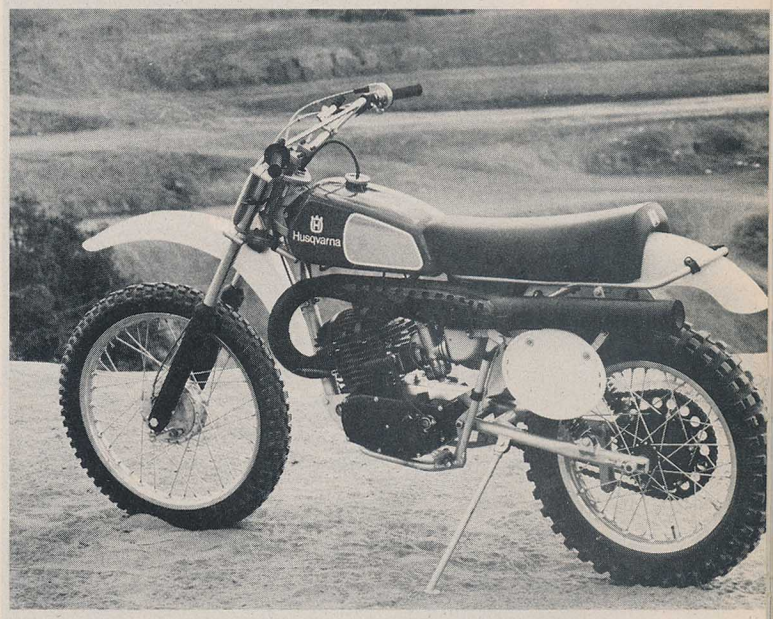
HUSQVARNA 360 AUTOMATIC

Not THE Answer . . . But AN Answer, And A Mighty Impressive One At That.



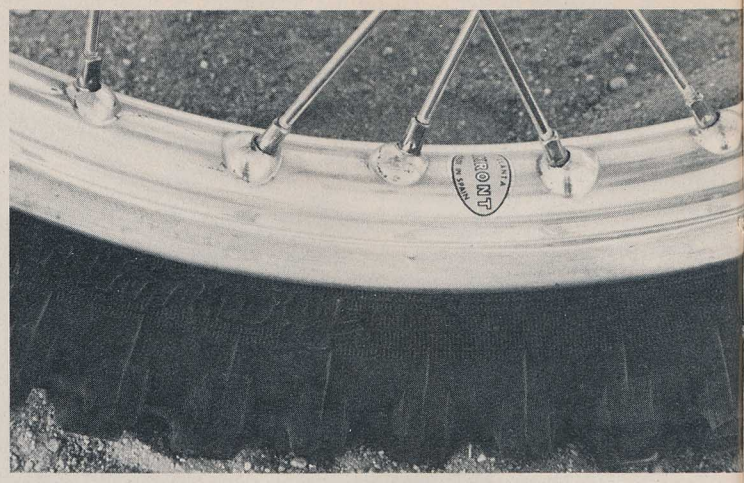
Cycle World Enduro Test

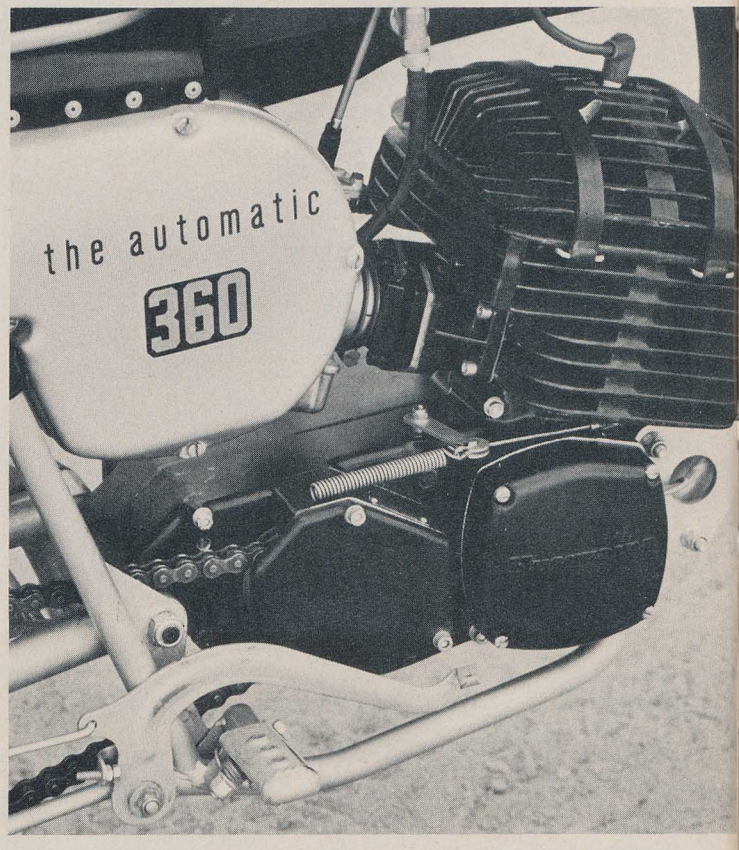
■ TO SOME PEOPLE, the words progress and automation go hand in hand. If you can get a machine to do more of the work for you, then you can enjoy the pleasurable aspects of what you are doing more fully. While we'll no doubt encounter readers whose opinions differ, we have to agree with this concept in so far as it applies to automatic transmissions on motorcycles.

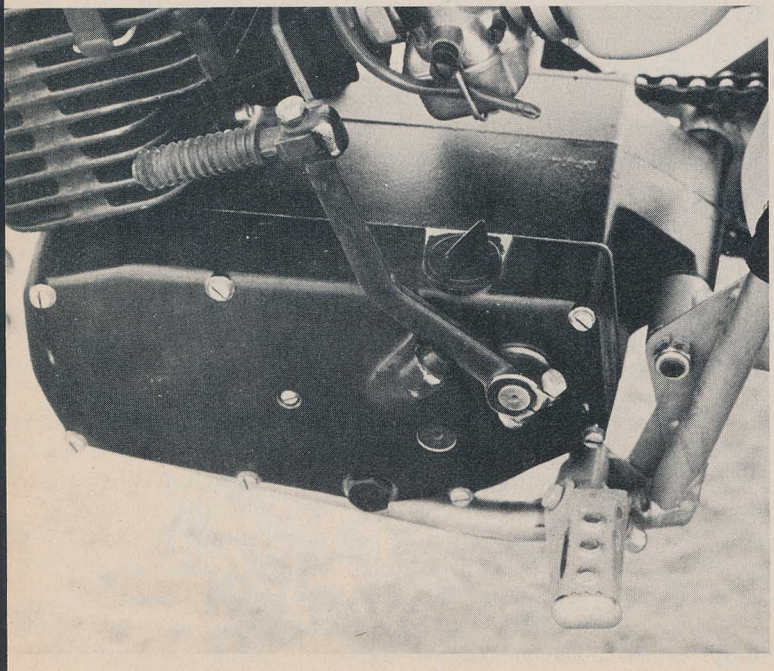
First, of course, was Rokon. It has been building off-road machines termed "Automatic" for the last few years. But, in a sense, the Rokons were not automatic transmission motorcycles, but rather transmissionless motorcycles. Their gear ratios were only definable in terms of the lowest possible low and the highest possible high. In between these two was a vast area defined only as "infinitely variable." This was accomplished by using a torque converter in which one of the cone-shaped sides moved closer to the other cone-shaped side as the demand upon the engine eased, and farther apart as the demand increased. Thus, for each tenth, hundredth or thousandth of an inch of movement by the torque converter cone, the actual ratio was altered. Hence the term "infinitely variable."

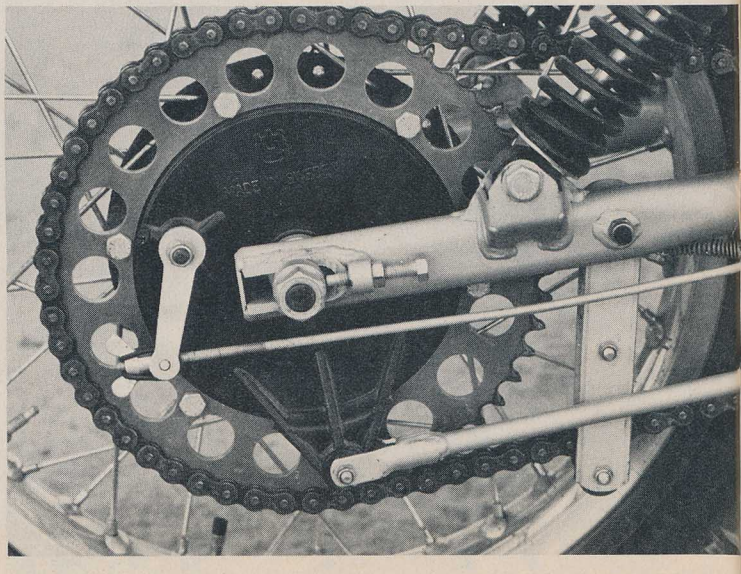
While having an infinite number of ratios available, depending upon the demand put upon the engine, is, theoretically, a very sound way of setting up a motorcycle, Rokons have a few drawbacks. First, they are heavy. No doubt the torque converter, and the belt-to-gear drive box contribute to their excessive poundage. Second, the belt will slip in water or mud. Also, the belts have been known to wear out rather quickly when fed a steady diet of mud or sand. Finally, if you should suffer a mechanical breakdown, the belt drags on the torque>

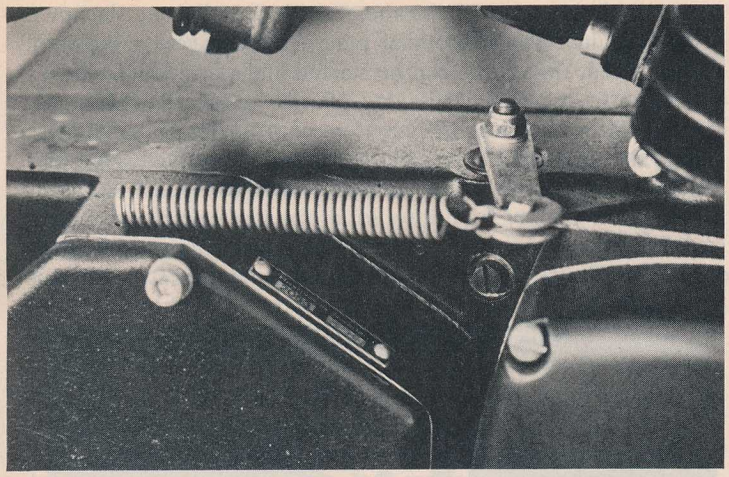
Photography: Fernando Belair, Walt Fulton, Paul Webb

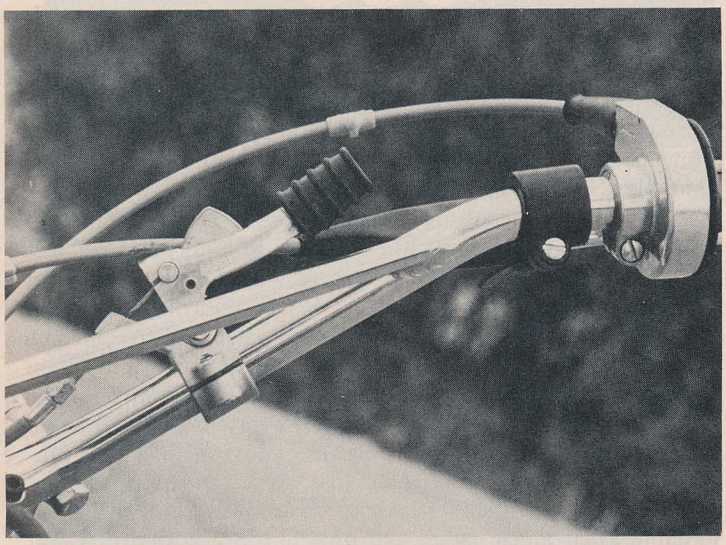


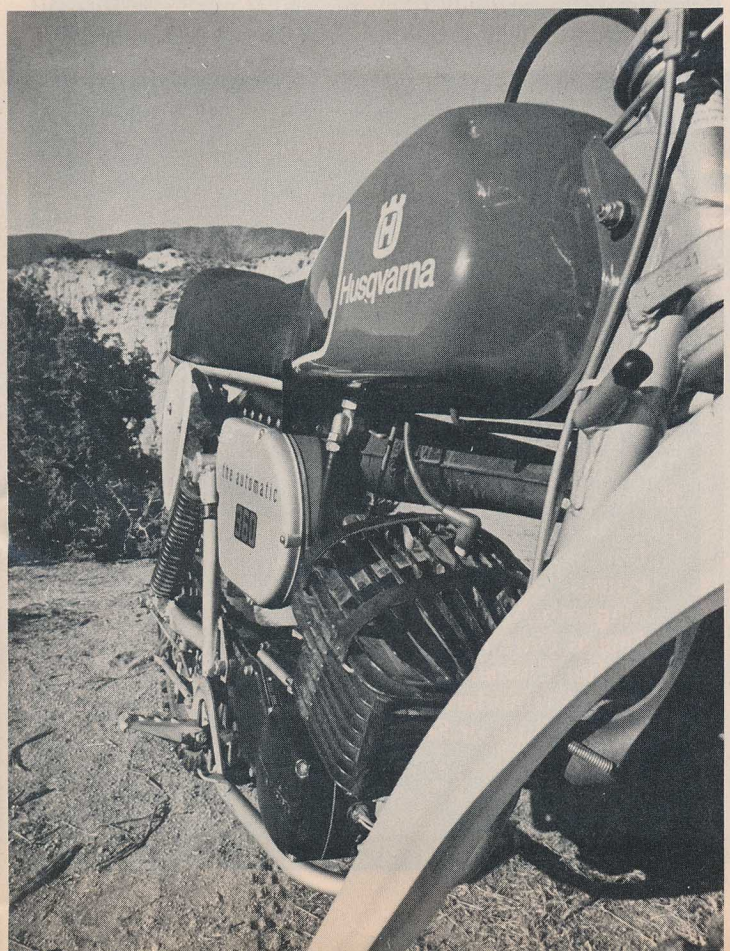












HUSQVARNA

converter, which makes it very hard to push the bike for more than a short distance. But Rokons are fine machines, and up until now, many people have put up with these inconveniences in order to have a "shiftless" motorcycle. But no more.

Husqvarna's new 360 Automatic has one-upped the Rokon in just about every category. . .including suggested retail price. It has also one-upped the standard transmission in several aspects, but has at the same time fallen short on some points.

Fully explained in the accompanying sidebar, Husky's Automatic is a true automatic. There are four pre-selected ratios and the transmission shifts up and down, from one gear to the next, depending on a combination of engine load and rear wheel speed. The gears receive the engine's output via a combination of the engine's centrifugal clutch, and one of three other centrifugal clutches located in the transmission. This drives the first set of gears that are in constant mesh with the second set. The second set of gears, which are on concentric shafts much like the first set, spin on roller bearings. There are two roller bearings between one gear/shaft and the next one. Between these bearings are what Husky terms "freewheeling devices." These devices lock and unlock the shafts that they separate, as dictated by the speed of the shafts. Again, for a more detailed description, read the sidebar.

The Husky transmission will upshift or downshift automatically, depending on the conditions. In the first three gears the machine will coast when the throttle is rolled off. In fourth gear there are no freewheeling devices, so the machine does have a usable engine brake, down to approximately 25 mph, at which point the fourth gear clutch disengages and the machine freewheels again.

All of the clutches in the Husky's transmission have brass bobweights that are grooved on their contact surfaces. When the clutches begin to slip or wear out, simply regrooving them with a hacksaw will restore them to full usefulness. Husky's testing has shown that clutch life will be very good: several hundred hours at least.

The rest of the engine is pretty straightforward. In fact, with the exception of different, non-magnesium cases, the engine is right off a 360 GP motocrosser.

A twin-pyramid reed cage passes fuel and air mixed in the 36mm Bing carburetor. The cylinder is ported to GP specs, but the power output is tamed down considerably by the double-walled enduro exhaust pipe. Actually, the Automatic is one of the quietest off-road machines we've ridden in a long time.

The chassis is a production motocross frame. Made from chrome-moly steel, the single-downtube unit proved quite strong for its intended use. The rear section of the frame is designed to accept the standard Girling gas-emulsion shocks in a radical cantilevered position that has become standard for Husqvarna production motorcycles. At the other end, a pair of Husky's own forks absorb bumps and jolts. These are virtually the exact same suspension components about whose low-speed manners we complained in last month's Husky WR250 road test. But on the Automatic, they were vastly improved. There was still a tendency for the front end to wash out at low speed, but the harshness of ride completely disappeared from both ends.

As on all of the WR series machines, Barum ISDT-type tires are fitted. The fuel tank is a large 3.0-gal. model painted in the usual Husky style, but green rather than maroon. It certainly makes for some surprised stares from other Husky owners. Lightness, always an important factor in motorcycling, has not >

been overlooked on the Automatic. Dry, it weighs only four pounds more than a 360 GP. This difference in weight is easily attributable to the lack of magnesium cases and the extra weight of the quieter enduro pipe.

Starting is a Husky function that must be mentioned. Since it cannot be bump-started, thanks to the freewheeling devices, a machine such as this should start readily using the available kickstarter. Husky has modified the starter somewhat to allow a much more useful arc than on its previous conventional models. This aids immensely in getting the engine to light up. When cold, only two kicks were required. After a spill, sometimes as many as five, but always with ultimate success. Remember to keep the petcock closed if you stop the engine. Bing carbs have been known to let gas leak by and flood the crankcase.

There is no clutch lever on the Automatic. But there is another lever, situated elsewhere on the handlebars, that puts the machine into and out of gear. With first gear completely disengaged, the engine can be started and warmed up. There's no fear of the machine taking off as the throttle is blipped. Then, after allowing the engine to come down to a complete idle, the lever may be released, engaging the spring-loaded first gear on the splines of the layshaft. From this point, it's gas it and go.

Like many, we at first found the Automatic very difficult to ride. Shutting off the gas, the machine goes straight. It is difficult to turn unless either the throttle or the brakes are applied. In fact, turning with any precision or speed must be accompanied by a practiced combination of both brakes and throttle. Riding the Automatic helps make one a much better motorcyclist all the way around, because it forces the rider to learn how to use the brakes. A skill in which many are remiss.

Although such devices are not fitted to the present production run, Husky is considering outfitting future models with rear brake levers on both sides, since braking is so important to the quick, smooth operation of the Automatic. For the present, they may simply market a kit to convert the present system over to a two-pedal arrangement. While there are no plans of implementing it, we also suggest that a double-lever system be devised for the front brake.

In practice, the Automatic simply has to be felt. It shifts so smoothly that you might think it had a Rokon type drive. But it doesn't. We tried a little motocross with the Automatic, but it isn't at home on a race track. It also isn't at home in the desert. It scoots along, but we feel that a standard-transmission WR360 would be faster. Where the Automatic shines is in enduros. The rougher the better. The transmission does the shifting for you. There's no clutch to wear out your left hand. Bottlenecks are no problem because you can just let it idle. The minute there's an opening, just gas it and squirt through. Also, if you get stuck on a tricky trail or on a hill, you can get rolling again much easier. But on a hill, if you find that you can't make it, be ready to hit the brakes when you back off the gas or the machine will freewheel backwards instantly.

PARTS PRICING

Warranty	None
Piston, w/rings	$39.95
(1) Set Rings	N.A.
Rear Shocks (each)	29.17
Wheel Rims (bare each)	48.83
Drive Chain (standard)	29.17
Front Fender	11.95
Rear Fender	11.95
Brake Lever	5.95
Throttle Cable	4.38
Brake Cable	4.86
Ignition Parts	
Coil	14.00
Points	4.38
Magneto Assembly	79.00
Sealed Unit Type	N.A.
Air Filter Element	5.26
Rear Tire (standard)	45.37
Headlight Bulb or Sealed Beam	N.A.
Taillight Lens	N.A.
Battery	N.A.

Out on the trail, the transmission keeps the engine humming in its most efficient range. Back off slightly on the throttle and you can get the tranny to shortshift into high for economical cruising. The split second that you gas it again, it will be in the proper gear as smoothly as though it never left. Handling, of course, is excellent. As with all Huskys, the faster you go, the smoother it rides. Seat height is relatively low. But the exhaust pipe will still burn your leg if you have to paddle. The only good thing here is that with the Automatic, you shouldn't have to paddle anywhere near as much as with a>

HUSQVARNA 360 AUTOMATIC

SPECIFICATIONS

List price	$2495
Suspension, front	telescopic fork
Suspension, rear	swinging arm
Tire, front	3.00-21
Tire, rear	4.75-18
Engine, type	two-stroke, reed-valve Single
Bore x stroke, in., mm	3.23 x 2.64; 82.05 x 67
Piston displacement, cu. in., cc	21.6; 354
Compression ratio	10.8:1
Claimed bhp @ rpm	N.A.
Claimed torque @ rpm lb.-ft.	N.A.
Piston speed @ rpm ft./min.	3080 @ 7000
Carburetion	36 mm Bing
Ignition	flywheel magneto
Oil system	pre-mix
Oil capacity, pt.	3.8
Fuel capacity, U.S. gal.	3.0
Recommended fuel	premium
Starting system	kick, folding crank
Air filtration	oil-wetted foam

POWER TRANSMISSION

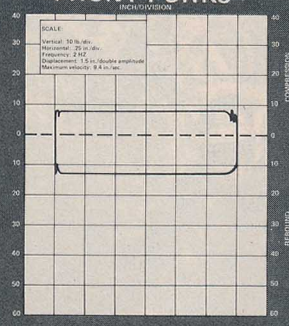
Clutch	centrifugal
Primary drive	helical-cut gear
Final drive	520 single-row chain
Gear ratios, overall:1	
4th	7.9
3rd	9.5
2nd	11.9
1st	16.0

DIMENSIONS

Wheelbase, in.	55.9
Seat height, in.	33.0
Seat width, in.	8.5
Handlebar width, in.	35.4
Footpeg height, in.	11.0
Ground clearance, in.	10.0
Front fork rake angle, degrees	32
Trail, in.	NA.
Curb weight (w/half-tank fuel), lb.	243.5
Weight bias, front/rear, percent	45/55

SUSPENSION DYNO TEST

FRONT FORKS

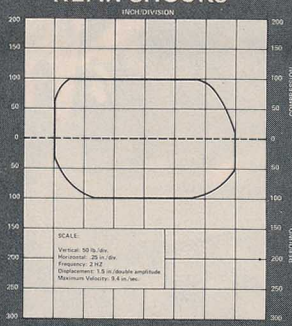


Description: Husqvarna Fork with HD315 oil
Fork travel, in.: 7.5
Engagement, in.: 4.0
Spring rate, lb./in.: 15/22 progressive
Compression damping force, lb.: 8
Rebound damping force, lb.: 13
Static seal friction, lb.: 6

Remarks: Suspension components on the 360 Automatic are identical to those found on the 250WR. Fork compression damping is fine. Rebound damping should be increased to approximately 20 lb. As is, the forks work beautifully when the bike is ridden fast over rough terrain, such as in the desert. If that's the type of riding you do, modifications are not necessary. If you ride in the woods a lot, or enter tough enduros, we recommend altering the rebound damping.

In order to increase the rebound damping, a more complex damper rod is required. Here's why. The Husky rod is a simple tapered unit made (on a profile lathe) out of a solid piece of aluminum. Holes in the bottom control compression damping. Because the system does not use a check valve, it is impossible to alter the ratio of compression to rebound damping much.

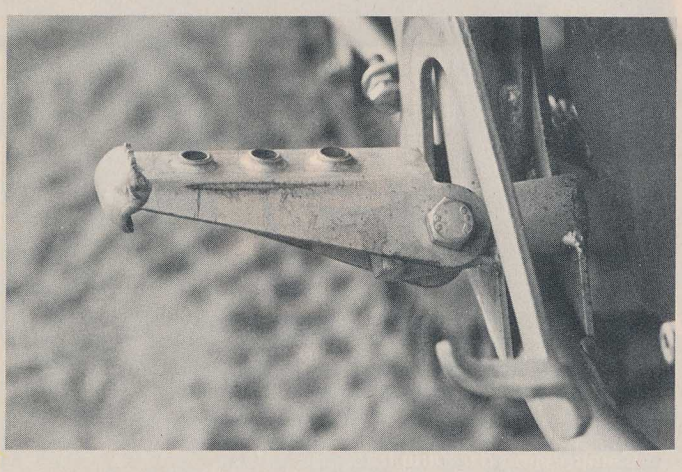
REAR SHOCKS



Description: Girling gas/oil shock
Shock travel, in.: 4.0
Wheel travel, in.: 7.0
Spring rate, lb./in.: 125
Compression damping force, lb.: 100
Rebound damping force, lb.: 100

Remarks: Husky believes in a 50/50 compression/rebound damping ratio at the rear. This effectively prevents bottoming out, but, at enduro speed, causes an unnecessarily rough ride. Reducing compression damping by 50 percent to 50 lb. would bring it in line with current theory. Rebound differs from current theory an equal amount, but instead of having too much, there isn't enough. For enduros, rebound damping should be bumped up to something in the neighborhood of 140 lb. For desert racing, however, the present system works fine.

Tests performed at Number One Products



standard-transmission machine.

Serviceability of the gearbox is outstanding. Both sets of gear clusters can be removed in less than 10 minutes by a single person, without extracting the engine from the frame. And any weekend warrior can fix a broken transmission part without worrying about how to put it back together. Tinker Toys were tougher to construct. Just watch which way you put in the freewheeling devices or you'll have four neutrals and a machine that can't be pushed forward. But broken transmission parts, like worn out clutches, will be few and far between.

Carburetion is more critical on the Automatic than on any other motorcycle we've ever encountered. Since transmission upshifts are controlled by the speed of the rear wheel, it is

HUSQVARNA

imperative that the engine be in a perfect state of tune so that it will rev out to a point at which the rear wheel speed is sufficient to engage the subsequent gear. If an engine is running rich it will cough and blubber, preventing the next gear from coupling up, and keeping you in a gear whose usefulness has already been spent.

If the over-rich situation becomes severe, the engine won't produce enough horsepower to stay in the gear that is engaged and it will begin downshifting until it can maintain a constant speed. Sometimes, this may take you all the way back into first—where you're likely to get stuck. Accurate jetting is the answer, but that presents another problem.

There just doesn't seem to be enough latitude in the Bing carburetor for much altitude adjustment. The needle has only three positions. Main jets come in large steps, as do pilot jets. If you ride an enduro that goes from sea level up to 5000 feet, you will have to stop and rejet or else the machine will not perform up to par.

Main jet changes are a breeze on the Bing, but needle jet alterations are very difficult and time consuming. To begin with, there's a plastic goodie between the spring and the slide that is designed to keep the throttle cable from disconnecting from the slide should the slide hang up momentarily. Once you get the slide out of the carb, the spring raised up and the plastic goodie removed, it's easy to get the clip off the needle. But on this model Bing, the needle is removed from the bottom of the slide. Getting the needle back in is easy, but installing the clip in the desired slot, in the dimly lit confines of the slide's recess, is a hit and miss affair.

The easiest way to cure this whole mess is to install a Mikuni. Jetting changes are much easier on the Japanese carburetor and the available settings are much closer to each other, allowing for a much more exact state of tune.

Complementing the properly adjusted carburetion, should be accurate timing and a spark plug that is in good condition. A clean air filter also helps. Of course, all of these things are important to the performance of any motorcycle, automatic or otherwise, but they are critical on the new Husky.

If you are a rider who enjoys weekend play riding, or who finds the challenge of a "family" enduro sufficient, you would be wasting your time with the Husky Automatic. The advantages it offers are far above the realm of the average rider. But for the rider who busts his tail on a 24-mph section, clocks in a minute or two late at the checkpoint, learns that no one else has been able to stay with the schedule either, and derives exhilaration from these facts, the Automatic is something that should be looked into.

When you've already gone through 150 miles of trees, logs, roots, mud, sand, rocks, bears, branches and the like, and you're so tired that you can barely see straight, yet there are 20 miles to go and you know that they've saved the worst for last, the Automatic will pull you through. It will bring you home.

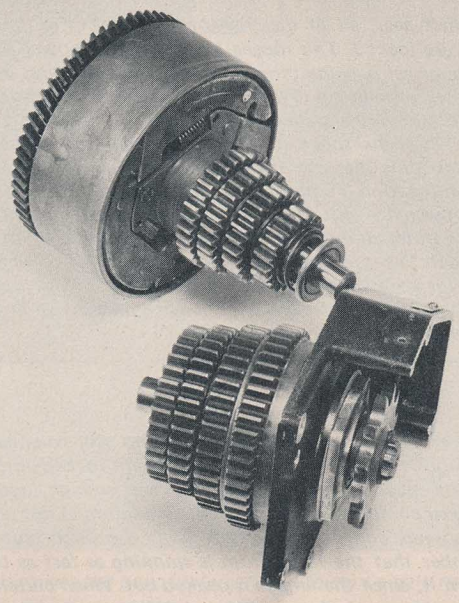
It's times like those for which you'll love the new Husky Automatic, for which you'll thank its green tank that you weren't worn out from shifting all day or clutching through the mud or over roots, or from having to find neutral and kickstart it every time you got stuck on a hill. It's times like those when you'll thank goodness that someone had the incentive, the fortitude and the wherewithal to devise, develop and produce such a marvelous machine. And it's times like those that the price of the machine won't seem as incredible as it now appears on paper.

360 AUTOMATIC

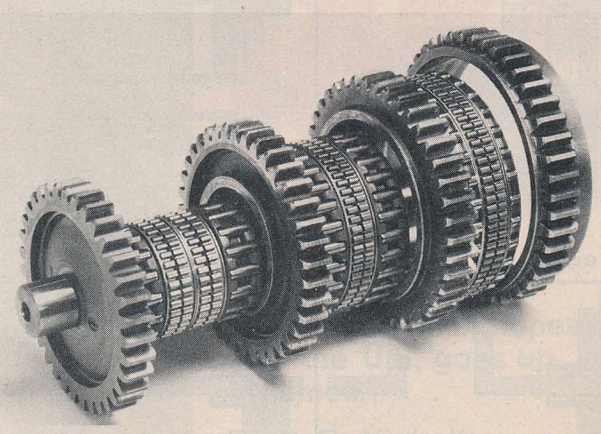
HOW THE AUTOMATIC WORKS

The Husky Automatic is a product of five years of research and development. Headed by R&D director Ruben Helmin, the Husqvarna factory has spent countless thousands of dollars, perhaps even millions, on automatic transmission concepts that one by one were ruled out as inefficient or impractical. . .until the present design was settled upon. Then came the job of working out the bugs, figuring out the spring tension in the clutches so that the transmission would shift at the proper point, selecting the most suitable ratios, etc.

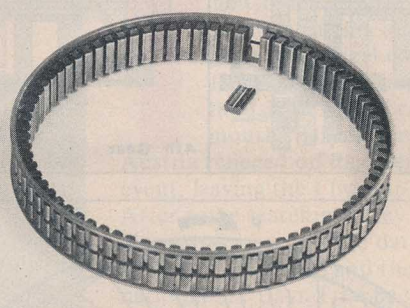
Working in the R&D department, under the supervision of Mr. Helmin, were second-in-command, Lars Erik Gustavsson and one of his top engineers, Hakan Fransson. These are the people who had the most to do with the development of the machine we tested. We have had the good fortune to discuss the machine and its workings with them. It was evident to us that they are both ecstatic and very proud of their new >



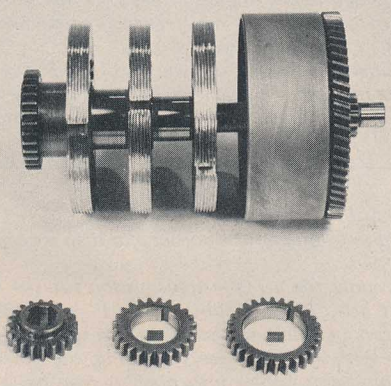
That's it folks, one automatic transmission. Looks simple, right? Don't bet on it.



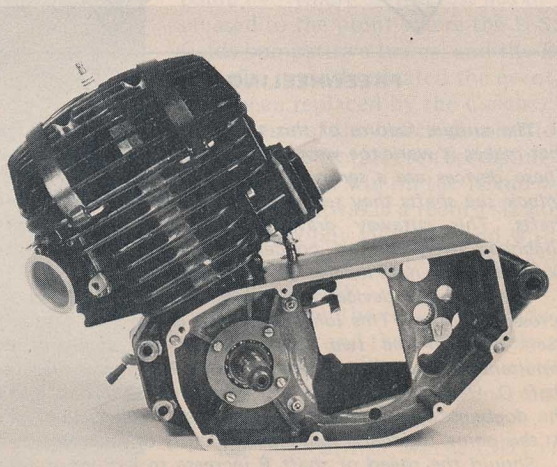
The rear gear cluster disassembled looks like this. Each shaft has two roller bearings separated by a freewheeling device. The narrowest shaft has two freewheeling devices because they couldn't get enough dogbones into one device to absorb the engine's load.



Pictured here is the largest of the freewheeling devices with one of the dogbones removed.



This is the front gear cluster with the gears removed and the three centrifugal clutches removed from the large clutch drum. Notice how each clutch is attached to a shaft of a different size.



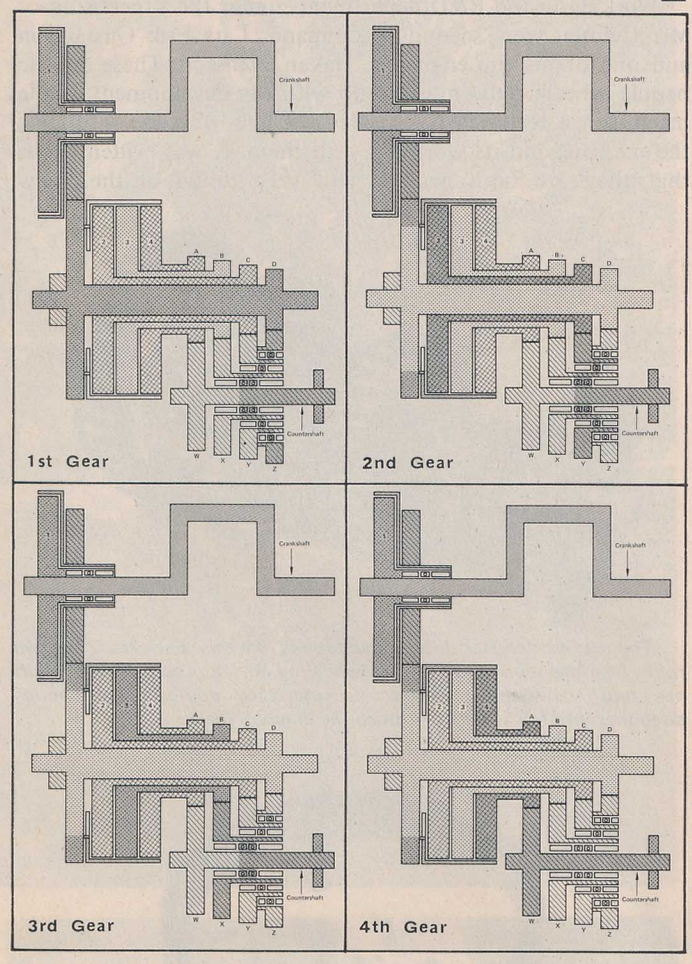
The entire transmission can be removed without splitting the cases. The lever hanging out in the opening is the engagement lever for first gear.

HOW THE AUTOMATIC WORKS

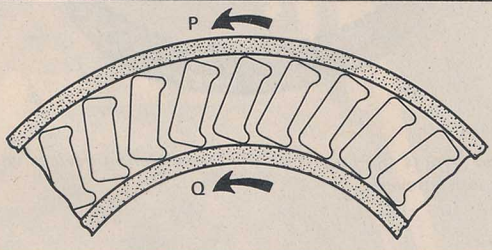
creation. They have a right to be.

The following is an explanation of the four-speed automatic transmission in the new 360 Husqvarna.

Husky calls it, simply, "the Automatic." We call it, simply, ingenious.



Illustrations by Mike Lavelle



FREEWHEELING DEVICES

The unique feature of this transmission, in fact the feature that makes it work the way it does, is the freewheeling devices. These devices are a series of caged "dogbones" that lock and unlock the shafts they separate, depending on the speed of the shafts. This cutaway drawing shows the positions of the dogbones between two concentric shafts. For the sake of explanation we have labeled the shafts P and Q.

The dogbone devices are longer across one diagonal than across the other. This longer diagonal is the part that wedges itself between the two shafts. All of the dogbones wedge simultaneously when the speed of shaft P is greater than that of shaft Q. However, should the speed of shaft Q surpass that of P, the dogbones immediately dislodge and "freewheeling" occurs. At this point, the shafts spin independently of each other.

Should the speed of shaft P increase to a point at which it exceeds that of Q, the dogbones will once again wedge themselves between the shafts, "driving" shaft Q at the speed of P.

FIRST GEAR

As the throttle is applied, the first thing that couples up is centrifugal clutch 1. Once this clutch is engaged, it remains engaged until the engine is brought back to a full idle. With clutch one engaged, the power is transmitted through the primary gears. Attached to the larger primary gear is a huge clutch drum and the central shaft of the first gear cluster. The clutch drum spins, as does the central shaft and gear D. Gear D drives gear Z. All of the freewheeling devices lock into position and the drive is transmitted through the shaft of which gear Y is a part, through the shaft of which gear X is a part, and finally to the central shaft of which gear W is a part. This central shaft protrudes out of the right side of the engine, where it carries the countershaft sprocket. The transmission is in first gear.

SECOND GEAR

In first gear, all of the freewheeling devices in the rear gear cluster are locked. This means that while the power delivery to the rear wheel is going directly from first gear only, gears W, X and Y are also being driven. They, in turn, drive gears A, B, C and the clutches attached to the left ends of their concentric shafts. When the speed of the rear wheel is great enough (just about the time that the engine runs out of breath in first gear), gear combination YC has clutch 2 spinning fast enough to spread the bobweights out and make contact with the feverishly-spinning outer drum. When this contact is made, all of the gears spin much faster, except for DZ. Since the shaft of which gear Y is a part is now spinning faster than the shaft of which gear Z is a part, the outermost freewheeling device unlocks and freewheels. The transmission is now in second gear.

THIRD GEAR

The same principle that caused second gear to engage is also responsible for third. Gears X and W are locked into gear Y. When the speed of the rear wheel is great enough (again, at top rpm), gear combination XB has clutch 3 spinning fast enough for it to spread and make contact with the large clutch drum. Remember that the large drum is spinning as fast as the motor can turn it, since the engine is peaked out. When clutch 3 makes contact, the speed of gears BX and AW is greatly increased over that of CY. This unlocks the middle freewheeling device. Only the innermost freewheeling devices are still locked. The transmission is now in third gear.

FOURTH GEAR

As the engine once more approaches maximum rpm, gears AW, which are locked into the speed of BX, spin fast enough for clutch 4 to make contact with the large clutch drum. When this occurs, gears AW accelerate, thus releasing the innermost freewheeling device. At this point the machine is in fourth gear. Since fourth gear requires no freewheeling devices in the rear gear cluster, it is a solid drive. In fourth gear, the engine can be used as a brake by rolling off the throttle. But as soon as the speed of the rear wheel diminishes enough to allow the springs in clutch 4 to withdraw the bobweights, the machine again freewheels.

DOWNSHIFTING

If you have to brake for a corner and then accelerate out, this is what happens.

As you apply the gas, the transmission's initial reaction is to engage first gear. But the split second that this happens, all of the gears start spinning, just as when first gear is engaged from a dead start. With all of the gears spinning, the speed of the rear wheel at this point comes into play. It may be low enough to keep the transmission in first gear. Or it may be fast enough to engage clutch 2 or even clutch 3. Once this is done, and the proper freewheeling devices have either locked or let go, the machine is in the proper gear. The beauty of this is, however, that it happens in about one-millionth the time it has taken you to read this paragraph. You never feel it. It is so quick, so smooth and so automatic that you would swear that the transmission has been in the proper gear all the time, just waiting for you to gas it.