

COMPLEX SIMPLICITY

The Swedish Army uses motorcycles for carrying messages, transporting officers, traffic control and — it's rumored — running over uppity Finns. In 1963, when the army decided it was time to order a new batch of bikes, Husqvarna was naturally asked to submit prototypes for testing. After all, Husky had made everything from motorcycles to 9mm automatic pistols for the army in the past.

The Swedish Army has a pretty unusual way of taking care of maintenance and service costs for its machinery. The seller has to guarantee that these expenses can be kept at, or below, a specified level over an agreed upon period. At the end of that time period, the costs are added up. If actual maintenance and service costs have been lower than the per-mile sum set, the seller is rebated the difference. On the other hand, if expenses turn out to be higher. . .

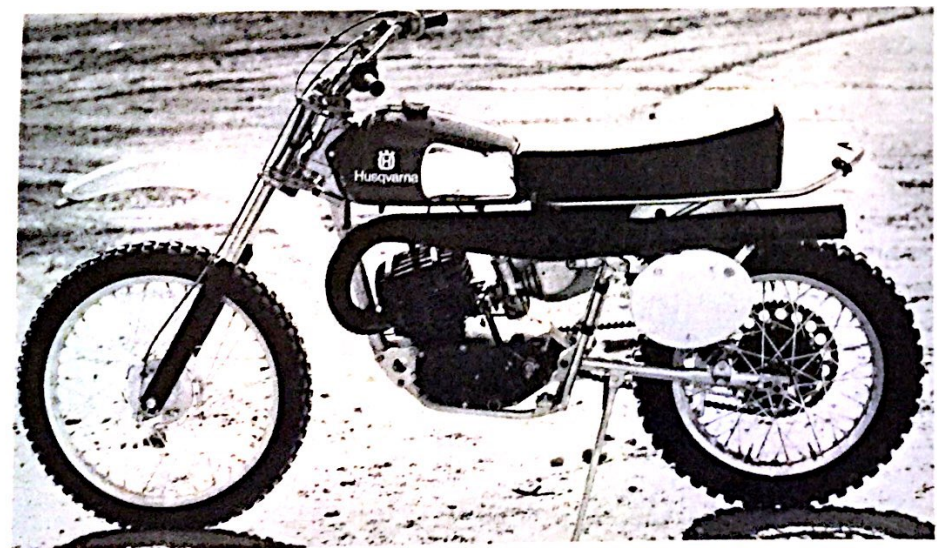
In the early '70s, the army wanted a new motorcycle, and three Swedish manufacturers were asked to submit prototypes for testing. The requirements were demanding. The bike had to be an automatic, in order that inexperienced riders could quickly be taught to use it, and it had to be able to maintain a cruising speed of 100 kilometers per hour (approximately 60 mph) with two fully equipped soldiers aboard. There was also a compendium of other requirements, including range, fuel consumption, etc.

After taking a long look at the problem, Husqvarna designed several prototypes which were tested and judged unsatisfactory. So an old two-speed moped concept from an earlier 50cc Husky engine of the late '50s was brought back and redesigned into a 250cc three-speed. After an initial development period, more prototypes were built and tested, and finally recommended for army purchase by a majority of the independent test riders consulted. In the meantime, one of the three



Husqvarna has built the lightest, most reliable, best performing automatic

HUSQVARNA 360



That's the selector lever up there on the right handlebar, and it's in the start or neutral position. The Motoplat ignition has a six-volt, 35-watt lighting coil included, with hook-ups should you want to add lights. The plastic fenders are of very good quality, and just the right length. Rubber band on the cylinder head holds down noise, not the head.

manufacturers in the competition had withdrawn (Monark), while another (Hagglunds) was involved in a series of modifications to correct handling, brake and reliability problems on their machine.

Price negotiations between Husqvarna and the army began, but remained unresolved. Additionally, the army wanted a standard maintenance guarantee on this completely new and untried concept, something that Husqvarna felt it was unrealistic to give. Realizing the commercial potential of the new machine, Husqvarna ended its negotiations with the army and developed a four-speed version with a 360cc engine, put it into their standard motocross GP frame and stuck it on a boat for America. As you read this there are probably fewer than one hundred Husky Automatics in this country, but more are on the way.

The Automatic we received for testing had been used before — both as a test vehicle and a dealer demonstrator — so it already had a large number of hours on it when we began. After six weeks of intensive testing we feel safe in concluding that the Automatic is a completely reliable unit. Our bike is still running and shifting at almost

Left side view shows the new kickstarter and improved sidestand. The rear motor mount has been eliminated, and the swingarm axle bolts right through the engine casting. Obviously designed by some clever Swede with transatlantic leanings. The exhaust pipe has a built-in Skyway spark arrestor, which is approved by the U.S. Forestry Dept. Tires are Barum Six Days style.

motorcycle ever made. But it'll cost you.

AUTOMATIC

by the
Staff of DIRT BIKE

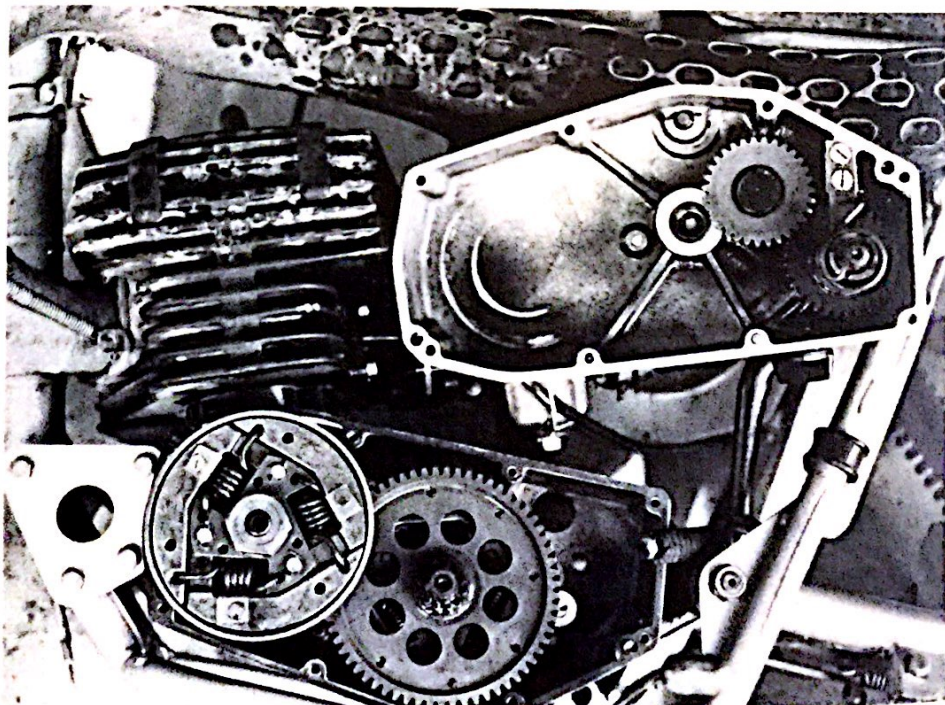
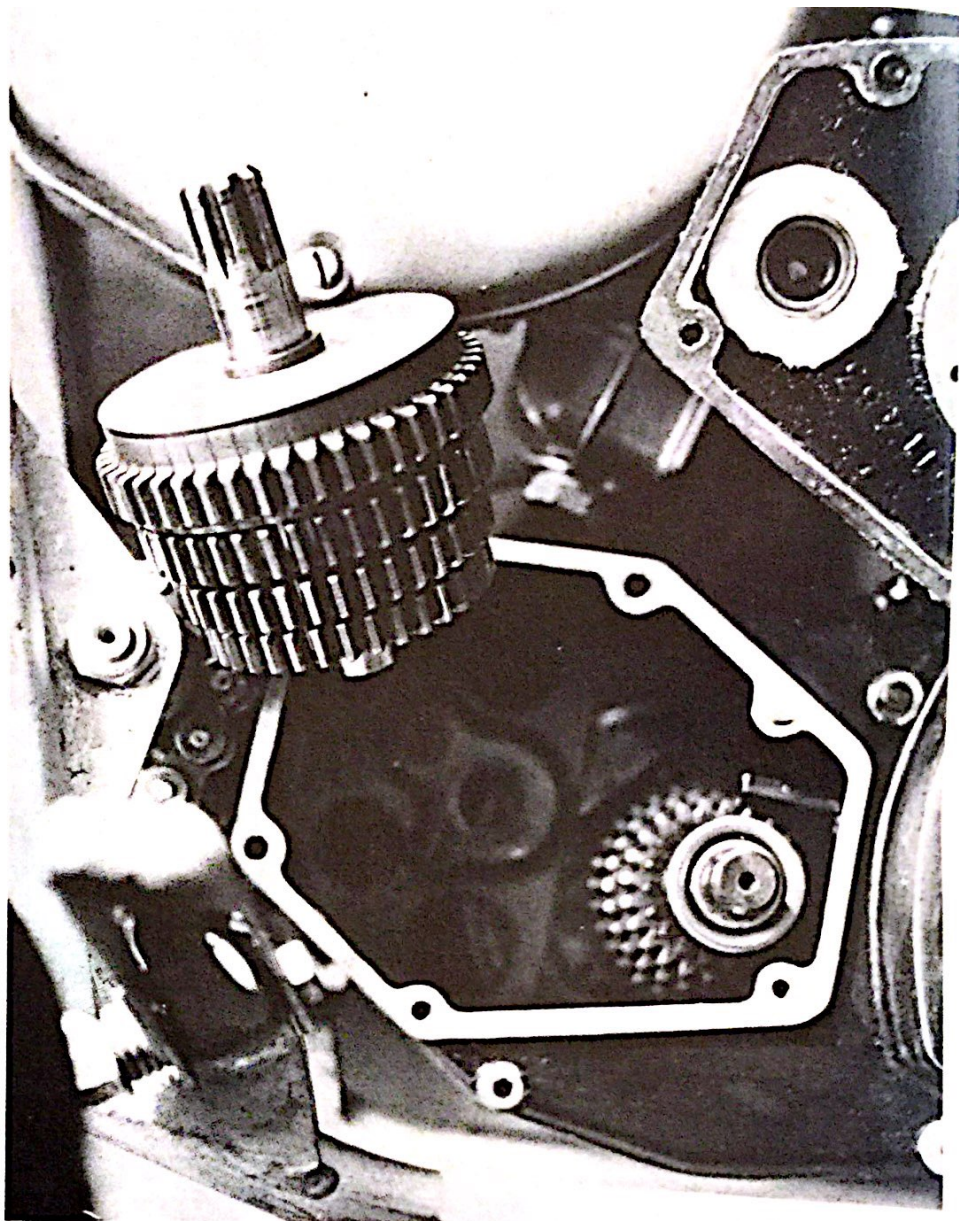
Automatic is the fact that the entire transmission can be taken apart while the engine is still in the frame — and in less than 15 minutes. After removing the brake pedal (one bolt) and sprocket (one circlip), five Allen screws are all that hold the right sidecover in place. With it removed, the gear stack can be lifted out and serviced.

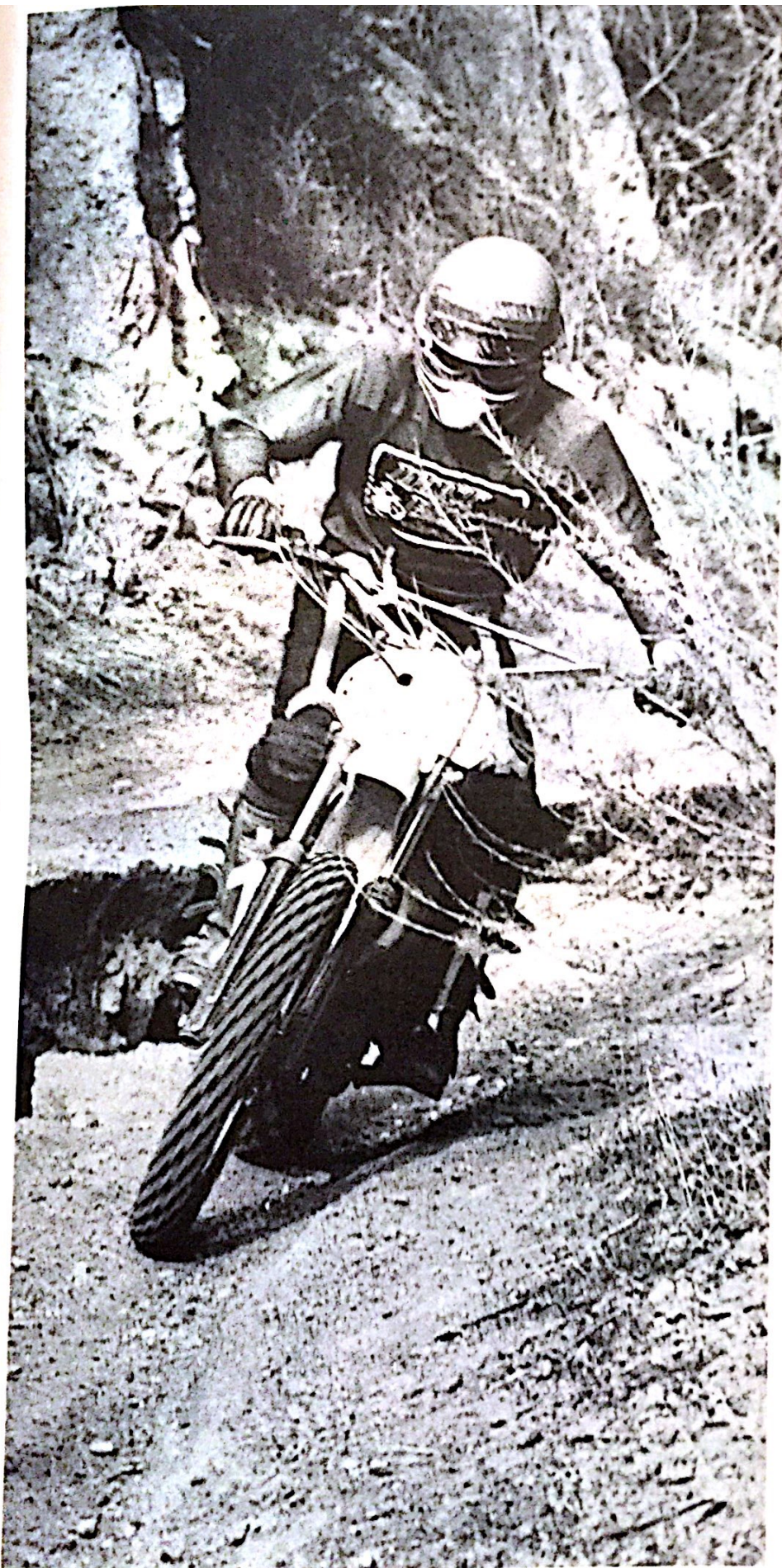
100-percent efficiency, and the only noticeable wear has been in the piston ring.

You may remember that we tested the Husqvarna 360WR last month. Well, in all things but its transmission and its paint, the Auto is a virtual carbon copy of that bike. The wheels, frame, suspension, pipe, tank, etc., are identical to those of the WR. Basically, it's green instead of fuchsia (thank the lord), weighs a few more kilos, has a Bing carburetor instead of a Gurtner and is automatically shifted. That's the difference, except for a few small improvements to the kickstarter, sidestand and rear motor mount which show up on the Auto. More about those later.

The Husqvarna Automatic transmission is truly unique. While the Automatic is not the first automatic transmission motorcycle by any means, it is the first of its kind. Ignoring the Rokon method of a drive belt with infinitely variable ratios, Husqvarna has chosen to go with four preselected gear ratios which — when they are engaged — offer a *direct gear drive* from the crankshaft to the countershaft. This transmission is so unique that a detailed description is called for, but that's easier said than done. The concepts involved are so new that there is hardly any terminology yet established to describe them in Swedish, much less in English — at least not in layman's terms. But we've done our best (see special section), and have included a four-color illustration to help you follow the process.

The left side of the transmission assembly is accessible after removing eight regular screws. One of them is located behind the kickstart lever in hallowed Husqvarna tradition. The complete kickstarter assembly stays in the cover when it is removed. A small puller is needed to remove the primary clutch from the tapered crankshaft; then the mainshaft can be lifted out with one hand.





Automatic, you immediately notice the absence of clutch lever and shift lever. The bars look naked, the engine cover incomplete. But a few minutes of riding is all it takes for the rider to completely forget that there was ever such an operation as shifting a motorcycle. Unlike the old problem of left versus right foot shifting, getting used to the Automatic is an easy process.

The Automatic cannot be push-started. To do so, you would have to first find a way to lock the clutch, and then push it at about 40 mph. And if you can do all that, you're wasting your time riding motorcycles. That being the case, the kickstarter, carburetor and ignition are unusually critical items on the Automatic.

On the right side of the Husky's bars there is a small lever which performs much the same function as the gearshift lever in an automobile with an automatic transmission. With the lever in the pulled-in position, the engine can be kick-started like any other motorcycle.

The Automatic's improved kickstarter lever makes this easier than it is on standard Huskys. Its shaft is located lower down in the cases, allowing your foot to arc through under the peg and so giving the engine a much better spin than the other Husky starters do. It takes a crank of about 400 rpm to get a spark out of a Motoplat, something that's difficult to generate with a standard Husky kickstarter. But the Automatic can do it easily, and we experienced quick two- or three-stomp starting throughout our test.

Once the bike is started, it can be warmed up by revving for as long as you like, so long as you don't release the lever on the bars. When you do decide it's time to move, the procedure is simply to allow the bike to idle, then release the lever. The gears will engage, and a twist at the throttle will move you forward. It's important to remember that, just as with an automobile, racing the engine during this moment can damage the engagement gears over a period of time. It's not difficult to remember to do it properly, but Husqvarna is working on an automatic brake device to slow the main

Text continued on page 88

This four-color illustration represents the Husqvarna Automatic engine, presented as though a horizontal cut had been made through the center line of all the shafts.

The heart of the Husqvarna Automatic is a system which uses four centrifugal clutches separated by freewheeling devices. A centrifugal clutch is a device that looks like the brake shoes in a standard drum brake. These "brake shoes," which are actually bobweights, spin around a shaft while held in place by springs. As rpm increase, centrifugal force quickly overcomes the spring tension and the bobweights are forced outward against the walls of the drum, forcing the drum to turn with the shaft. By adjusting the weight of the bobweights and the amount of spring tension, the clutch can be made to engage at different rpm. The four centrifugal clutches in the Husqvarna system are numbered one through four in this illustration.

Clutch No. 1 spins at the same speed as does the crankshaft, while the other three turn more slowly. These last three clutches, located on the mainshaft, spin on concentric tubular shafts, one inside the other, which are separated from one another by roller bearings (the round objects between each clutch in the illustration). The counter, or drive, shaft (which is green in this illustration) has three concentric shafts sheathing it, each one gear-driven and separated from the others by freewheeling devices. These freewheeling devices permit the shafts to move in only one direction in relation to one another. As long as the clutches move in one direction, they can spin at will, but a locking action of the freewheeling devices will prevent movement in the other direction. This action is somewhat similar to that of a bicycle crank, which will allow the pedals to freewheel in only one direction.

HOW THE AUTOMATIC WORKS AUTOMATICALLY

When power is applied and the engine revs up to about 2000 rpm, clutch No. 1 (the yellow clutch in our illustration) engages and turns all of the yellow parts of the engine, including the complete clutch drum and the countershaft. The first, or yellow, gear at the countershaft moves too, and the three sets of freewheeling devices between first gear and the countershaft lock, spinning all the gears and driving the (green) countershaft. This in turn drives the countershaft sprocket and the drive chain, and power is transmitted to the rear wheel. Because all the gears on the countershaft are spinning because of the locking of the freewheeling devices, they are also driving clutches Nos. 2, 3 and 4; but at different speeds, since the gearing between the main and counter shafts is different. The Automatic is now in first gear.

As engine speed increases with the continued application of throttle, the rpm of clutches Nos. 2, 3 and 4 increases too, and when they reach a sufficiently high rate of rpm, clutch No. 2 (blue) will engage the drum. This is calculated to occur when the engine is peaked out in first gear.

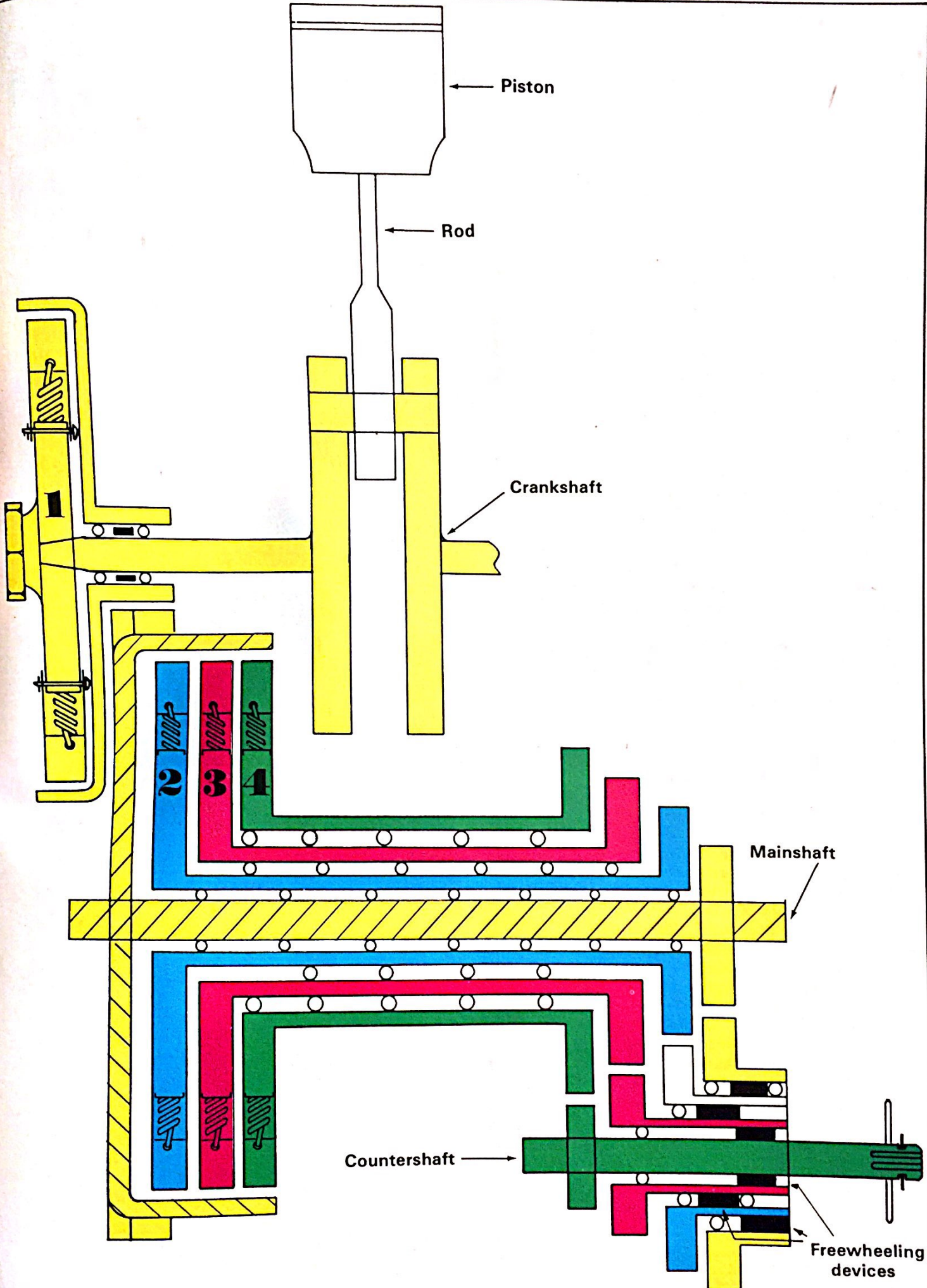
All of the yellow parts are still turning with the engine, but since the gear ratio between the mainshaft and the countershaft is taller for the blue gears than for the yellow, the blue drive will now take over and drive the countershaft through the locked freewheels at its own speed. The yellow shaft can continue its slower pace without interfering, because the blue drive is turning faster and the freewheels between the yellow and blue drive gears are unlocked, allowing the yellow to spin freely without affecting the actual drive speed. The red and green shafts and clutches are now being driven by the blue shaft, while the yellow is simply coasting. The Automatic is now in second gear.

As speed further increases and engine revolutions build, the No. 3 clutch (red) will engage in its turn and begin to drive the countershaft

through its own, taller, ratio. The freewheels between the red and the green shaft are locked, while the freewheels between red and blue and between blue and yellow are unlocked, allowing those shafts and clutches to spin, or coast. The Automatic is now in third gear.

Should the rider ease off the throttle at this point, allowing rpm to fall, the transmission (with the exception of the No. 4, or green, clutch) will slow down and eventually stop turning. As it slows, the clutches will retract due to the lack of centrifugal force and the engine will idle, eventually slowing all of the yellow, blue and red parts to a halt as the transmission automatically downshifts through the gears. The only things turning at this point (except the crankshaft) are the green shaft and clutch. If throttle is reapplied at this point, the transmission reacts as though the engine were beginning from a dead start, though the bike is, in fact, coasting. First, the No. 1 (yellow) clutch will re-engage, then the Nos. 2 (blue) and 3 (red) — if the bike is still making fast enough headway to need third gear. If not, only the clutch driving the gear necessary for the amount of speed involved will engage. In other words, the transmission will keep upshifting automatically until it finds the proper gear for the current rate of speed of the motorcycle. This entire upshifting procedure takes place within fractions of a second, and can not be felt by the rider.

The shift from third to fourth gear happens in the same way as do the others, but since there are no freewheeling devices between fourth gear (green) and the countershaft (also green), the rider will experience usable engine braking in that gear should he let off the throttle. But as soon as engine speed decreases enough so that the transmission downshifts to third, the freewheels between the other gears will begin working again and engine braking will cease.



This is it. All the parts and all the tools necessary. Since we didn't have the special clutch puller handy, we modified a Husky crankcase tool to do the job. All shafts run within needle bearings. Can you pick out the right-side footpeg?

clutch drum down to ease engagement.

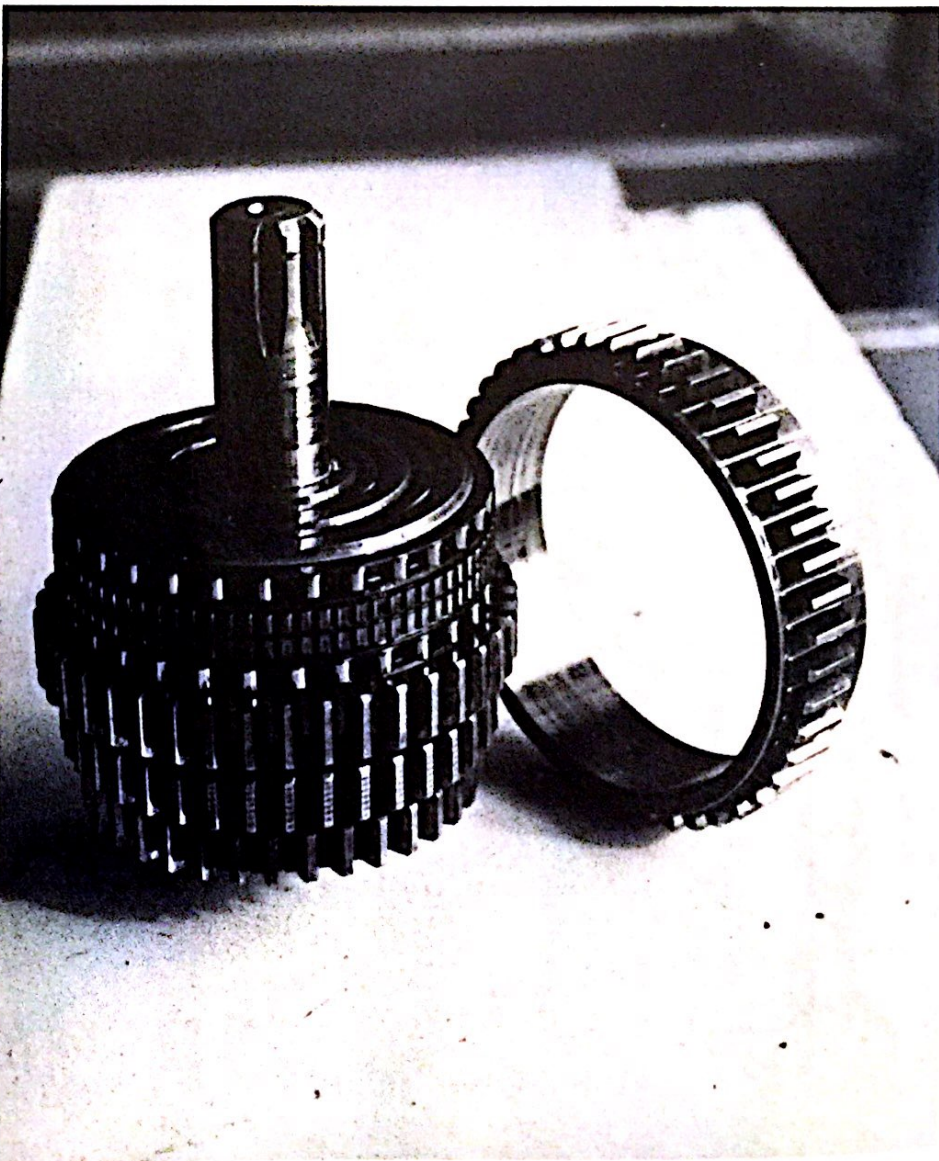
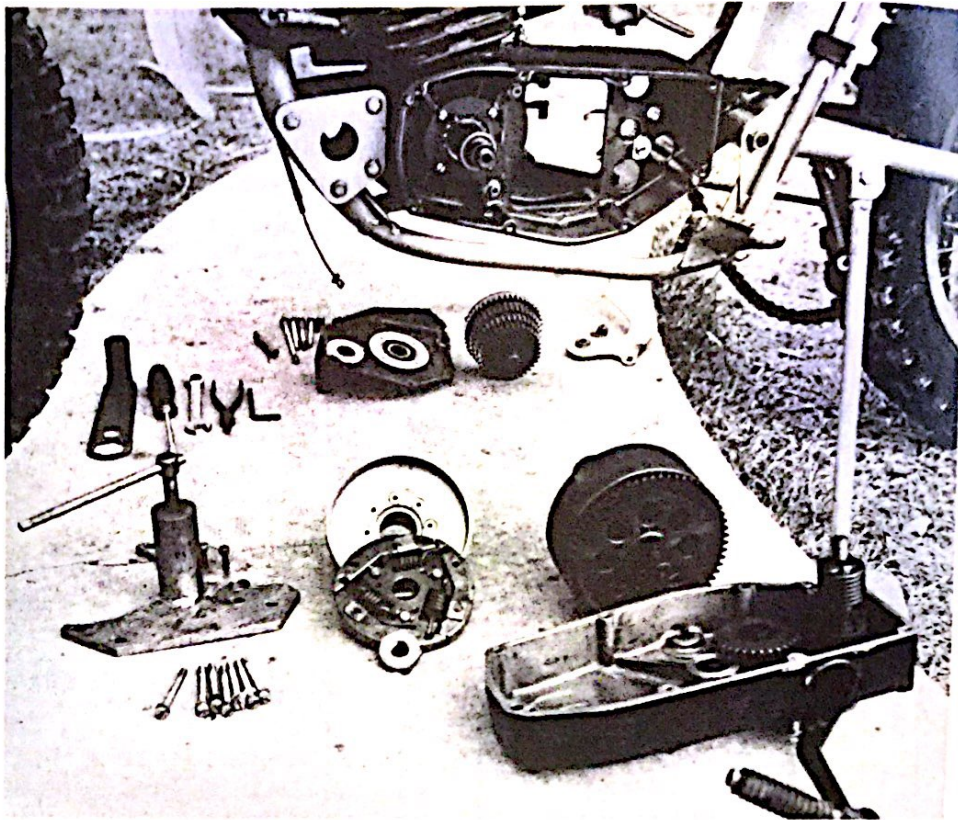
Once in gear, the selector lever doesn't need to be moved again until the next time you want to start the engine. Idling can be accomplished simply by not twisting the throttle. To stop, leave the throttle alone. To start, just gas it and go. Simple.

One of the great blessings of the Auto is that should you fall while riding, the bike will simply lie there and idle (except for those very occasional times when the engine stalls), waiting for you to pick it up and go again. So long as you don't accidentally twist the throttle while picking it up, you can just get back on and continue your ride as though nothing's happened. This can save a rider considerable time and energy during an event.

Break-in running is very important on any Husky. If the engine is run very, very gently for its first hour or two and the revs kept low, engine lifetime will increase dramatically. After this has been done, the rider can first begin to extend the motorcycle and find out exactly what it's all about.

Because of the twin demands of easy starting and consistent idling, we feel that Husqvarna was wise to stick with a Bing carburetor for the Automatic. True, it does take some knowledge to tune a Bing successfully, but there are no mysterious tricks involved. One problem is that it takes about ten minutes of riding before the engine heats up enough to dispel the initial feeling of richness, allowing carburetion to become stable. It is for this condition that mental adjustments have to be made. A tuner who didn't know this would lean the mix out too much, and then, when it heated up, the bike would run too lean. So it's

This is the countershaft with the first gear removed. The two rows in the middle, between the two roller bearings, are the freewheeling device. When the gear is slipped over it, it makes it possible for the gear to turn in one direction only. Second and third gears are installed the same way.





carbureted bike thoroughly before making carburetion adjustments.

Any corrections in the mid-range which are needed can be made by changing needle jets. The needle itself, though easy enough to change, has three positions, but should always be left in the middle one so that the degree of taper will give the right mixture ratios for the whole mid-range. Changing the needle position will offset the air/fuel ratio in either the lower or higher mid-range. We feel that the adjusting possibilities of the Bing are entirely adequate, and that there is no need to go to another type of carburetor. If it works well enough for Lackey, Mikkola, Burleson, *et. al.*, it should work well enough for you — when adjusted properly. It is also, without doubt, the simplest carb to work on.

Since the Automatic does all of its own shifting, it allows the rider to concentrate on path and style. Shifting is precise, smooth and quiet, and straight line acceleration seems almost docile until you realize how fast you are suddenly going. We believe that with certain modifications this bike could be a competitive motocrosser or TT bike, but the present model is obviously a cross-country and enduro machine. Because of the extra muffling, power is a little down from that of the CR. Still, the Automatic's top speed is in the middle 70s.

First gear is quite tall, and the bike is capable of 20 mph at 4000 rpm in this gear. We thought this a bit too much, so we geared down by going from a 12 to an 11-tooth countersprocket. This proved an advantage, especially in tighter woods work, and still gave the bike a top end of well over 60 mph — enough for most of us. Those who might want to gear down still further should consider going to a 58-tooth rear sprocket, rather than using the ten-tooth countersprocket available for the Husky 125, since that front/rear ratio would be hard on the chain.

The centrifugal clutch which engages first gear has to do some

Like its standard shift cousins, the Automatic doesn't drown out easily. Ours never missed a beat during

slipping before you gather momentum in first, especially during difficult starts on uphill or in mud or snow. The next three shifts, however, occur within fractions of a second, with a minimum of slippage. Therefore, the first gear clutch, located on the crankshaft, has to take a lot more abuse than do the others. Each clutch has three brass bobweights (which run in transmission oil), which are grooved to dissipate oil so that they can engage their drum smoothly and without slippage. When these grooves become worn, they can be regrooved with a hacksaw. After all the hard hours our test bike had on it, the first clutch was overdue for regrooving, though the bike still ran well enough. The other clutches, however, seemed as good as new.

The oil used in the transmission is a special kind of fluid with extremely high viscosity under a wide temperature range, so that shift points will not be altered as the engine heats up. It will be available through Husqvarna dealers. While no actual damage would be experienced through the use of regular oil, shifting is more precise and stable if the Husky lube is used.

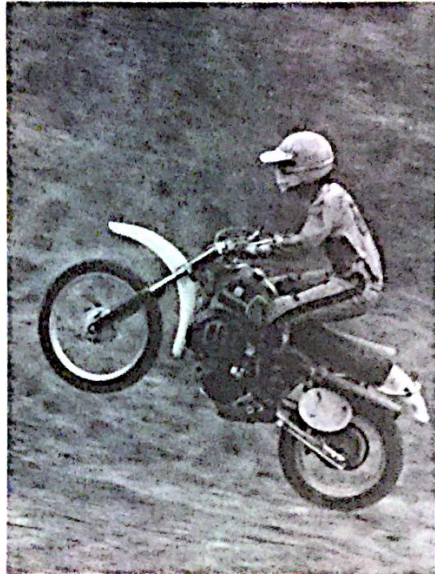
With the use of only four gears and the baffled pipe restricting the power somewhat, the Automatic's long GP wheelbase can really be felt. The front end is a bit heavy, and there's not always enough power to lift the front wheel over logs, ditches, etc. The excellent suspension works to neutralize this problem to some extent, but it's still there.

Going down a steep hill with the engine freewheeling is an experience. Since there is no engine braking, except in fourth gear (see illustration and explanation), you have to depend solely on the brakes. At least they're good units, the front having a strong feel, and the rear being not at all grabby.

You shouldn't take our earlier comments about low power too seriously. In comparison, say, to the 360CR, the Automatic is perhaps a tad slow. But it will be more than sufficient for anyone but top experts, with the additional advantage that with the engine doing the shifting, it's impossible to become bogged down. Apart from braking technique, the Automatic is ridden just like any other bike, except that everything is so much easier and smoother when you're into the rough

stuff. With no shifting or powerband worries, the rider can concentrate on finding the best path to the finish line.

Since the chassis of the Automatic is identical to those of other competition Huskys, you can expect its handling to be the same. The bike is an extremely stable unit, which needs to have the fork tubes pulled



up 25mm through the fork crowns in order to turn well under tight conditions. The fork seals are of a new rubber compound which doesn't leak. The rest of the fork assembly is identical to those of the GP bikes, with 185mm of travel.

The rear suspension is the proven GP version with laid-down gas Girling shocks. It is unquestionably one of the finest suspensions available today. It is a suspension which has proven itself where it counts — on the track and in pounding cross-country competition runs. The results speak for themselves.

Husqvarna bars seemed to suit most of our test riders, as did the seat. The pegs could use a little more serration, but they work well enough. The rims are the new, reinforced shoulderless Akronts.

Two small problems. In tight woods riding there's a good possibility you'll burn your left thigh on the top rear end of the exhaust pipe. As long as your foot's on the peg, everything's fine, but when you start using your leg for support in turns or to move the bike forward, you quickly get this nasty hot feeling in your leathers. The second problem is the front brake. Initially fine, it became increasingly grabby as the test went on, to the point that we didn't really want to use it. Husky

HUSQVARNA 360 AUTOMATIC

Price:

(retail, approx.) — \$2495

Engine Type:

Two-stroke single, reed valve

Displacement 354cc

Bore and Stroke 82mm x 67mm

Compression Ratio 10.8:1

Carburetion 36mm Bing

HPat RPM 30.6 at 7500

Clutch Light alloy, 5-disc

Primary Drive Gear, 2.42:1

Overall Transmission Ratios:

1) 16.0:1

2) 11.9:1

3) 9.5:1

4) 7.9:1

Final Drive:

12-tooth countershaft

53-tooth rear sprocket

Air Filtration Twin Air foam

Electrical System:

Motoplant CDI, pointless

Lubrication Pre-mix, 25:1

Recommended Fuel Premium

Recommended Oil N/A

Fuel Capacity: 11.5 liters (3.0 gallons)

Frame: Single downtube, chrome moly

Suspension:

Front:

Husqvarna forks,

18.4cm travel (7.4 inches)

Rear:

Swingarm with Girling gas shocks,

19.1cm travel (7.5 inches); measured

at the rear axle

Wheels and Spokes:

Shoulderless Akront rims, stainless

spokes

Tires:

Barum, 3.00 x 21

Barum, 4.75 x 18

Dimensions:

Wheelbase 143.5cm (56.5 inches)

Swingarm length 42.8cm (19.0 inches)

Ground clearance 25.5cm (10.0 inches)

Bars, width 89.0cm (35.0 inches)

Bars, height 113.0cm (44.5 inches)

Pegs, width 46.0cm (18.2 inches)

Pegs, height 33.0cm (13.0 inches)

Seat height 88.0cm (34.6 inches)

Fork angle 30.5 degrees

Weight:

106 kg (234 pounds) actual with no

gas; 45 percent on front wheel,

55 percent on rear wheel

Brakes:

Front Cable-operated, 140mm

Rear Rod-operated, 160mm

Instruments None

Lights None

Silencer:

Built-in muffler with Skyway

appr. spark arrestor

Warranty:

None, but Husky replaces obvious

defects

Parts Prices:

Piston assembly complete — \$39.77

Rings (one) \$4.88

Clutch cable DNA

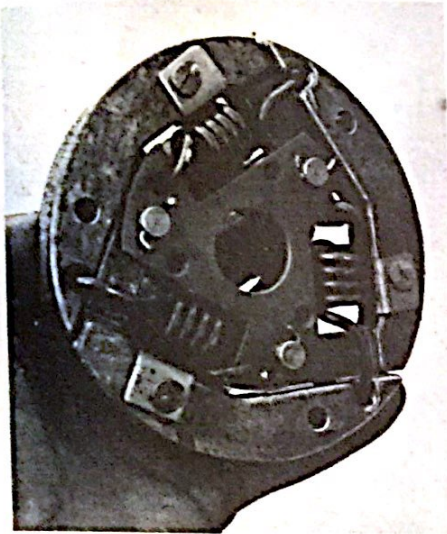
Cylinder \$149.99

Shift lever DNA

Brake pedal \$8.76

Brake lever (complete) \$13.28

has chosen to use its full-width hub for the Automatic, because it gives the possibility of hooking up a speedometer. We attempted to clean the brake shoes up, but oil and dirt had become imbedded in the lining and replacement was the only solution. Apparently, the full-width hub seals less well than the smaller GP item.



The centrifugal clutch on the crankshaft is almost identical to the three that are positioned on the concentric shafts over the mainshaft.

WHAT WE THINK AND WHY THAT IS

The Husqvarna 360 Automatic is a very impressive motorcycle, especially when you consider that it is a first rendering of a totally new motorcycle concept. At \$2500 it is easily the most expensive dirt bike we know of, but it offers the rider a whole series of features he'll find nowhere else. After the first ride, the Automatic can leave you with an undecided feeling, but as time goes on and you learn to use the bike's full potential, enthusiasm grows. It offers the experienced rider the plus of being able to totally concentrate on difficult terrain, leaving problems of correct power application to the transmission. And under conditions of low traction, the Automatic wins hands down over standard transmission motorcycles, as the transmission negates wheelspin and pulls traction under almost any conditions. It's those slippery uphill, mud trails and long ankle-grabbing ruts where you'll first begin to love the 360 Automatic.

We feel that the Husqvarna 360 Automatic is a triumph of progressive engineering, a motorcycle at least two years ahead of its time. Probably that's worth \$2500.



HI-POINT BOOTS



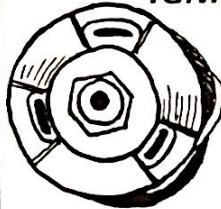
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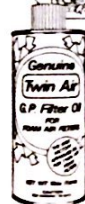


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