

ST 400

HOWARD
ST 400



Operating Instructions

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Introduction

Howard would like to thank you for purchasing this machine and offer their support and assistance throughout its productive life.

This machine has been designed and manufactured as a tractor driven, ground cultivator - no other use is intended.

Please read and understand this manual before operating the machine.

Warranty

The warranty applicable to your machine is detailed on separate documentation which should accompany this manual. If this is missing, please contact your dealer.

Serial Number

The Serial Number and Model are stamped on the Identification Plate attached to your machine. For future reference record this information below. Always quote them when ordering spare parts.

MODEL _____

SERIAL No. _____

Date Purchased: _____

SAFETY PRECAUTIONS



PLEASE READ. IT MAY SAVE A LIFE. SAFETY IS YOUR RESPONSIBILITY.

The safety of operators and any other connected personnel is a major component of; machine design, manufacture, retailing, commissioning, operation and maintenance. Howard have designed and manufactured this machine with as many safety features as possible. The retailer's responsibility is to ensure you have selected the correct machine for your tractor/application and to commission this machine.

Your responsibilities as owner or operator are to ensure the safety of any personnel in connection with; the operation, transport, maintenance or storage of this machine. Be aware of your responsibilities and carry them out. The owner or an appropriately designated officer, if the owner is a company or corporation, is responsible for all safety issues related to this machine.

The most important safety device attached to this machine is a Safety Conscious Operator whose training and experience must include:

- Correct and complete installation and commissioning of the machine to ensure safe and reliable operation in the intended application.
- Training in safety issues, operation and maintenance of this machine in its application prior to beginning work. This training is to be reviewed or repeated annually.
- Being aware of their environment to the extent that unforeseen safety issues that may arise are dealt with to ensure the safety of all personnel (including operators, maintenance personnel and bystanders).

This is the SAFETY ALERT symbol and means:



ATTENTION ! SAFETY ISSUE !

Failure to comply with the given instruction could result in severe injury or death.

If you have questions not answered in this manual please contact your dealer or distributor.

IF YOU REQUIRE MORE COPIES OF THIS MANUAL PLEASE CONTACT YOUR DEALER. ALTERNATIVELY YOU ARE WELCOME TO COPY AND DISTRIBUTE THIS MANUAL TO THE OPERATORS AND MAINTENANCE PERSONNEL.

SAFETY DECAL CARE

- Keep safety decals clean and legible at all times. Replace any missing safety decals or any that have become illegible. Safety decals can be purchased from you dealer or distributor.
- If any part is replaced that supports a safety decal ensure that a decal is affixed to the replacement part.

ATTACHING SAFETY DECALS

1. Clean and dry the area where the decal is to be affixed. Warm soapy water is the best as some cleaning agents leave an oily film which may prevent the decal adhering.
2. Remove/fold back a small portion of the backing and affix the exposed portion of the decal in the desired position.
3. Peel back the remaining backing paper from under the decal and smooth down the decal with a rag, working any bubbles towards the edge of the decal.
4. Any bubbles that remain trapped can be pierced with a pin and smoothed down.

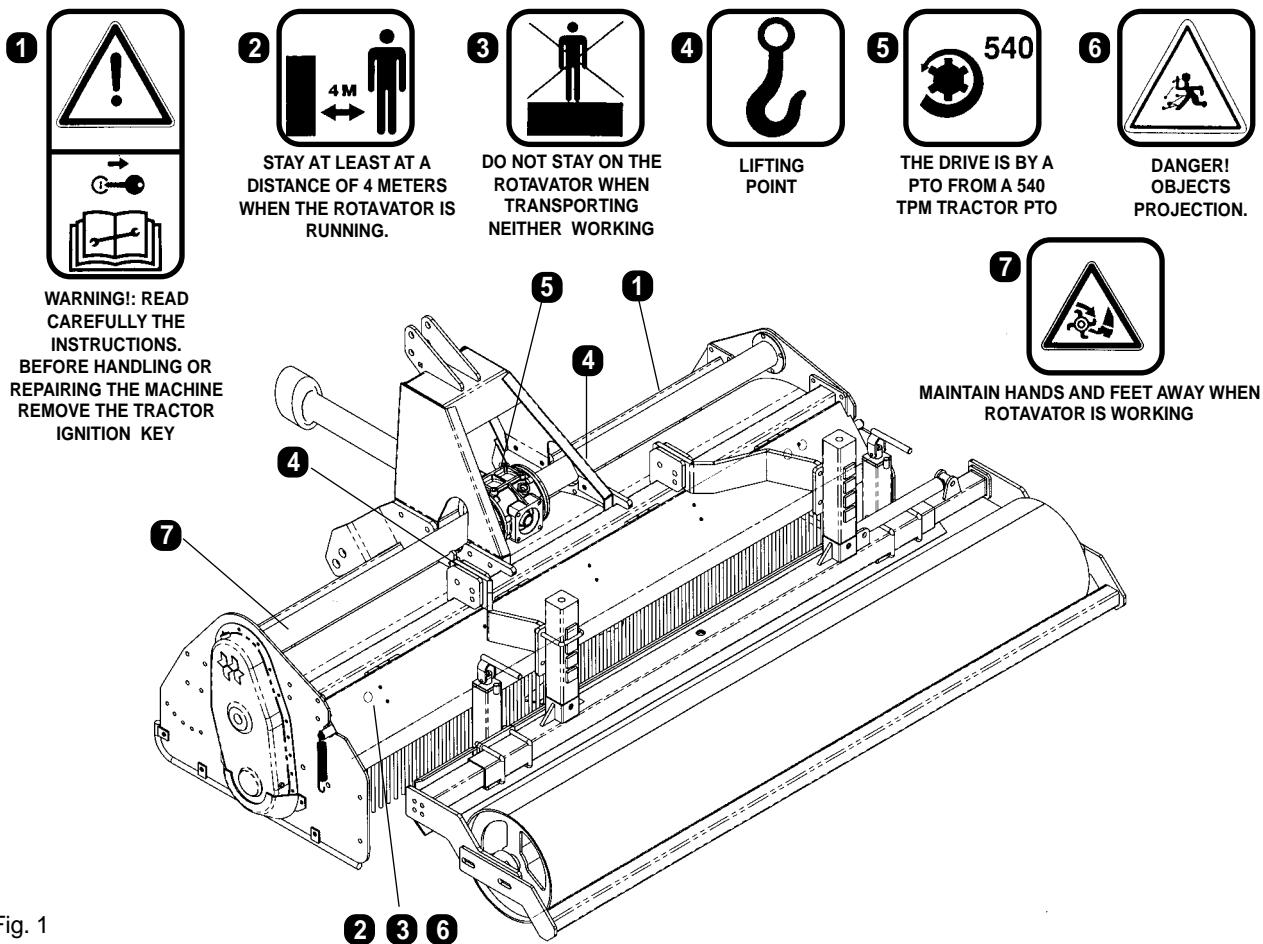


Fig. 1

AT ALL TIMES

- Use the machine only for the purpose for which it has been designed, and in accordance with the instructions in this operators manual.
- Ensure that only responsible, properly instructed people operate this machinery. Inexperienced operators will require training, followed initially by careful supervision.
- Children are not permitted to operate this machinery.
- Keep children well clear and appropriately supervised when connecting/disconnecting the tractor, operating or maintaining this machinery.
- Do not wear clothes that are loose fitting or with drawstring ties which can catch in moving parts.
- Wear appropriate protective clothing and equipment. Boots are a minimum, however if your tractor is not fitted with a controlled environment cab you may also need protection from prolonged exposure either to noise, dust or sunlight.
- Interpret 'Left' and 'Right' as if seated in the operators seat and facing forward.

BEFORE OPERATION

- Read and understand this manual.
- The tractor to be connected to the machine:
 - Must be the tractor that the machine has been commissioned to operate with. Check that it has been correctly maintained and has not been re-configured (for example front weights removed etc) which may reduce stability and control.
 - Consult the Tractor Manufacturers Manual for instructions on mounting implements and safe working methods.
 - Is recommended to be fitted with a Roll Over Protection System (ROPS).
 - Must be one the operator is familiar with.
- Prior to starting the tractor ensure the PTO is disengaged and the tractor is in neutral.
- Do not allow anyone to stand between the tractor and machine while backing the tractor up to attach it.
 - Quick hitch systems are recommended for both Safety and convenience.
 - Before attempting to connect the universal drive shaft to the tractor, lower the machine to the ground, stop the tractor, apply the park brake and remove the key.
- Visually inspect the machine and check:
 - Hitch pins and drive shaft are secure.
 - No components are excessively worn, cracked or otherwise defective and all bolts are tight.
 - Guards, covers, warning labels and safety devices are all correctly fitted and operative.
 - Maintenance as per schedule has been carried out.
 - No tools or other unsecured items have been left on the Rotavator.
- Practice operation of the tractor and machine combination.
 - Take sufficient time to become completely familiar with all controls, particularly those required to bring both tractor and machine to an emergency stop if so required.
 - Progress slowly initially and check stability, steering and braking are satisfactory.

- Ensure the work area is clear, especially of children or animals.
- Inspect the work area for hidden obstructions which may constitute a hazard.

DURING OPERATION

- Ensure the work area is clear, especially of children or animals.
- Do not attempt to start the tractor or engage the PTO until correctly seated in the driver's seat.
- Never leave the tractor running unattended.
- Do not allow passengers on the machine. [Or on the tractor unless approved seating is available.]
- Never attempt to make adjustments or perform maintenance functions while the machine is operating.
- Observe all safe driving procedures:
 - Reduce speed when working on sloping ground or during sharp turns.
 - Do not attempt to work on steeply sloping ground where there is a risk of the tractor overturning.
 - Do not attempt to work near the edge of drop-offs or banks.
 - Avoid sudden starts and stops.
- After striking an obstacle, stop the tractor and implement and inspect it for damage. Repair as necessary before continuing.
- Disengage the PTO when transporting the implement or when not in use.
- When halting operation, even temporarily, lower the machine to the ground, stop the tractor, apply the park brake and remove the key.
- Allow the machine sufficient time to cool down before performing any maintenance, or changing gears in the Selectaspeed gearbox. [Oil and other transmission components may be hot enough to inflict burns.]
- Note:
 - By virtue of its mode of operation it is not possible to totally enclose a machine with guards.
 - Contact with the blades while operating can result in severe injury or death.
 - Do not allow anybody (operators, maintenance personnel, bystanders or especially children) anywhere near the blades whilst the implement is operating. Note that children will often be attracted to placing objects into the blades if you leave it running - this machine is not a toy.
 - Be aware that machine blades will not only cut, but drag limbs etc. into further danger.
 - Ensure that all shielding is in place before operating. If guards are removed for maintenance work, ensure they are replaced correctly upon completion. Repair or replace any damaged guards.
 - NEVER place hands or feet under the machine, nor endeavour to make any repairs or adjustments while the blades are rotating; they are capable of inflicting serious injury.
 - NEVER touch the blades or attempt to free any jammed obstacle while the tractor engine is running. The clutch may be slipping and removal of any obstruction may allow the blades to rotate, the result possibly being serious injury.

FOLLOWING OPERATION

- Visually inspect the machine and check:
 - All bolts are tight.
 - That no components are excessively worn, cracked, damaged or otherwise defective.
- Note and organise any maintenance required.
- Allow the machine sufficient time to cool down before performing any maintenance. The gearboxes, lubricant and other transmission components may be hot enough to inflict burns.
- Refer to TRANSPORT SAFETY and STORAGE SAFETY for issues related to travel to/from operation and disconnection of the machine from the tractor.

STORAGE SAFETY

- When unhitching the machine and before leaving the tractor to disconnect the universal drive shaft and remove hitch pins:
 - Check that the PTO drive has been disengaged.
 - Stop the tractor, apply the park brake and remove the key.
- Store the machine away from human activity and in particular do not permit children to play around, or on, stored equipment.
- Store the machine in a dry level area and ensure parkstands and wheels/roller are securely positioned to prevent it tipping, falling over or rolling onto any personnel (particularly children).

MAINTENANCE SAFETY

- Maintain the machine as detailed in the given schedule and check for any damage after use. Poor maintenance is an invitation to trouble.
- Ensure that all shielding is correctly in place when maintenance is completed. Repair or replace any damaged guards. Warning or instruction decals are to be kept in a readable condition; unreadable decals must be replaced.
- NEVER place hands or feet under the machine nor endeavour to make any repairs or adjustments, while the blades are rotating; they are capable of inflicting serious injury.
- If working on the implement whilst it is raised on the tractor's three-point linkage, ensure:
 - That the tractor is turned off and the ignition key is removed to prevent accidental starting.
 - The park brake is engaged and the wheels chocked to prevent the tractor moving.
 - The PTO drive is disengaged.
 - The machine is properly supported by blocks or stands. DO NOT rely on the tractor's hydraulic system to support the implement.
- Modifications or fitment of non genuine replacement parts.
 - If the equipment is modified in any way from the original design, the manufacturer will not accept any liability for any injury or warranty as a result of their use or attempted fitment.
- Fasteners.
 - Fit only the correct replacement fasteners and tighten fasteners to the torque specified in the manual. Incorrect (too weak) fasteners may break when torqued

to the required setting or, if too strong, may induce failures in other components.

- Follow safe workshop practices during any maintenance:
 - Keep working area clean, dry and in particular free of oil spills.
 - Ensure the workshop is adequately ventilated. Do not run the tractor engine inside a closed building. The exhaust fumes can reduce mental alertness initially and will progressively cause death by asphyxiation.
 - Use tools, lifting or jacking equipment suitably capable of the intended task.
 - Ensure electrical equipment is safe to use before operating.
 - A fire extinguisher and first aid kit should be readily accessible during maintenance.
 - Tools, parts and other service equipment must be removed to appropriate storage locations prior to any test running.
 - Do not wear baggy, ill-fitting or frayed clothing when working around transmission components.
 - Wear suitable gloves when handling or working with sharpened cutting elements.
 - Ensure bystanders, especially small children, are kept clear during maintenance or while making any adjustments.
- Hydraulic fluid can be dangerous.
 - When disconnecting any hydraulic fluid line, shut off the hydraulic supply and relieve the hydraulic pressure.
 - Never use hands to locate hydraulic fluid leaks. Escaping hydraulic fluid is capable of cutting and penetrating skin. Use a small piece of cardboard or wood.
 - Minor cuts are susceptible to infection from hydraulic fluid. Gangrene can result. If injured by escaping hydraulic fluid or you suspect you have been infected, seek medical treatment immediately.

TRANSPORT SAFETY

- When transporting the implement on a tractor on public roads ensure that you comply with the relevant regulations.
 - Class of roads permitted for travel may be restricted.
 - Transport may be restricted to daylight or, off peak traffic hours.
 - Signs indicating width may be required.
 - Lights indicating vehicle width if transported within the hours of darkness may be required.

If in doubt, contact your government department responsible for road transport.

- Secure the machine for transport.
 - Disengage the PTO when transporting.
 - Ensure all hitch pins are correctly fitted with retaining pins.
 - Mechanically secure hydraulic cylinders to prevent cylinders creeping.
- Observe the tractor manufacturers regulations and recommendations - specifically those relating to:
 - Maximum transport loads.
 - Maximum speed.
- Passengers

- Do not allow passengers to ride on the tractor unless a specific seat is provided.
- Do not allow anyone to ride on the implement when it is being transported.
- Consider other road users.
 - Plan your route to avoid heavy traffic and peak traffic periods.
 - Be a safe and courteous driver. Give way to oncoming traffic in all situations, including narrow bridges, intersections etc.
- Adopt safe driving practices:
 - Lock tractor brake pedals together. Never use independent braking at transport speeds.
 - Drive at a safe speed to ensure control and ability to stop in an emergency. Ensure the additional weight of the machine on the linkage does not compromise steering and braking - for example front weights or repairs to the brakes may be required if the tractor is not safe to drive.
 - Reduce speed during turns. Tractors have not been designed for fast cornering.
 - Use engine braking when going down hills - do not coast.
 - Do not drink alcohol and drive.
- Watch for obstructions, particularly if over-width.
- Observe any load ratings applicable on bridges.

IDENTIFICATION OF HAZARDS

- Owners and operators must be prepared to assess their; equipment, operators, maintenance procedures and applications to identify safety hazards.
- Appropriate methods to reduce the hazards identified must then be applied.

MACHINE SUITABILITY TO APPLICATION

Machine have been designed and manufactured as a tractor driven, ground cultivator - no other use is intended.

- Before beginning work it is necessary to assess the effect of the machine on the safety of both the operator and any potential bystanders. It is recommended that you contact the manufacturer or distributor for assistance in this area.

AUTHORISED OPERATORS & TRAINING

If you are an employer, do not assume an operator is trained for use of this equipment, (you would not let an unlicensed driver borrow your car !).

- Ask to see licences if applicable, and record numbers and validity dates.
- Request details of previous experience, in writing and check them out if appropriate and ensure such records are retained.
- Devise a suitable training course for operators if appropriate, and ensure records of their completion are retained.

MAINTENANCE RECORDS

Recommended maintenance is detailed in the Lubrication & Maintenance section. Failure to follow these may jeopardise safety as well as economic operation.

Records of periodic maintenance are important as they detail when and who carried out the last maintenance and inspection. Appropriate checklists should include maintenance as detailed and in particular the following safety aspects:

- SAFETY DECALS AFFIXED & LEGIBLE.
- GUARDING - All fitted and secure.
- CRITICAL FASTENERS SECURE



Fit all safety guards before operating. Operation is not permitted without safety guards fitted. These are not fitted at the factory due to freight limitations.

NEVER

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

**BE A SAFE OPERATOR BY THINKING –
BEFORE ACTING**

PTO DRIVE SHAFT GUARDS

HOWARD PRODUCTS are supplied with non-rotating PTO Drive Shaft 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 if 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 at its 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.

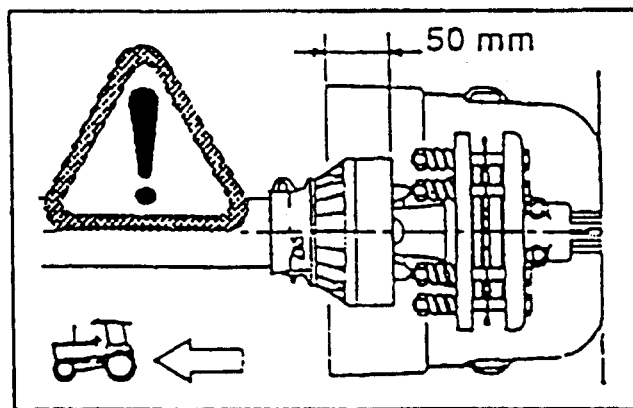
Always ensure the sliding surfaces of the guard tubes are clean and the guard bearings lubricated.

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**



Minimum overlap in straight position

Model	Working width cm	Transport width cm	Rotor speed rpm	Weight kg	Number of blades	Tractor engine HP
ST400S-130M	130	152	251	480	30	40-75
ST400S-155M	155	177		560	36	40-75
ST400S-165M	165	187		600	39	45-75
ST400S-180M	180	202		640	42	45-75
ST400S-205M	205	227		720	48	50-75

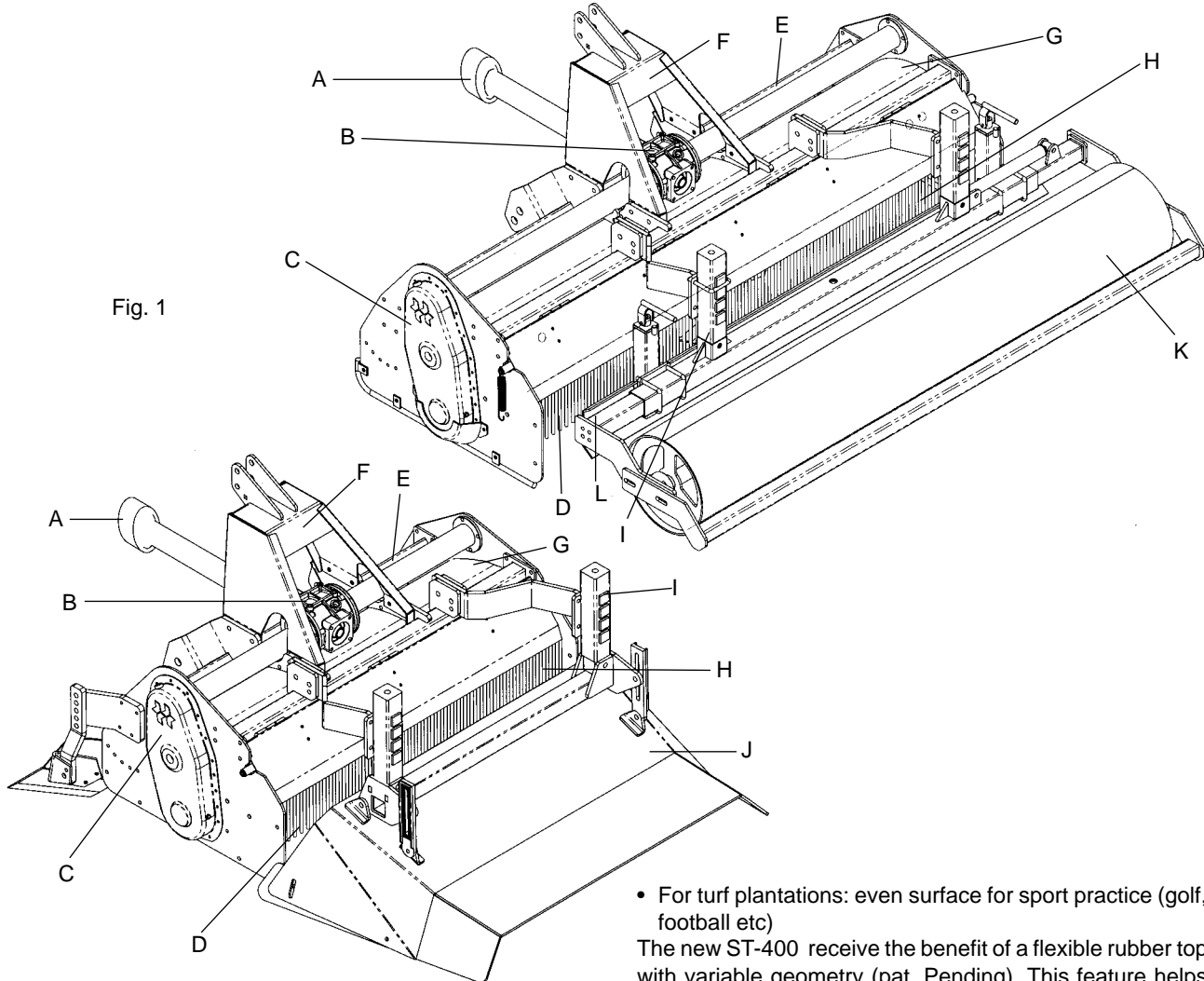


Fig. 1

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: Frame
- F: Top mast
- G: Rubber hull
- H: Sieve
- I: Depth control
- J: Bed former
- K: Roller
- L: Levelling board

ST-400 is a Stone burier designed to prepare perfect seed beds, both for flat field crops (grass, turf, vegetables) or for vegetable planting in beds (tomato, strawberries, vegetables in general.)

The reverse rotating rotor, lifts the soil in the front of the machine and the rear sieve is separating stones and clods from the fine soil. The result is a structured seed bed with two separate layers that are ensuring:

- Perfect operation of the seed drill or planter
- Better crop implantation: The first growing phase is crucial
- Trouble free operation of the following operations: mower, harvester.

- For turf plantations: even surface for sport practice (golf, football etc)

The new ST-400 receive the benefit of a flexible rubber top with variable geometry (pat. Pending). This feature helps the machine to avoid the most common disadvantages that usually appear on this kind of machines:

- 1. Work in wet soils:** The rubber top is avoiding soil sticking and longer free operation than metal shield machines
- 2. Noise level:** The machine works in a substantial lower noise level than a conventional machine even in fields with high stone content
- 3. Frame deformation:** No permanent deformations of the top are expected due to stone impacts. The rubber absorbs the energy of the impacts from the stones and this is not transmitted to the frame.
After long service, just changing the rubber hull as a wearing part, and the machine is maintained as if it was new.
- 4. Loads on transmission:** The machine is protected by a friction clutch, but even though, if a severe blockage happens with a stone, the rubber top is reducing the loads on the transmission elements, protecting them.

WARNING! THE MACHINE CAN ONLY WORK IN SOILS WITH STONES NOT BIGGER THAN 12 CM. OTHERWISE THE MACHINE CAN HAVE A SEVERE OBSTRUCTION.

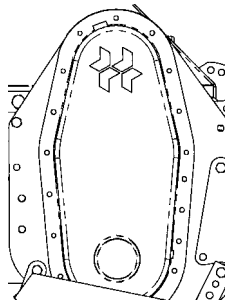


Fig. 2

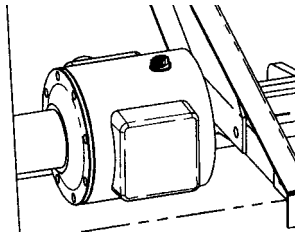


Fig. 3

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.
3. All oil and grease points as indicated on p. 22 (Lubrication)
4. All nuts and bolts tightened. (Re-tighten after first hour's work)



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

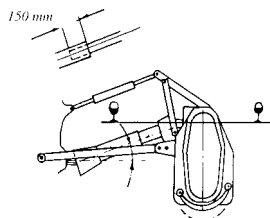


Fig. 5

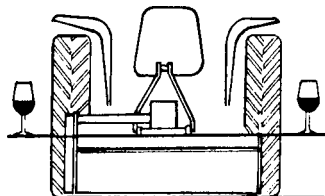


Fig. 6

ATTACHING THE MACHINE TO THE TRACTOR

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 machine 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 machine 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.

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 machine.

Attach stabilizer bar or check chains to limit sway to 50 mm (2"). Adjust tractor linkage to level machine laterally and longitudinally (fig. 5 and 6). Before engaging the tractor

PTO, lift the machine 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.

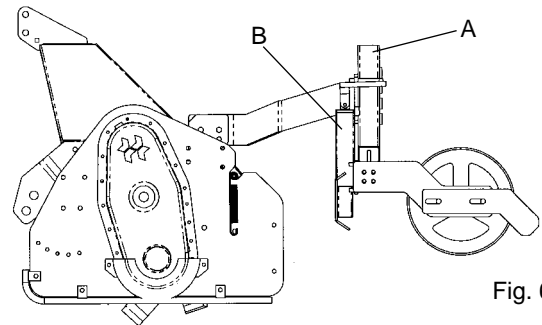


Fig. 6

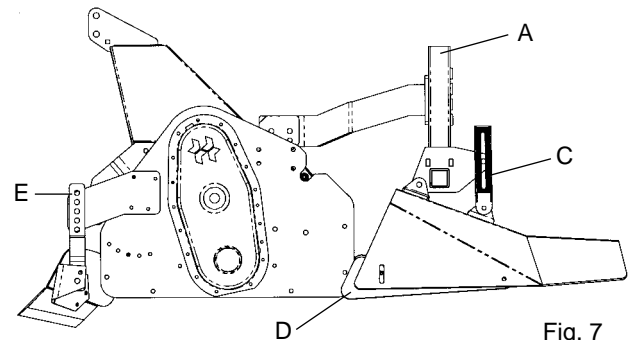


Fig. 7

Depth control

Machines with roller (fig 6):

Adjust the roller height by means of the spindle (A) until the required position.

It is also necessary to adjust the height of the levelling board by means of the spindles (B) in order to get a correct and regular soil flow.

In order to obtain a good result the machine should be adjusted in horizontal position. By adjusting the length on the 3rd point linkage, ensure that the lower profile in the side plates is horizontal.

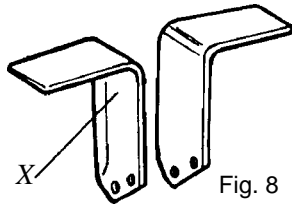
It is possible to offset the position of the roller, ensuring a good overlap between the passes, without marking in the field. Optionally the offset is made by means of a hydraulic ram.

Machines with bed former (Fig.7):

On these machines the adjustment is made by adjusting the height and the working angle of the bed former.

Modify the height by means of the spindle (A). In order to make the correct adjustment it might be necessary to modify the working angle. By moving the adjusting plate (C) the working angle is changed and is possible to modify the pressure on the soil. The plate (D) is then regulated in order to close the bed former sides.

Is also possible to change the height of the side skimmers (E) to regulate the incoming soil flow.



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

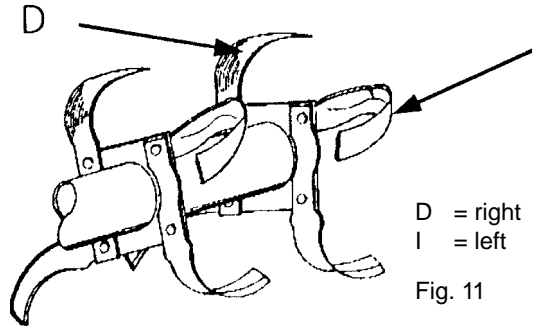
When replacing worn blades, remove one blade and fit the new one in its place before proceeding to the next. This will ensure that the blade «scroll» patern is maintained.

ROTOR AND BLADES

ST400 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 wiht»speed» blades model 9953/54 (Fig.9)



Fig. 10



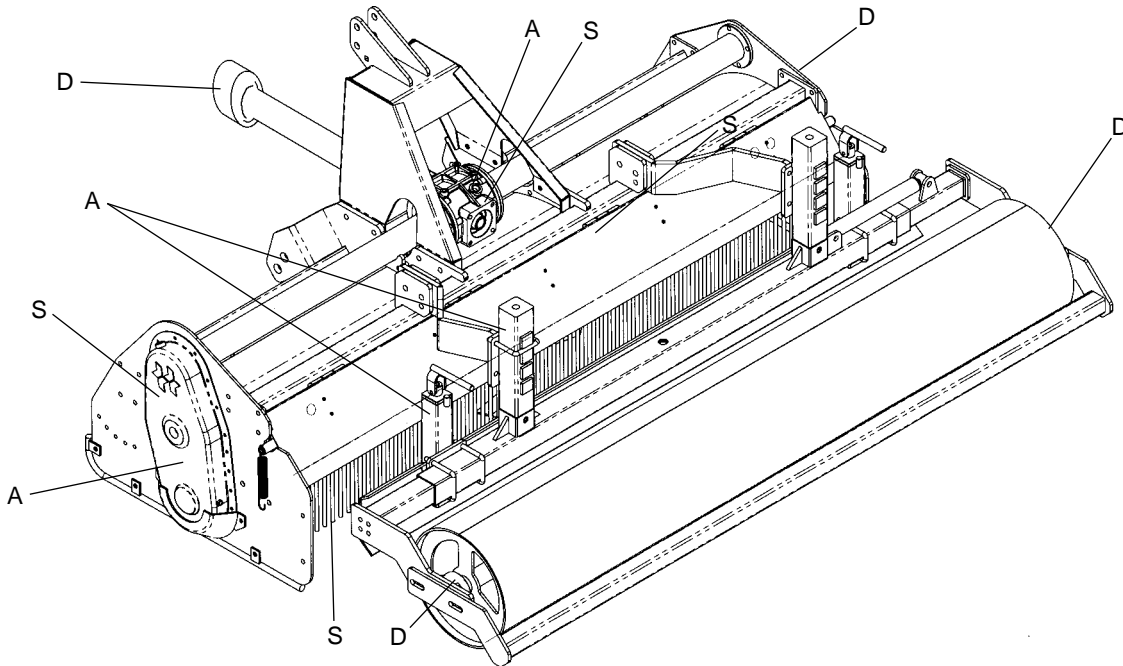
D = right
I = left

Fig. 11

Rotacadet

ST400 can optionally be 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 patern-». (Fig. 11)

LUBRICATION + MAINTENANCE



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
- 3. Lubricate with grease gun roller bearings

• **(S) WEEKLY:**

- 1. Top up with oil SAE W85-140 The gearbox.
- 2. Top up with oil SAE W85-140 The side drive gearcase.
- 3. Tighten fasteners.

• **(A) EVERY 500 WORKING HOURS:**

- 1. Drain flush and fill with oil SAE W85-140 the gearbox.
- 2. Drain flush and fill with oil SAE W85-140 the side drive gearcase.
- 3. Lubricate with oil the spindles

Operational advice

Insufficient Depth Obtained

- (a) adjust depth control equipment
- (b) insufficient power : use lower tractor gear
- (c) chaincase on hard soil. Further passes required
- (d) blades "trowelling" (rolling over ground), use lower tractor gear
- (e) blades incorrectly mounted

Tilth too fine

- (a) use a faster tractor gear
- (b) raise levelling board

Tilth too coarse

- (a) use lower tractor gear
- (b) wait until soil is drier if sticks
- (c) lower the levelling board

Blades "Balling up" with soil

- (a) ground too sticky for working
- (b) raise levelling board
- (c) decrease tractor speed

Excessive Blade Wear

- (a) reduce rotor speed
- (b) replace loose or bent blades

Machine "Bumping" on Ground

- (a) obstacles entangled in blades
- (b) blades incorrectly mounted with no scroll effect or blades fitted with blunt edge leading or broken blades

Obvious Points

- (a) Machine not level - cutting too deep on right side. Shorten right hand tractor lift rod or adjust depth control wheel (b) Not overlapping - drive closer to last run
- (c) Working on hillsides. Work up the slope if possible. If lateral work cannot be avoided, work from the top to the bottom in order to limit any terracing effect.

Advice

1. When operating the machine the most suitable practice is to work in "lands"
2. The worked ground should always be to the right of the driver.
3. Working on the field headlands should not be carried out until the "lands" have been completed.
4. Always raise the machine before turning.



THE MACHINE SHOULD NEVER BE LOWERED WHILST THE TRACTOR IS TURNING.