Advanced Systems in Two Wheeler

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Abstract- Necessity to develop modern advanced system in two wheeler for delicate aged people to run a smooth driving.

Indexed Terms- TPFC Systems, Anti-Kickback System, Disc Brake, Rotary Gear Mechanism

I. INTRODUCTION

In recent times great boom is visualizing in Indian automobile sector. Due to competition in two wheeler industries Advance techniques are adopted in newly launching vehicles. Different companies such as hero Honda, Yamaha, and Bajaj introduce new techniques in their new product.

Hero Honda also adapted new techniques in their launched product CBZ and Hero Honda smart .In Hero Honda CBZ, TPFC system and Disc brake system are introduced. Honda smart introduces Anti kick back system, Rotary gear mechanism and Auto clutch.

TPFC is transient power fuel control system, which is used for accelerating vehicle from 0 to 60 km/h in 5 seconds.

Disc brake is generally installed on front wheel to control the speed from 60 to 0 km/h within 3 seconds.

In Hero-Honda Street anti-kickback system, rotary gear mechanism and auto clutch system are introduced. Anti-kickback system is used for street, which is generally handled by delicate people (old age or ladies). Rotary gear mechanism used for easy shifting of gear. Auto clutch is used for easy engagement of gear.

This is a brief introduction to some of the techniques adapted by Hero-Honda Company to their products.

Carburettor specification of all the models Pre Y2K

Model Description	CBZ
Carburettor Type	P. D.
Identification No.	P. D. C. 6 A.
Venturi diameter	22mm
Main Jet size	105
Slow Jet size	35
Needle clip position	No groove
Needle Jet No.	B5 7B
Throttle valve No.	H3F
Idling Speed	1400 – 100rpm
Air screw	1.875 turns out

II. TPFC SYSTEM (Transient Power Fuel Control)

- Introduction: Full form of TPFC system is "TRANSIENT POWER FUEL CONTROL". This TPFC System Is Firstly Designed And Introduced By Hero Honda Motors Limited In Their Power Bike Called As Hero Honda CBZ.

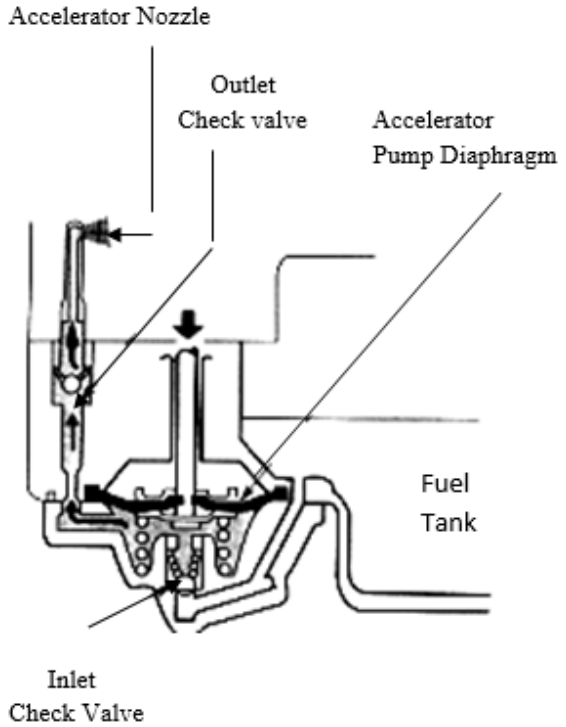
As the name suggest, transient means time dependent whenever we need of sudden acceleration, TPFC plays a major roll. It is a

specially designed carburettor with the acceleration pump in it. Having TPFC system in our own bike, tremendous acceleration we can get, from 0 to 60 km/hr within 5 seconds.

- Location: Spread type of system is located inside the carburettor with acceleration pump.

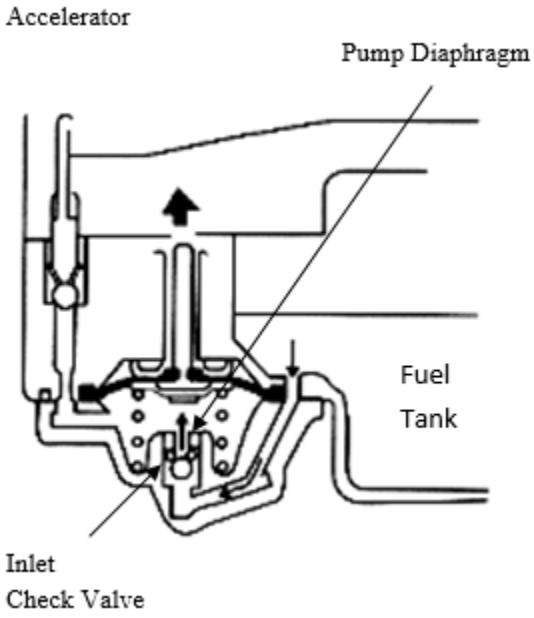
- Description and working: In ordinary two wheelers, carburetor is having a single float in float chamber. This single float is working all the time of running bike.

In CBZ, transient power fuel control system has two floats get a side each other. In float chamber one float is working as like the normal engine operation, but a facility is provided in CBZ vehicle in accelerator when we give sudden jerk (acceleration) to the accelerator, extra cord connected to accelerator, opens 2nd float and extra fuel is provided.



Throttle Valve Opens

Whenever throttle is suddenly pressed the air velocity in the venturi rises leaving the fuel behind due to higher density of fuel. So a lean mixture is provided to the engine momentarily when there is a requirement of rich mixture to overcome this drawback accelerator pump is provided in the carburetor.



Throttle Valve Closes

The acceleration pump includes a diaphragm, which is forced downward by a lever (called arm set pump), which in turn linked to the throttle. When sudden acceleration is applied, the linkage pushes the diaphragm in to fuel filled pump chamber, which in turn pushes down the valve and an additional fuel comes out of the pump chamber, this results in better and smoother acceleration.

So 0 to 60 km/hr of acceleration we get in 5 seconds.

- Advantages

1) Sudden Acceleration for Overtaking.
2) Lesser load and providing fuel to accelerate, to single float.
3) Easily accessible technique to get TPFC worked.

- Disadvantages

1) Average (mileage) of bike gets drastically reduced with use of this system.

2) It sometimes may be hazardous, could prove to accident.
3) This system is costly and complicated for maintenance.

- Application

Used in the vehicle where high speed is required like power bikes.

Model Description	Street
Carburetor Type	P. B.
Identification No.	P. B. 881N
Venturi diameter	16mm
Main Jet size	72
Slow Jet size	38
Needle clip position	3rd groove from top
Needle Jet No.	O. H. D. A.
Throttle valve No.	9 JA
Idling Speed	1400 – 200rpm
Air screw	1.25 – 1.75 turns out

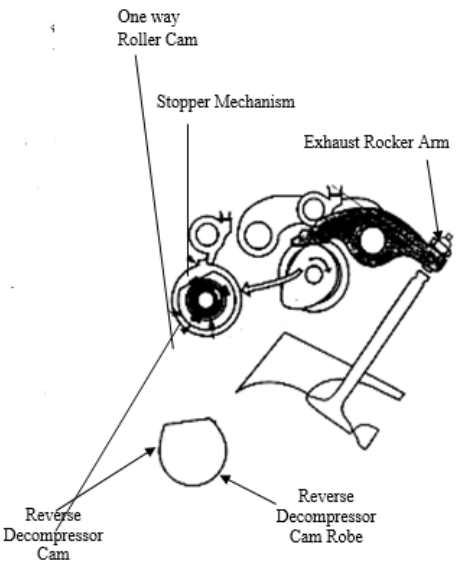
III. ANTI KICK BACK SYSTEM (Decompression cam system)

- Introduction: Decompression cam system is introduced by Hero Honda motor ltd. in Hero Honda Street smart. It is a unique concept design by Hero Honda motors limited. This innovative system is specially design for delicate handling humans such ladies or old age people by having this system in our vehicles generally in two wheelers Hero Honda prevented hazardous effect that can cause major or minor injurious by backing operation of kick.

Due to decompression cam system starting efforts are drastically reduced.

- Location: Reverse decompression cam system is mounted on camshaft, which means crankshaft of the engine adjusted to exhaust cam lobe or exhaust arm.

- Working: During the normal operation of engine for starting, when we kick the cam on the crankshaft rotates in clockwise direction and due to which charge of fuel is injected in the combustion chamber as inject arm opens. The timing of opening of inject arm and the ignition of spark plug are made synchronous, but sometimes synchronization of this timing fails due to many reasons and engine does not start due to which the compressed charge of fuel and air don't get exhausted. This operation affects an impetus on the cam, which is connected to the camshaft that turns in anticlockwise direction and kick gets back.



Normal Engine Operation

Hero Honda Motors Ltd. introduces one way roller cam or reverse decompression cam which is having a lobe type of shape with one way roller bearing. This bearing function only when backing of kick occurs this bearing allows reverse decompression cam to free wheel or free moving whenever the engine is turning in normal direction. The decompression cam is stationary during normal engine operation but if the engine kicks backs during starting operation. The reverse direction locks up the one-way roller bearing, which moves the cam lobe.

Engine Kick back during start up

In to position such that it moves the exhaust locker arm, this locker arm pushes exhaust valve arm down wards to open the valve and in this way the compressed charge of fuel and air get exhausted from the chamber, and after that decompression came in to position.

The reverse decompression cam automatically returns to its normal position when the engine stops turning from the kick back.

In this way we can prevent the kick back operation.

- Advantages

1) This reduces the engine compression by about 30% in case if the backpressure is developed during kick starting.
2) Kick starting becomes much easier without having tedious efforts for engine starting
3) This system can be used not only in Hero Honda Street smart but also in other two wheelers also.

- Disadvantages

1) Depression of the cam is higher compared to other vehicles.
2) Construction is complicated and hence maintenance is more.

- Applications

Kick Starting Becomes Much Easier for the female category as well as old persons, so the ladies or old persons generally use it in lighter vehicles, which are mostly handled.

IV. ROTARY GEAR MECHANISM

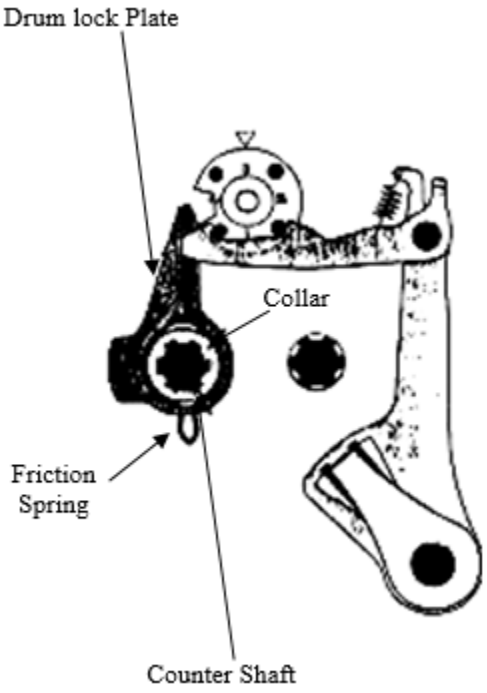
Introduction: Hero Honda motors limited, in Hero Honda Street Smart, introduced rotary gear mechanism. This specially designed rotary gear has all the gears on the circumference of the GSD. This system shifts gear from top gear to neutral when the motorcycle is in stopped condition.

It has attachment to prevent gear shifting from top gear position to neutral while the vehicle is in running condition called as drum-locking

mechanism having friction spring assisted locking plate.

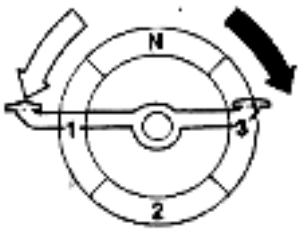
a) GEAR SHIFTING DRUM MECHANISM
LOCATION: Rotary gear is located in gearbox. New design of gear shifting drum.

WORKING: Rotary gear mechanism is specially designed having gear mounted on rotary drum, called as gear shifting drum. This gear shifting makes possible, from the top gear to neutral when the motorcycle is in stopped condition.



When in 3rd (top) gear position

When we shift the gear claws get trapped the knob of the gear-shifting fork, gear shafts mounted on the individual claws and in this way the gear is shifted. The gear shifter drum rotates continuously without any stoppage when vehicle is in stopped condition.



When motorcycle stop

When vehicle is in stopped condition the gear drum allows the gear to be shifted from top gear position to neutral. In stopped condition we can make neutral both way (opposite direction also).

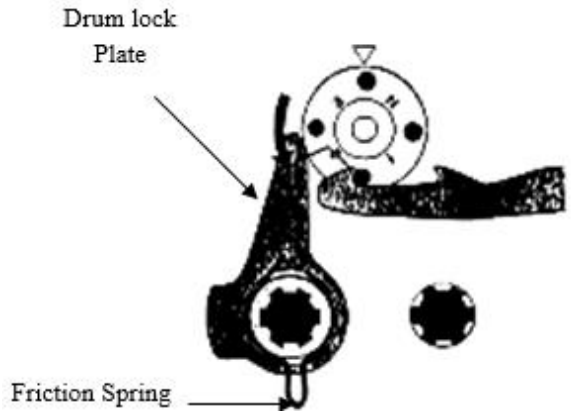
- Advantages

1) It is easy to shift the gear from top gear to neutral while vehicle is in stopped condition.
2) Less cost, size and simplicity in gear box.

b) DRUM LOCKING MECHANISM
There is a drum locking mechanism, which prevents gear shifting from top to neutral while the vehicle is running. Diagram shows while the motorcycle is in running conditions i.e. when we run the vehicle on the top most gear & vehicle is to be stopped we shift the gear in reverse direction from third, second, first & neutral.

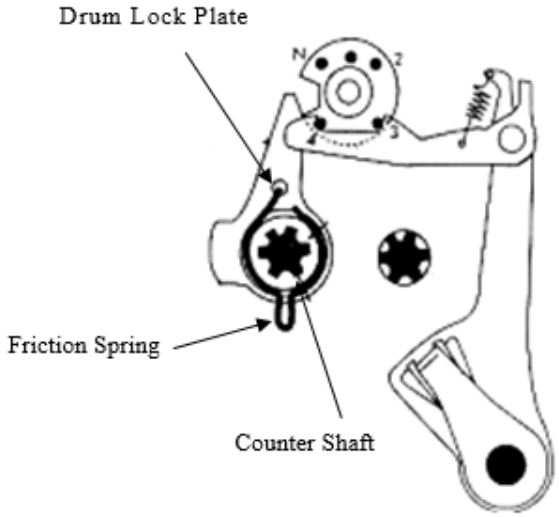
Location: Drum locking plate is mounted on the counter shaft with the help of friction spring.

Working: When vehicle is running and suddenly obstacle comes in front which slows down the speed, due to which necessity to shift the gear from top to bottom while it is doing in street by using rotary gear mechanism there is chance of making vehicle directly neutral without shifting gears descending order (3 – 2 – 1 - neutral) due to use of rotary gear mechanism.



When motorcycle stop

To prevent this drum locking system is provided with rotary gear mechanism having friction spring assisted locking plate. The friction spring on the collar, which is fitted on the counter shaft, is forcing the drum locking plate against the gear-shifting drum when the motorcycle is in motion and the counter shaft is rotating. The shifter gear can't be turned from top to neutral because the lock plate is in cut away of the



When motorcycle running

Shifter drum and doesn't allow the shifter drum turn whereas shifting is possible to third gear only.

- ADVANTAGES:

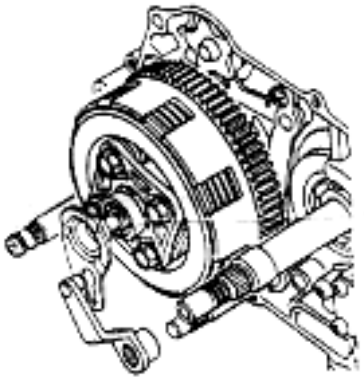
1) Easy to switch over to neutral from the top gear position.
2) Features most convenient for those who are not habited to driving gear vehicles.

- DISADVANTAGES:

1) After few years' friction in plate may give chance to shift gear from top to neutral when speed slows down (0 – 5 km/h).
2) Maintenance is costly. System is complex and not easily accessible to the workers.

V. TRANSMISSION OF AUTO CLUTCH

Now a day due to competition new techniques are adapted in to the automobile to increase power, efficiency and simplicity to handle the vehicle. Due to trafficking chaos, speed of vehicle is varying so to minimize losses, increase smoothness for this purpose new system are adopted for this purpose hero Honda motor limited is also provides auto clutch systems in Hero Honda street vehicle for easy handling purpose.



Auto Clutch

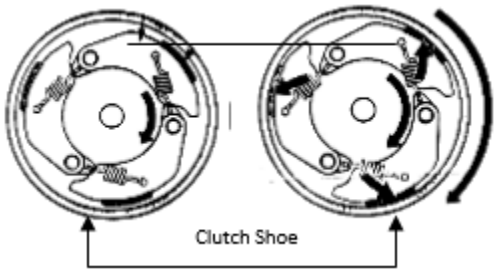
a) CENTRIFUGAL CLUTCH

A centrifugal clutch system helps in power transmission under all speed condition and allows engine to run smoothly especially during low speed condition.

- LOCATION: Centrifugal clutch is mounted on crankshaft.

- WORKING: When engine speed is low, the weights are kept in place by spring force (shoe pad are contracted) disconnecting crankshaft

rotation from the further transmission system. In the street smart, when we shift gear, firstly centrifugal clutch is going.



When motorcycle is stopped

To engage, then gear is shifted. Before the rotary gear mechanism, clutch system is mounted on the paddle.

As we accelerate, the engine speed is increases the clutch shoe expands due to centrifugal force acting on weights (shoe pad expands) and clutch is engaged.

So engaging of clutch depends on engine speed, & then power transmitted to gearbox.

- ADVANTAGES:

1) Engine will not stop under low speed condition even while in gears, thus adding to the ease of handling of vehicles.
2) This helps to Reduces load on crankshaft.

Stress free operation due auto transmission.

b) SCISSORS GEAR (Primary drive gear)

- Purpose: A scissor gear mechanism is used to reduce backlash noise.

- Location: It is mounted on crankshaft

- Functioning: The scissors gear mechanism is composed of a pair of main and sub gears. The sub gears are spring loaded to eliminate clearance. During ideal operation when the driving torque is small, the teeth of the spring loaded sub gear contact the driven gear teeth. A combination of main and sub gear eliminate backlash.

When the driving torque is great, such as when accelerating the main gear drives the driven gear, as the force of spring is smaller than the driving force, it is compressed and the sub gear is line with the main gear.

- ADVANTAGES: By providing the scissor gear on the crankshaft backlash noise is reduced.

VI. DISC BRAKE

Now day, advance techniques are adopted in two vehicles. When vehicle is running above 60 km/h and sudden demand of stopping, at that movement we need to apply brake but it is not possible to stop within 5 – 6 sec. But now a day's disc brake technique making is possible, which is used in Hero Honda CBZ. Hero Honda motors introduced disc brake in CBZ.

- Location: Disc brake is generally connected to front wheel and its reservoir for storing hydraulic fluid is provided on the handle.
- Purpose: It is used for quick reduction in speed from 60-0 km/hr within 3 seconds.
- Working: When vehicle is in running condition and there is need to stop quickly we operate the brake that means the brake will operate the reservoir. Reservoir consists of piston boot, master piston, and Snap ring pillars. When front brake switch is applied the master piston operates and forces the fluid (oil) to the bottom side through hose. There is increase in pressure due to spring force and master piston. The pressured liquid will then passed through hose and come to wheel header. Header is a compact unit with washers, piston purrs. Header consists of pads and pistons. Friction Pads are provided on both side of disc.

The pressured liquid forces the piston on the disc (disc is attached to the wheel drum) as rotating disc will tend to stop and hence wheel is ceasing down (vehicle is stopped) friction pads are of

when brakes are not in used the pressured of the bottom pad is less but they kept slight contact with the disc but not enough to cause wear.

When the brakes are applied hydraulic pressure forces the piston press the pad on the disc hence vehicle is stopped.

- Advantages

1) By using disc brake it is easy to control speed 60 – 0 km/h within 3 sec.
2) Distractions event is minimized up to some extent.
3) Safety measures while driving the bike increases.

- Disadvantages

1) Cost of the system is higher due to the value added parts.
2) Maintaining of the system becomes higher with costly parts.
3) A heat generated during operation is more.

- Application

1) It is used in power bikes.
2) Already existed in motorcars, heavy-duty vehicle.

CONCLUSION

In recent times great boom is visualizing in Indian automobile sector. Due to competition in two wheeler industries Advance techniques are adopted in newly launching vehicles. Different companies such as hero Honda, Yamaha, and Bajaj introduce new techniques in their new product.

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REFERENCES

[1] "Honda Worldwide | Technology Close-up". World.honda.com

[2] Effectiveness of ABS and Vehicle Stability Control Systems" (PDF). Royal Automobile Club of Victoria, First Automotive Anti-lock Brake System (ABS) gmheritagecenter.com

[3] "ABS 'should be compulsory on new motorcycles by 2015' - Latest Transport News - Transport News - TRL News Hub".

[4] bikeadvice.in › anti-lock-braking-system-abs

[5] http://www.tezu.ernet.in/sae/Download/transmission.pdfTRANSMISSION SYSTEM

[6] A Textbook of Automobile Engineering by R.K. Rajput

[7] Automobile Engineering (Vol. I and II) by Dr. Kripal Singh