

**HOWARD ROTAVATOR
OPERATING INSTRUCTIONS
HR 14 / HR 16 / HR 19 / HR 21 / HR 18(USA)**

Rotavator

HR14 / HR16 / HR19 / HR21 / HR18 (USA)

ENGLISH

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We congratulate you for your purchase of a new HOWARD machine. It has been designed and manufactured for intensive use and for a long worklife. We recommend you read this manual thoroughly and pay strict attention to the instructions in it so the machine will provide optimum service and work will be done safely and efficiently

Serial number

The serial number and model numbers are stamped on the identification plate attached to your Rotavator. For future reference, record the numbers below. Always quote them when ordering spare parts

MODEL
SERIAL N.
DATE PURCHASED

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SAFETY PRECAUTIONS



BE ALERT: When you see this symbol on a Rotavator or in the instructions, it warns of a hazard which could lead to injury

Before Use

- Ensure operators have read and are familiar with the instructions contained in this publication.
- Consult the tractor Manufacturer's Manual for instructions on mounting implements and safe working methods
- Ensure the Rotavator is standing on firm, level ground with the praking prop in the lowered position.
- Make certain that all guards, covers, warning labels and safety devices are correctly fitted and operative.
- Ensure that the work area is clear of bystanders.
- Inspect the work area for obstructions which may constitute a hazard.
- Disengage all clutches and shift into neutral prior to starting the tractor engine.

During use

- Observe all safe driving procedures such as reducing speed on slopes and sharp turns.
- Be alert for hidden obstructions, should an obstruction be struck, stop and check for damage to the Rotavator before proceeding.
- Avoid working on ground where there is a risk of the tractor overturning.
- Do not cultivate across the face of slopes.
- Avoid disengaging the tractor transmission before raising the Rotavator from the ground.

After use

- Inspect the Rotavator for damage.
- Check that all bolts, nuts and fasteners are tight.
- Carry out lubrication and maintenance as detailed in this publication.
- Disengage the pto. drive when transporting the Rotavator.

Always

- Wear substantial or safety footwear.
- Avoid loose clothing which may be caught in moving parts.
- Remove the tractor ignition key, before handling or repairing the machine.
- Wear gloves when handling worn implements or parts with sharp edges.
- Ensure the Rotavator is not operated by children or untrained persons.
- Use the Rotavator only for the purpose for which it was designed and tested, and in accordance with the instructions contained in this publication.
- Interpret "left" or "right" as left or right hand of the operator when sitting on the tractor seat and facing forward.



NEVER:

- Touch any moving part of the Rotavator or parts which may be hot from operation.
- Check the levels whilst the Rotavator is running.
- Carry out adjustments or repairs to a mounted Rotavator unless the tractor engine is stopped and the Rotavator firmly supported or lowered to the ground.
- Leave the tractor seat unless the Rotavator is lowered, the PTO drive disengaged, the gear shift in neutral, the brake applied, the engine stopped and the ignition key removed.
- Climb onto the machine when it is in operation.

PTO drive shaft guards

HOWARD products are supplied with non-rotating PTO drive shaft guards which must be correctly fitted and well maintained. Before and after each use PTO driven implements should be examined to ensure the drive shaft rotates freely in the guards, the guards are undamaged, securely fitted, correctly seated on the shaft grooves and the restraining chains attached to the tractor and implement.

Should the guards be broken, damaged or badly fitted the implement must not be used until damaged parts have been replaced and/or bad fitting corrected.

Always ensure the guard tubes do not separate at the PTO drive shaft's longest working or transport length, or jam at it's shortest.

Avoid damage to guards when the PTO drive shaft is being connected or disconnected from the tractor by resting it on a support.

Never allow PTO drive shaft guards to fall into the implement or drop to the ground; damage will almost certainly occur. Always ensure the sliding surfaces of the guard tubes are clean and the guard bearings lubricated.

When replacing worn or damaged sections of the guard, use special tools available from the makers.

Always follow the fitting, lubrication and maintenance instructions supplied by the makers of the PTO drive shaft guard.



UNLESS CORRECTLY GUARDED PTO DRIVE SHAFTS CAN KILL

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TECHNICAL SPECIFICATIONS

Model	Speeds	Working Width cm	Number of blades	Total width cm	Weight Kg	Tractor power HP	Rotor speed rpm
HR14-080	1	80	18	102	210	25-30	219
HR14-090	1	90	21	112	225	30-35	
HR14-100	1	100	24	122	240	30-40	
HR14-115	1	115	27	137	255	35-45	
HR14-130	1	130	30	152	270	40-50	
HR14-140	1	140	33	162	285	40-55	
HR14-155	1	155	36	177	300	45-55	
HR14-165	1	165	39	187	315	45-60	
HR14-180	1	180	42	202	330	45-60	
HR14-190	1	190	45	212	345	45-65	
HR14-180 SM	1	180	40	202	330	25-50	
HR14-205 SM	1	205	44	227	358	35-65	
HR19-130	4	130	30	152	285	40-55	
HR19-140	4	140	33	162	300	40-50	
HR19-155	4	155	36	177	315	40-55	
HR19-165	4	165	39	187	330	45-55	
HR19-180	4	180	42	202	345	45-60	
HR19-190	4	190	45	212	360	50-65	
HR16-080	1	80	18	102	215	25-30	223
HR16-090	1	90	21	112	230	30-35	
HR16-100	1	100	24	122	245	30-40	
HR16-115	1	115	27	137	260	35-45	
HR16-130	1	130	30	152	275	40-50	
HR16-140	1	140	33	162	290	40-55	
HR16-155	1	155	36	177	305	45-55	
HR16-165	1	165	39	187	320	45-60	
HR16-180	1	180	42	202	335	45-60	
HR16-190	1	190	45	212	350	20-60	
HR16-205	1	205	48	227	365	50-65	
HR16-180 SM	1	180	40	202	330	25-50	
HR16-205 SM	1	205	44	227	358	35-65	
HR18-130	4	130	30	152	290	40-50	172-205 243-290
HR18-140	4	140	33	162	305	40-55	
HR18-155	4	155	36	177	320	45-55	
HR18-165	4	165	39	187	335	45-60	
HR18-180	4	180	42	202	350	45-60	
HR18-190	4	190	45	212	365	50-60	
HR18-205	4	205	48	227	380	50-65	

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DESCRIPTION

Fig. 1 indicates assemblies referred to in the text of this manual which are named below:

- A: PTO drive shaft
- B: Gerabox
- C: Side drive
- D: Rotor
- E: Hull
- F: Top mast
- G: Frame
- H: Trailing board
- I: Depth control skids

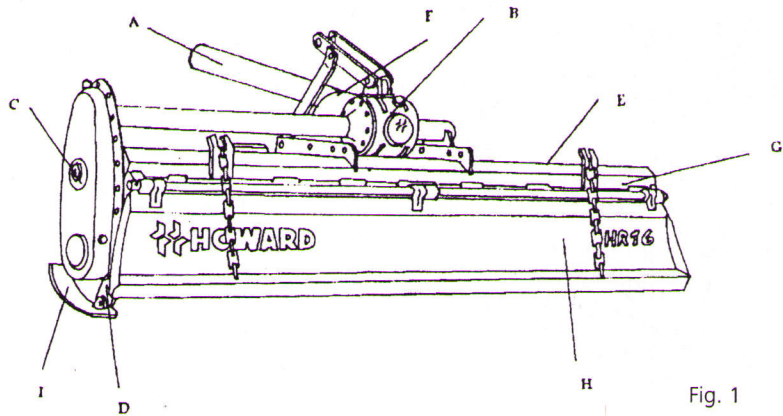


Fig. 1

HR14 / HR16 / HR19 / HR21 / HR18 (USA) are designed for 25 to 65 HP tractors with cat I and II linkage. The drive is by a PTO shaft from a 540 tpm. The gearbox is single speed (HR14 / HR16) and 4 speeds (HR19 / HR21 / HR18 (USA)). The jackshaft transmit the power from the gearbox via the side chain in the models HR14 / HR19 or via the side gear train in the models HR16 / HR21 / HR18 (USA). An overload clutch provides protection for the transmission.

The normal tillage depth of 7 to 22 cm is regulated by the depth control skids. Rotavator are suitable for primary and secondary tillage, weed control and incorporating of material into most soil types..

NEW MACHINE

PTO shaft

For transport purposes, the PTO shaft is dismantled and must be refitted.

Lubrication and general

With the machine standing level ensure the following preparatory work has been done:

1. The gearcase filled to the level plug (A) (fig. 2) Capacity: 2l. Use SAE 90 oil.
2. The gearbox filled up to the level mark in the inside rod (A) (fig. 3). Capacity 1,5 l. (HR14 / HR16) and 3,5 l (HR19 / HR21). Use SAE 90 oil.
3. All oil and grease points as indicated on p. 14 (Lubrication)
4. All nuts and bolts tightened. (Re-tighten after first hour's work)

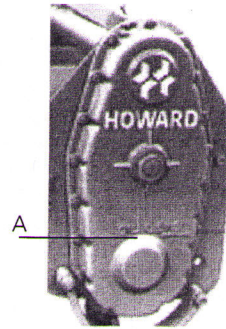


Fig. 2

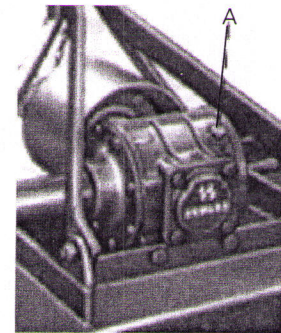


Fig. 3



SERIOUS DAMAGE CAN RESULT FROM FAILURE TO CARRY OUT THE ABOVE PROCEDURES

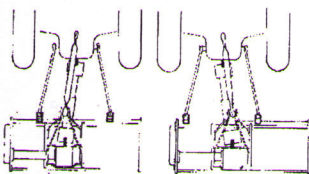


Fig. 4

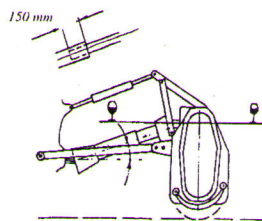


Fig. 5

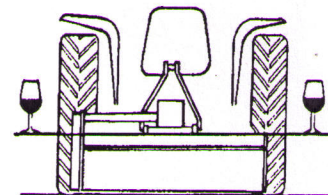


Fig. 6

ATTACHING THE ROTAVATOR TO THE TRACTOR

All models have dual mounting position, i.e. central or offset to the right. Offset mounting is achieved by repositioning the lower link mounting brackets. (fig.4)

The PTO drive shaft must be set to a safe working length to ensure the male shaft does not "bottom" or separate from the female tube under all conditions of use and transport.

To determine the correct mounting position: with the Rotavator on a firm level surface the Depth Control equipment should be adjusted until the gearbox input shaft is horizontal (fig.5). Position the tractor at a distance from the Rotavator to give 150 mm (6") minimum engagement of the male half of the PTO drive shaft in the female tube when connected to the tractor. This establishes the safe working length of PTO drive shaft for connection to the tractor.

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Position the tractor lower link ball joints in line with the mounting pins. Connect the tractor lower links. Fit the tractor upper link and secure. Attach the PTO drive shaft to the pressure plate by the studs and tighten the nuts. Attach the PTO drive shaft guard chains to the tractor and Rotavator.

Attach stabilizer bar or check chains to limit sway to 50 mm (2"). Adjust tractor linkage to level Rotavator laterally and longitudinally (fig. 5 and 6). Before engaging the tractor PTO, lift the Rotavator on the hydraulic lift linkage until the PTO drive shaft attains an angle of 40 ° and set the limit stop on the hydraulic lift control quadrant. (fig. 5)



ATTENTION! : THE PTO DRIVE SHAFT ANGLE MUST NEVER EXCEED 40°.

Finally check that during transport and use the PTO drive shaft does not "bottom" or separate and that the maximum angle of 40 ° is not exceeded. Should it not be possible to obtain the aforementioned setting with your tractor, SEEK ADVICE, it may be necessary to reduce the length of the PTO drive shaft by cutting.

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Depth control

Fig. 7 illustrates how to adjust the depth control skids.

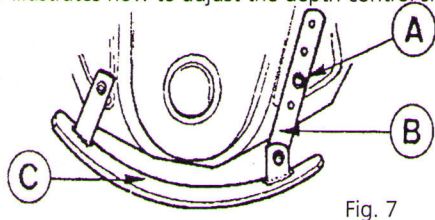


Fig. 7

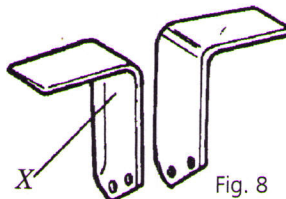


Fig. 8

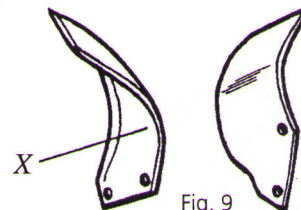


Fig. 9

ROTOR AND BLADES

HR14 / HR16 / HR19 / HR21 Rotavators are fitted with original HOWARD BLADES model 9900/9901. See fig. 8 where the left blade is marked with X. Use always only ORIGINAL HOWARD BLADES and HOWARD blade bolts. As an option it can be fitted with «speed» blades model 9953/54 (Fig.9)

The blades must form a «scroll» pattern (fig. 10). This ensure that they enter the soil at regular intervals to even out the load on the transmission.

When replacing worn blades, remove one blade and fit the new one in its place before proceeding to the next. This will ensure that the blade «scroll» pattern is maintained.

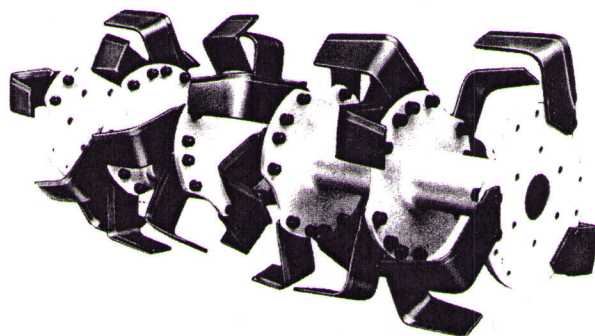


Fig. 10

Rotacadet SM

HR16 SM is fitted with a special rotor with four blades per flange type ROTACADET (9941/9942)

When replacing worn blades take special attention to the following instructions in order to get the correct mounting and maintain the «scroll» pattern». (Fig. 11)

D = Right
I = Left

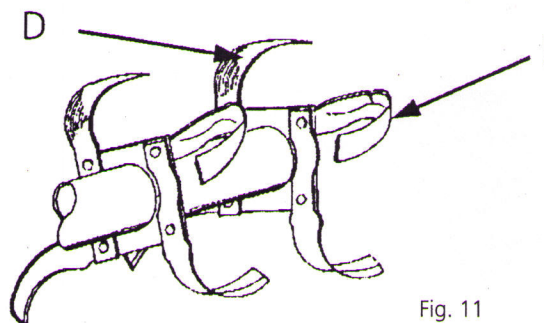
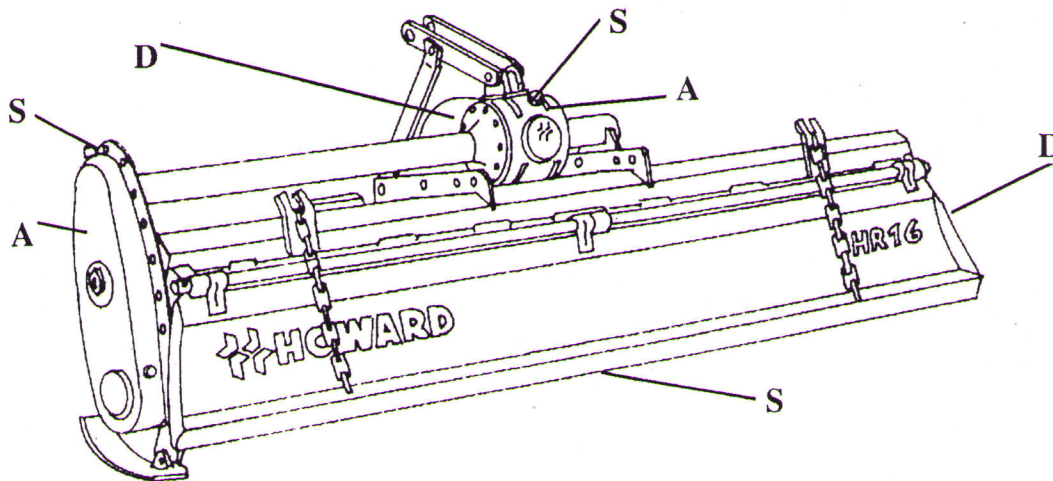


Fig. 11

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ATTENTION! IN ORDER TO OBTAIN A CORRECT MAINTENANCE AND FUNCTION OF YOUR MACHINE IS IMPERATIVE TO FOLLOW THE ENCLOSED INSTRUCTIONS:

- **(D) DAILY:**
 1. Lubricate with grease gun PTO spiders.
 2. Lubricate with grease gun right hand stub axle bearing
- **(S) WEEKLY:**
 1. Top up with oil SAE 90 The gearbox.
 2. Top up with oil SAE 90 The side drive gearcase.
 3. Tighten fasteners.
- **(A) EVERY 500 WORKING HOURS:**
 1. Drain flush and fill with oil SAE 90 the gearbox.
Drain flush and fill with oil SAE 90 the side drive gearcase.

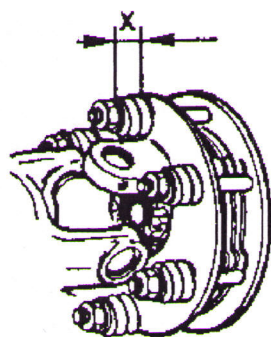


Fig. 12

PTO	Tractor HP	Number of turns	X (mm)
540	45	1 + 1/4	29,9
	55	1+1/2	29,5
	65	1 + 3/4	29,1

ADJUSTMENTS

Clutch

In general the clutch should be adjusted to give drive to the rotor during normal work. Should tree roots, rocks or similar obstacles be struck the clutch must slip to protect the Rotavator and the tractor transmission. If the clutch is set too loosely the rotor turn erratically leading to excessive wear of the friction discs. Conversely a clutch set too tightly provides no protection, transmitting a shock load when obstacles are encountered.

To set the clutch proceed as follows:

- Take off the guard
- Slacken nuts until the spring can easily turn by hand..
- According to the power of the tractor used, adjust the spring length in accordance with the dimensions given here (fig.12/13) Turns of nut and maximum length of springs X.

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OPERATING INSTRUCTIONS

Operational information

By simple adjustments, HR14 / HR16 / HR19 / HR21 / HR18 (USA) Rotavators, will produce a range of tilths in most soil types to prepare the desired seedbed suitable to seed-drill requirements. As a general principle fine tilths are produced by a combination of slow tractor speeds and a lowered trailing board (fig.14). Conversely coarse tilths are produced by fast tractor speeds and a raised trailing board (fig.15).

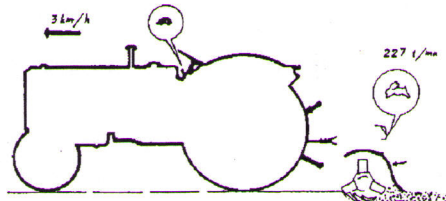


Fig. 14

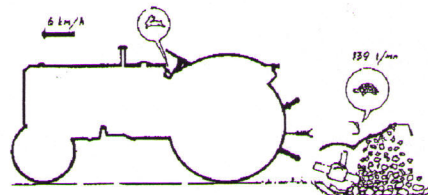


Fig. 15

Intermediate grades of tilth from coarse to fine can be obtained by:

- Adjusting the pressure on the trailing board which by impact shatters the blade cut «clods».
- Raised the trailing board also deposit weeds and trash on the surface to wither .
- With the trailing board completely pressured trash is buried and have a levelling effect on the soil.
- Increasing or decreasing the tractor speed it will also affect to the tilth.
- Changing the gears on the Selectatilt gearbox it gives more possibilities of different tilths.
- High working speeds may also be used for shalow work on previously borken ground.

Working instructions

Set the depth control skids to the required tillage depth (page 21). Select a trial trailing board and a rotor speed (only for HR18 / HR19 / HR21) to give the type of thilth required. Engage the tractor Pto and Drive forward progressively lowering the Rotavator into the ground. Proceed for a short distance and check whether the resultant tilth is satisfactory and the tillage depth is uniform across the rotor width. If not make the apropiate adjustments to procedure the required tilth.

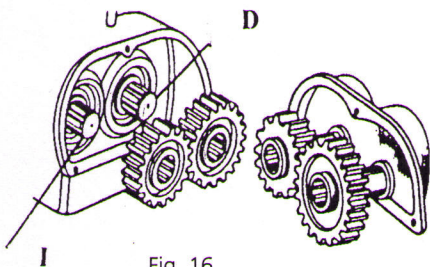


Fig. 16

I	D	rpm HR 19	rpm HR21/HR18
26	20	169	172
24	22	201	205
22	24	239	243
20	26	285	290

Fig. 17

Selectatilt gearbox (HR18 / HR19 / HR21)

The Selectatilt gearbox enables rotor speeds to be altered by simply transposing or changing pairs of pick-off gears (Fig.15/17).



Changing the gears. Important: STOP THE TRACTOR AND DISENGAGE THE PTO

A sparepair of gears is attached to the inner face of the gearbox cover which is removed by slackening the bolts that fixed it

BEWARE: OIL & COMPONENTS MAY BE HOT.

Be sure that gears in use must be fitted with its protruding looking to the shaft bearing. Also adopted this same procedure when replacing the spare pair of gears, fitted with the protruding looking to the working gear.

NEVER OPERATE THE ROTAVATOR WITHOUT A SPARE PAIR OF GEARS FITTED TO THE GEARBOX COVER.

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OPERATORS CHECK LIST

Insufficient depth obtained

- Adjust depth control skids
- Insufficient power: use a lower tractor gear
- Gearcase on hard soil. Further pass required
- Blades incorrectly mounted.

Tilth too fine

- Raise the trailing board.
- Use a faster tractor gear
- Use a lower speed on the Rotavator (change the gears)

Tilth too coarse

- Lower the trailing board
- Use a lower tractor gear
- Wait until soil is drier if sticks
- Use a higher speed on the Rotavator (change the gears)

Blades "balling up" with soil

- Ground too sticky for working
- Raise trailing board
- Decrease tractor speed

Excessive blade wear

- Replace loose or bent blades

Rotavator "bumping" on ground

- Obstacles entangled in blades
- Blades incorrectly mounted with no scroll effect.
- Blades with blunt edge leading or broken blades

Uneven depth

- Verify the skids and the tractor arms

Working on hillsides

- Work up the slope if possible

Advices

- The worked ground should always be to the right of the driver
- The field headlands should not be carried out until the «lands» have been completed



**THE ROTAVATOR
SHOULD NEVER BE
LOWERED WHILST THE
TRACTOR IS TURNING**

WARNING AND DANGER SIGNALS

These signals are placed on the machine and they advice from warnings and potential dangers. Please follow the indication enclosed, and remember them when working with the Rotavator.



**DO NOT WORK UNDER
THE MACHINE UNLESS IT IS
FIRMLY SUPPORTED.**



**WARNING!: READ
CAREFULLY THE
INSTRUCTIONS.
BEFORE HANDLING OR
REPAIRING THE MACHINE
REMOVE THE TRACTOR
IGNITION KEY**



LIFTING POINT



**STAY AT LEAST AT A
DISTANCE OF 4 METERS
WHEN THE ROTAVATOR IS
RUNNING.**



**DO NOT STAY ON THE
ROTAVATOR WHEN
TRANSPORTING NEITHER
WORKING**



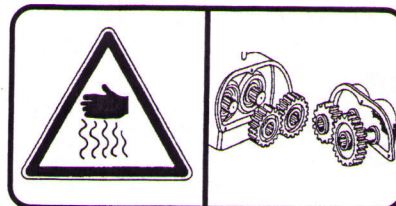
**THE DRIVE IS BY A PTO
FROM A 540 TPM TRACTOR
PTO**



**DANGER! OBJECTS
PROJECTION.**



**MAINTAIN HANDS AND FEET AWAY WHEN ROTAVATOR IS
WORKING**



ATTENTION! MAY BE HOT!