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TX-200-6 HYDROKINETIC TRANSMISSION

Interim Report

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ARMY MATERIAL COMMAND

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SUMMARY

From a commercial power train the Army Tank-Automotive Command has developed the automatic hydrokinetic transmission TX-200-6 for vehicle engines developing not more than 425 pound-feet of torque.

RELATED TIR'S

7-66 TIR AMC-2
8-59 TIR 13-2-2B1(1)

Automotive Components
TX-200 Transmission

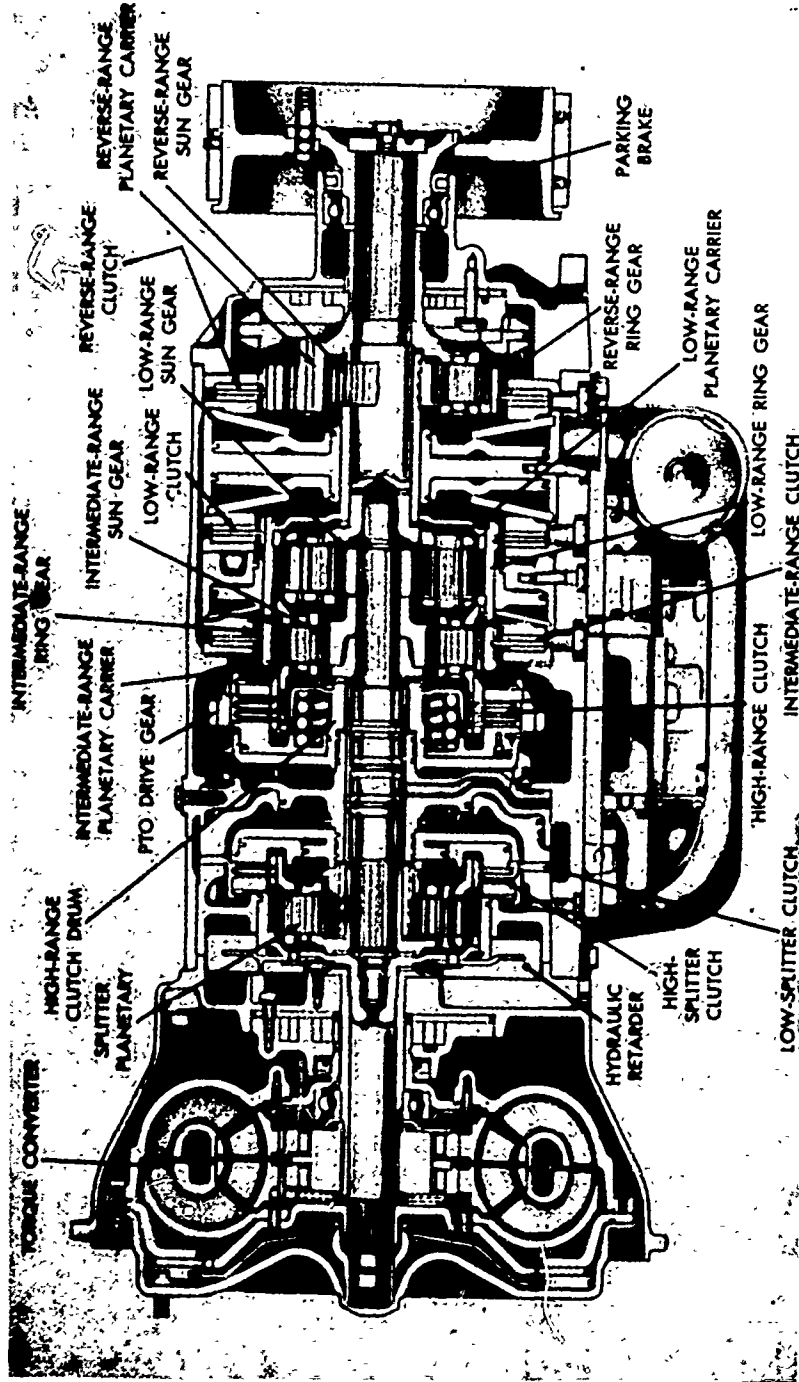


FIG 1. LONGITUDINAL SECTIONAL VIEW OF TX-200-6

TX-200-6 HYDROKINETIC TRANSMISSION

The Army continues the gradual switch from mechanical to automatic transmissions for vehicles; at the cost of a slight increase in fuel consumption the automatic transmission greatly extends the lives of engine and drive train by eliminating ill effects of poor driving — notably of severe shocks and of heavy lugging in too high a gear at too low an engine speed.

For wheeled vehicles with engines developing a maximum of 425 pound-feet of torque, the US Army Tank-Automotive Command is modifying (as the TX-200-6) a commercial power train (Allison MT-41). The TX-200-6 is automatic; it has a hydraulic torque converter combined with four sets of planetary lockup clutch.

The torque converter is a single-stage, polyphase, three-element assembly: pump, stator, and turbine. The stator, mounted on a ground sleeve, can rotate in one direction only. The blades of pump, stator, and turbine are so designed that the rate and direction of oil flow are automatically controlled to cause the converter to operate as either a torque multiplier or a fluid coupling.

The converter has an automatically operated lockup clutch that provides direct-gear drive, through the planetary-gear system, in all six forward speeds. The lockup control is sensitive to the relation between the degree of opening of the engine's throttle and the speed of the vehicle; when this relation is such that hydraulic coupling through the converter is unnecessary, the lockup clutch is actuated automatically, locking the converter pump to the turbine.

The four sets of gears are the first, second, and third planetary units and the splitter planetary unit. Associated with the sets of planetary gears are five wet clutches. Neutral, reverse, and the four forward speed ranges are selected manually by the operator (Fig 3), but shifting is automatic within each forward range: low position, first and second ranges; drive-3 position, third and fourth ranges; drive-2 position, third, fourth, and fifth ranges; and drive-1 position, third, fourth, fifth, and sixth ranges.

The TX-200-6 has two power takeoffs to which the power comes through the converter, the splitter gearset, and the takeoff gear.

The new transmission provides great ease of operation; gears can be shifted with only momentary interruption of the flow of power. The hydraulic control mechanism selects automatically the proper gear ratio within each speed range, and hydraulically insulated from shocks the engine operates effectively over a wide range of vehicle speeds at or near its most efficient speed and power output; stalling and lugging are eliminated, and the vehicle starts smoothly on upgrades.

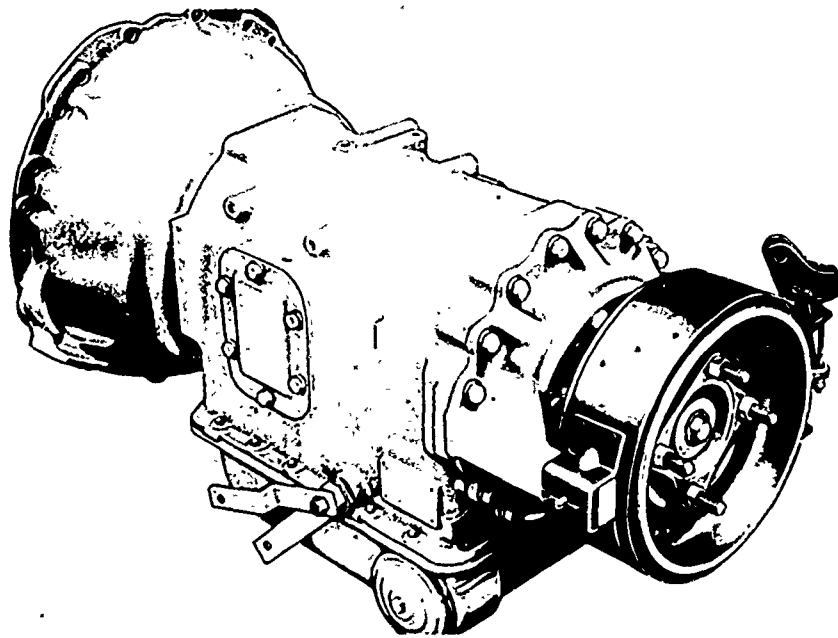


FIG 2. THREE-QUARTER VIEW OF TX-200-6 FROM REAR

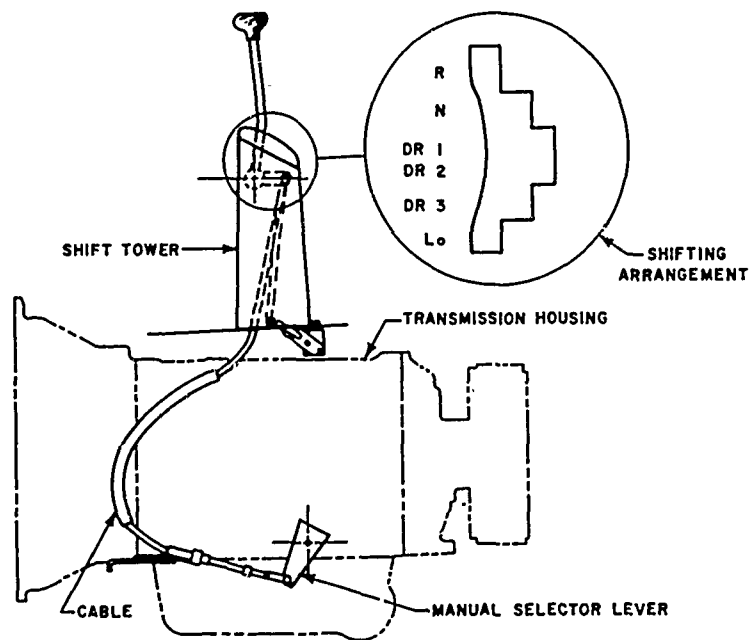


FIG 3. TYPICAL CABLE-CONTROLLED SYSTEM FOR SELECTION OF SPEED RANGES

Several prototypes of the TX-200-6, installed in M656 5-ton 8x8 cargo trucks and M520 8-ton Goers, have been subjected to advanced production engineering testing, covering a total of about 100,000 miles at Aberdeen, Fort Knox, and Yuma proving grounds; they have been extensively tested by the contractor also. The slight faults discovered in both design and materials have now been rectified, and the next state, production, may begin soon.

TENTATIVE PRINCIPAL CHARACTERISTICS

Maximum engine torque	425 ft-lb
Input speed, maximum	2,800 rpm
Input rotation	right hand
Torque converter Type	polyphase, single-stage
Maximum multiplication	3.0:1
Gear ratios	automatic engagement within ranges
First	5.296:1
Second	3.810:1
Third	2.690:1
Four	1.936:1
Fifth	1.390:1
Sixth	1:1
Reverse	6.042:1
Speed quadrant position (man- ual selection)	
Low	1st and 2nd ranges
3	3rd and 4th ranges
2	3rd-5th ranges
1	3rd-6th ranges
Lockup clutch	single nonmetallic plate
Other clutches	wet disks, hydraulic
Oil	
Specification	MIL-L-2104
Capacity	5.5 gal
Weight	504 lb (approx)

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13. ABSTRACT From a commercial power train the US Army Tank-Automotive Command has developed the automatic TX-200-6 hydrokinetic transmission for use with vehicle engines developing not more than 425 pound-feet of torque. Each quadrant position of forward speeds, manually selected, gives from two to four ranges; there are six forward speeds and one reverse. Under the right conditions at each forward speed a lockout clutch in the hydraulic converter effects direct mechanical drive. The TX-200-6 has an effective hydraulic retarder and two power takeoffs. ()		

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