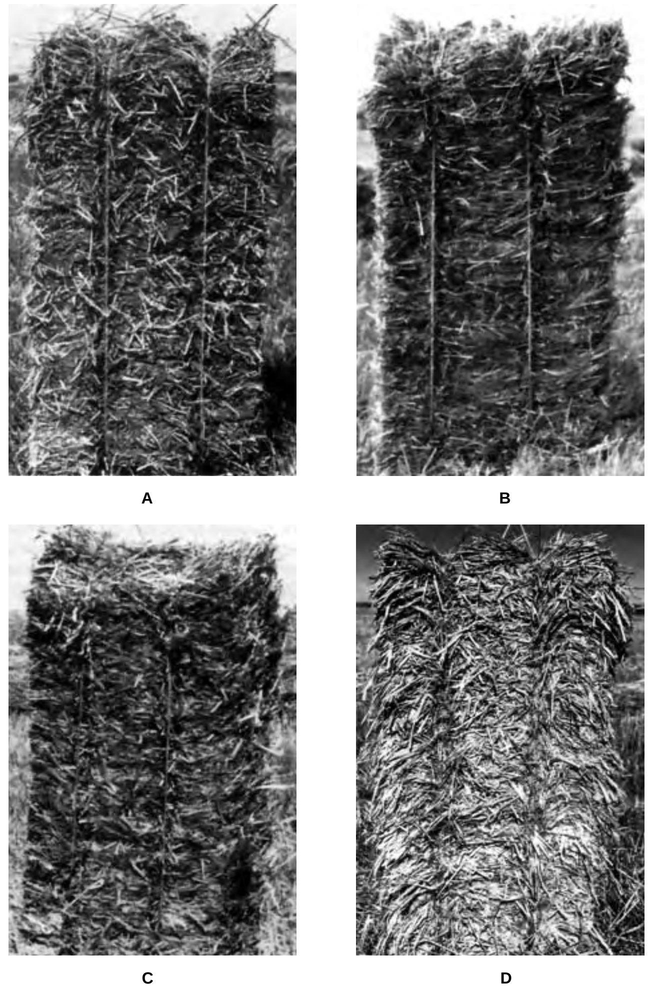

FIGURE 2. Typical Bales: (A) Alfalfa, (B) Bromegrass, (C) Greenfeed, (D) Straw.

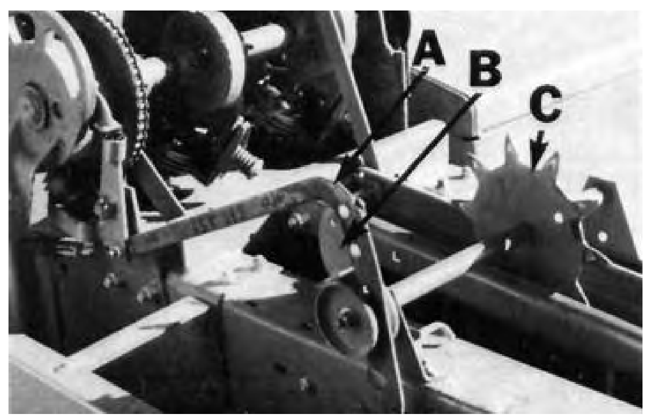

FIGURE 3. Bale Length Adjustment: (A) Metering Arm, (B) Adjustable Stop, (C) Metering Wheel.

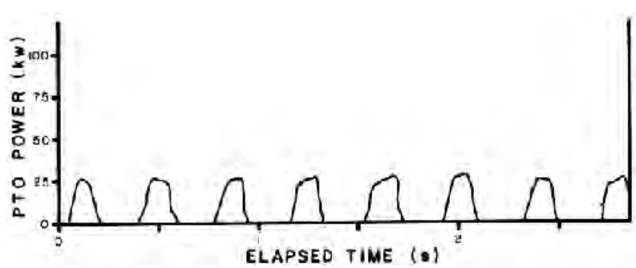

FIGURE 4. Instantaneous Power Take-off Requirements when Baling Alfalfa at 8 t/h Feedrate.

Tractor Size: The manufacturer recommended a minimum tractor size of 23 kW (31 hp). Average power take-off requirements were usually less than 21 kW (28 hp) and power required to pull the baler on level ground was usually less than 4 kW (5 hp). A 40 kW (54 hp) tractor was, however, needed to fully utilize baler capacity in soft or hilly fields and to overcome the power fluctuations illustrated in FIGURE 4.

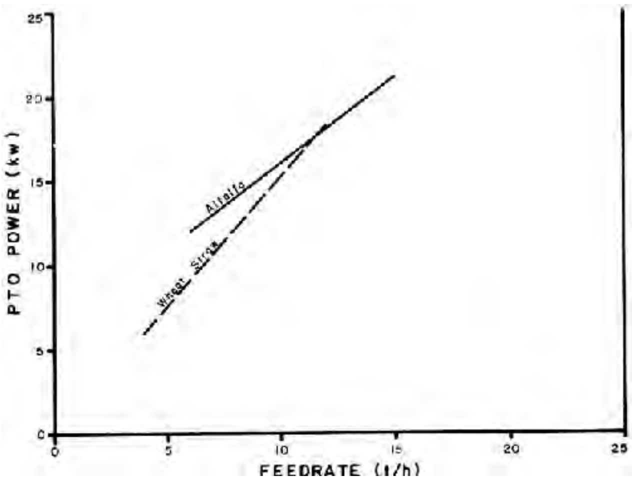

FIGURE 5. Average Power Take-off Requirements when Baling Alfalfa and Straw.

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 124 varied from 0.4 to 0.7 t/kW•h (0.3 to 0.6 ton/hp•h) in alfalfa and from 0.6 to 0.7 t/kW•h (0.5 to 0.6 ton/hp•h) in wheat straw. This compares to an average specific capacity of 0.5 t/kW•h (0.4 ton/hp•h) for large round balers in alfalfa. These values represent average conditions and not peak output.

EASE OF OPERATION

Hitching: The Massey Ferguson 124 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 hitch clevis and power shaft pedestal were adjustable to suit drawbar height.

Transporting: Occasionally is was necessary to get off the tractor when swinging the hitch tongue into transport or field position to align the locking pin with the hole. Dismounting the tractor was necessary to fold the bale chute and raise the pickup. The Massey Ferguson 124 could normally be placed in transport or field position in about three minutes.

The bale chute, in its folded position during transport (FIGURE 6) was inadequately secured. When transporting on rough roads, the bale chute chains easily became dislodged from their hooks. It is recommended that the manufacturer consider providing an improved means of securing the bale chute in its folded position.
The baler towed well behind a tractor or suitable sized truck.

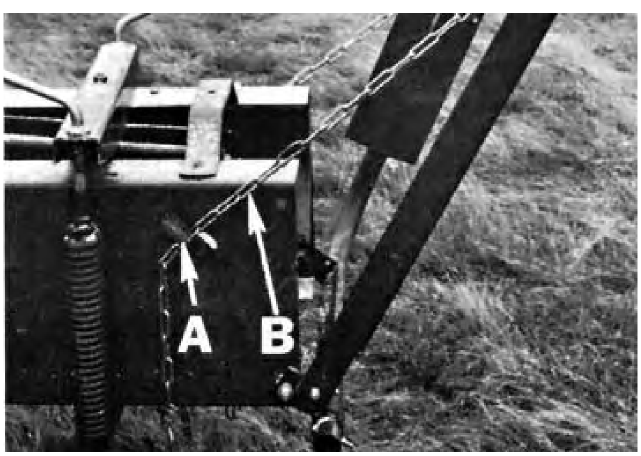

FIGURE 6. Bale Chute in Transport Position: (A) Hook, (B) Link.

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

Maneuverability: The Massey Ferguson 124 was sufficiently maneuverable for efficient baling. Care had to be exercised on sharp left turns to prevent interference between the hitch jack and 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 558 to 1270 mm (22 to 50 in) were possible. Obtaining a consistent bale length was difficult, since bale lengths varied, depending on windrow uniformity and feedrate.

Bale Density: Bale density was easily adjusted by hand cranks, located at the rear of the bale chamber. Setting the cranks for a specific crop was a trial and error procedure and required the operator to dismount the tractor.

The hand cranks provided sufficient adjustment range to produce bales of adequate density in most crops. Normally, twine knot strength was the only factor limiting bale density. In very dry conditions or light windrows, additional bale wedges had to be installed in the bale chamber.

Feeding System: The packer fork 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 7). A wrench was needed to position the optional pickup gauge wheel. Wrenches were also required to adjust the pickup windguard for various windrow sizes. The windguard was easily removed without tools for convenient access to the feeding area.

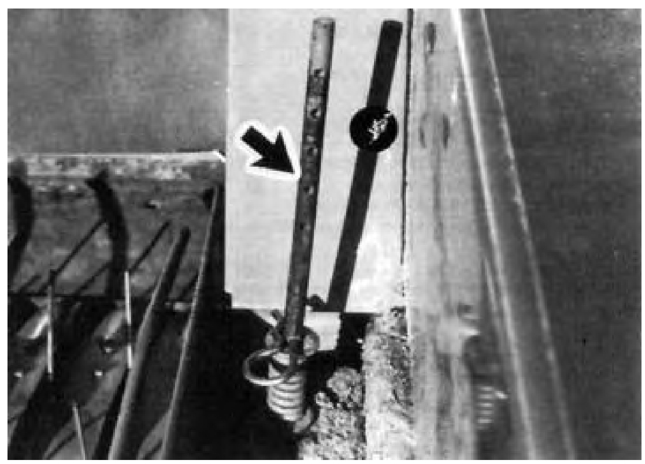

FIGURE 7. Pickup Height Adjustment.

Overload Devices: The drive shaft slip clutch functioned well, requiring adjustment only once during the test. This adjustment was inconvenient as no further spring adjustment was provided. Washers were added to the clutch springs to increase slipping torque. Replacing the flywheel shearbolt was convenient. The packer fork shear bolt did not require replacement during the test.

Bale Chute: The quarter turn bale chute was easily adjusted to place the bales on edge. Due to the large chain link increments the bale chute could not be adjusted level with the bale chamber, causing slightly bowed bales in some crops. The bale chute was reversible so bales could be dropped on either the left or right side.

Servicing: The Massey Ferguson 124 had five drive chains, 15 grease fittings and two gearboxes. The operator's manual recommended chain oiling every 10 hours, lubrication of nine grease fittings and inspection of the main gearbox every 50 hours and lubrication of five knotter grease fittings and packing the wheel bearings annually. About eight minutes were required for daily servicing of the Massey Ferguson 124. The shielding at the rear power shaft universal joint prevented access for lubrication. A notch was cut in the shielding to permit lubrication. It is recommended the manufacturer provide improved lubrication access to the rear power shaft universal joint.

Tool Box: A tool box located in the twine box was provided for storing small tools and spare shear bolts.

OPERATOR SAFETY

The Massey Ferguson 124 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.

DURABILITY RESULTS

TABLE 2 outlines the mechanical history of the Massey Ferguson 124 during 120 hours of field operation while baling 21,065 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		
-A hitch bolt nut was lost and replaced at	52	8130
-A needle protection frame nut was lost and replaced at	52	8130
-The bottom tension rail securing bolt nut was lost and replaced at	52	8130
-A hitch weld broke and was rewelded at	69	11,880
Drive Train		
-The slip clutch was tightened to manufacturer's specifications at	beginning of test	
-The slip clutch began slipping excessively and was readjusted at	67	11,550
-The power take-off set screw loosened and was tightened at	77	13,460
Pickup Assembly		
-Two pickup teeth broke and were replaced at	79	13,790
-Another broken pickup tooth was replaced at	81	14,160
-The pickup overrunning drive filled with chaff and dirt, causing the pickup to stop turning. The drive was cleaned at	81	14,160
Feeder Assembly		
-The packer fork timing was incorrect and was adjusted to specifications at	beginning of test	
-Three of the four bolts which mount the packer fork drive gearbox were lost and replaced at	48	7500
Knotter Assembly		
-Needle to knotter clearances were adjusted to specifications at	beginning of test	
-The plunger safety stop clearance was adjusted to specifications at	beginning of test	
-The bale counter glass was lost. The counter was replaced at	3	210
-The metering arm began slipping on the metering drive wheel causing extreme bale length variation. The metering arm and spring were replaced at	6	330
--he bolt securing the right knotter frame to the bale chamber was lost and replaced at	10	1350
-The knotter knives were sharpened at	20	2630
-The left needle to knotter clearance was checked and readjusted at	73	12,690
-The left knotter billhook gear roll pin broke and was replaced at	52	8130
-The right knotter billhook gear roll pin broke and was replaced at	87, 93	14,960, 16,120
-Knotter clearances were checked and adjusted to specifications at	87	14 960
-The needle safety latch adjustment was checked and readjusted at	93	16,120
-The metering arm spring was lost and replaced at	108	18,510
-The left knotter mounting frame weld broke at the base causing the knotter assembly to shift. The mount was repaired at	end of test	
Bale Chute		
-Two nuts and a bolt were lost on the bale chute. They were replaced at	79	13,790

DISCUSSION OF MECHANICAL PROBLEMS

FRAME ASSEMBLY

Hitch: A weld at the hitch pivot point failed (FIGURE 8), causing the baler to sag. The failure occurred because of an incomplete weld. The hitch was rewelded and no further problems were encountered.

Loose Nuts and Bolts: Loose nuts and bolts were a frequent problem on the Massey Ferguson 124. The power take-off set screw loosened, requiring tightening. Nuts were lost on the hitch clevis, right knotter frame, needle protection frame, bottom tension rail, packer finger drive and the bale chute; all requiring replacement.

KNOTTER ASSEMBLY

Metering Arm: The metering arm began slipping on the metering drive wheel (FIGURE 3), causing extreme bale length variation. The friction edge of the metering arm was too smooth for the metering drive wheel to grip consistently in normal baling conditions. The metering arm and the metering arm tension spring were replaced. No further problems were encountered.

Billhook Gear Roll Pin: The billhook gear roll pins broke on two occasions due to fatigue. On one occasion the roll pin failed due to binding between the knotter and billhook gears.

Knotter Frame: The weld on the left knotter mounting frame failed (FIGURE 9) as a result of a poor weld. The mounting frame was rewelded and no further problems were encountered.

FIGURE 8. Broken Hitch Weld.

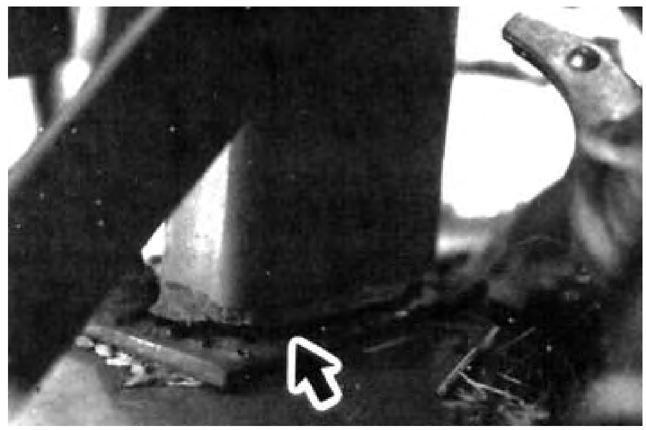

FIGURE 9. Broken Knotter Mounting Frame.

APPENDIX I
SPECIFICATIONS

MAKE:	Massey Ferguson Baler
MODEL:	124
SERIAL NUMBER:	163026
OVERALL DIMENSIONS:	
-- width	700 mm
-- length	6150 mm
-- height	1880 mm
-- ground clearance	220 mm
WEIGHTS:	
-- left wheel	762 kg
-- right wheel	413 kg
-- pickup gauge wheel	18 kg
-- hitch	331 kg
Total	1524 kg
TIRES:	
-- left	9.5L x 14, 6-ply rib implement
-- right	9.50 x 15, 4-ply rib implement
-- pickup gauge	12 x 3.00 semi-pneumatic
PICKUP:	
-- type	cam actuated drum pickup
-- height adjustment	adjustable rod
-- width	1500 mm
-- number of tooth bars	5
-- number of teeth	5
-- tooth spacing	75 mm
-- speed	71 rpm
FEEDING MECHANISM:	
-- type	packer fork
-- speed	80 strokes per minute
PLUNGER:	
-- strokes per minute	80
-- length of stroke	760 mm
BALE CHAMBER:	
-- width	457 mm
-- height	356 mm
-- range of bale lengths	558 mm 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
-- packer finger	shear bolt
SERVICING:	
-- grease fittings	9, every 50 hours 5, annually
-- chains	5, oil every 10 hours
-- gearbox	1
-- wheel bearings	2

OPTIONAL EQUIPMENT:
- -- tail gate and wagon loading chute
- -- remote pickup lift
- -- quarter turn bale chute*
- -- swinging wagon hitch
- -- plunger face extension
- -- hydraulic bale density control
- -- pickup gauge wheel*
- -- bale counter*
- -- bale chamber wedges*
- -- pickup slip clutch
- -- bale thrower
- -- safety chain

*Supplied on test machine

APPENDIX II
MACHINE RATINGS

The following scale is used in PAMI Evaluation Reports:

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

APPENDIX III
CONVERSION TABLE

1 hectare (ha)	= 2.5 acres (ac)
1 kilometre/hour (km/h)	= 0.6 miles/hour (mph)
1 tonne (t)	= 2200 pounds mass (lb)
1 tonne/hour (t/h)	= 1.10 ton/hour (ton/h)
1 tonne/hectare (t/ha)	= 0.45 ton/acre (ton/ac)
1 millimeter (mm)	= 0.04 inches (in)
1 metre (m)	= 39.4 inches (in)
1 kilowatt (kW)	= 1.3 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds mass (lb)
1 kilogram/cubic meter (kg/m^3)	= 0.06 pounds mass/cubic foot (lb/ft^3)
1 tonne/kilowatt hour (t/kW•h)	= 0.8 ton/horsepower hour (ton/hp•h)

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