

STABILITY IN THE MODERN CAR

(Continued from page 39)

tial action is nil and this car should have little or no wheel fight in addition to even tire wear.

This section was included because wheel fight contributes heavily to driver reaction. Also, jounce and rebound suspension-steering influence car front end oversteering and understeering.

POWER STEERING

Power steering virtually eliminates all road shock from reaching the driver and stabilizes car steering during all operating conditions. Shown in Fig. 11 are the functioning parts of Chrysler power steering. As the driver turns the steering wheel, the steering column spur gear climbs up or down with respect to the worm shaft axis. This causes an up or down motion of the valve operating block. While the movement of the block is of very small magnitude, it is sufficient to open and close the distribution and reaction valves in the desired combination. This produces a difference in pressure between the power cylinders so that the pistons move the power arm in the same direction as the worm-and-roller is driving the steering gear shaft.

In regard to the problem of car stability, how does the power steering unit work as the front wheels of a car drop into a chuck hole or encounter other road obstacles? In a reverse action, the steering linkage is started in motion by a turning of the car wheel. As the driver is holding the steering wheel, the spur gear mounted at the end of the steering gear shaft tries to climb upon the gear at the end of the steering column. As a result, the valve operating block moves up or down and the valves are set in operation, causing the oil pressure in the power cylinders to oppose the movement of the car wheels. Thus, hydraulic pressure is applied as a counteracting force to dampen the shock that was previously acting on the steering linkage and greater steering and car stability is achieved.

BALANCED WEIGHT DISTRIBUTION

The final phase of designed stability in the modern passenger car is balanced weight distribution. The evaluation of mass distribution has gone from horseless carriage to the science of balance now employed in our present-day cars. Automobiles of the early 1900's may have had as much as 70% of the weight on the rear wheels. This 30% front wheel loading would make our modern car oversteer dangerously when going around curves. This is one fundamental objection on the part of some automotive engineers regarding rear-engine cars, as this type of car is usually loaded more at the rear than at the front.

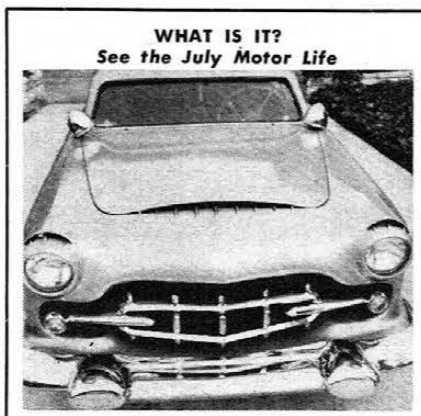
By careful placement of the modern

passenger-car chassis and body components, a 50-50 weight distribution is usually obtained. However, whenever possible, the balance of loading is generally shifted to 55% on the front wheels, since an understeering car is much easier to manage. The passenger load is applied primarily to the rear wheels. With a curb weight distribution of 45-55%, the 50-50 loading is more nearly approached when the car has a full passenger load.

Of equal importance to the suspension engineer is the mass distribution in the vehicle. The four most important suspension frequencies of a passenger car are: jounce, roll, pitch, and yaw. The latter two—pitch and yaw—are dependent on the moment of inertia of the vehicle at an axis perpendicular to the wheelbase passing through the center of the car, as shown in Fig. 11.

The mass of the car could be split in two sections and placed several feet off the front and rear bumpers and, if properly split, the basic 47-53% wheel weight distribution would remain the same. But the moment of inertia would be changed considerably over this car shown. The car weight has only been decreased 55 lbs. from 1952 to 1953 in the Plymouth. However, the wheelbase has been shortened 4½ in. and the distance between the centerline of the front wheels and the engine—a big factor in mass distribution—has been decreased 2½ in.

Briefly, balanced weight distribution means this. The jounce rate of the front and rear suspension has remained unchanged. This tends to retain car spring stability. The pitch and yaw car frequencies depend on the moment of inertia, as well as being a function of the square of the distance from the center of gravity to the centers of the front and rear springs. While the moment of inertia of some of our 1953 cars has been relatively unchanged, the wheelbase has been shortened, thus reducing the distance from the c.g. to the centers of the front and rear springs. As a result, the pitch and yaw frequencies have been reduced in these cars. To the engineer this means a better "isolation ratio"; to the driver it means a wider range of driving conditions with less road disturbance.



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Bumper Guard Tail Lights
Cover Hot Rod
Cover Custom
Dago Drags

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You Can't Judge a Book by its Cover

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