

# sisis®

## **AUTO-ROTORAKE Mk.5**

### **INSTRUCTION MANUAL**



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Company reg no 641526 - Vat No GB 345 9918 12

SP20008\_REV\_1  
10/12

# Certificate of Conformity

**Auto-Rotorake CN Code: 8432 29 10**

**Manufacturer:-** Howardson Ltd, Howardson Works, Kirk Langley, Derby, DE6 4NJ. UK

**Owner of Technical Document:-** Mr I.D. Howard, Howardson Ltd, Howardson Works Kirk Langley, Derby, DE6 4NJ, UK

I the under signed Declare that these machines:-

Model	Operating Width	Power (Honda)	Measured Sound Power Level	Guaranteed Sound Power Level	Serial Number
ARR/5	20" (510mm)	GX160	79dB Lwa	98dB Lwa	See Product ID range

**Tested at:-** Howardson Works test site September 2011

Complies with the applicable requirements of:-

- Machine Directive 2006/42/EC
- Noise Directive 2000/14/EC (Annex VI Procedure 1)

**Managing Director**



**Ian Howard**

## Serial Numbers



**NOTE**

*MAKE A NOTE OF THE SERIAL NUMBERS OF YOUR MACHINE & ENGINE AND ALWAYS QUOTE THEM IN ANY COMMUNICATION WITH PERSONNEL AT DENNIS.*

**MACHINE SERIAL NUMBER**

**ENGINE SERIAL NUMBER**

## Introduction

The reliability and quality of performance of the **SISIS Auto-rotorake** depends upon some simple care maintenance carried out regularly. This manual has been prepared to allow the user to carry out all such work.

It is advisable to read the instructions carefully. Proper care and attention will enable the machine to give a continuous, satisfactory, and reliable service. Failure to carry out regular lubrication and maintenance as outlined in this manual may render any guarantee or warranty invalid.

In the case of any difficulty, or if further information or advice is required, our Service Department is always at your call. In the interests of speed and accuracy of information please quote the serial numbers of the machine and engine when making enquiries.

For the machine, this is to be found on a plate attached to the side frame. The engine number is stamped on either the crank case or the gear casing facing towards the front of the machine. We suggest you write the numbers on the front page of this book.

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## Technical Data

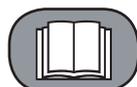
Model	Auto-Rotorake Mk. 5
Width (mm)	780
Length with Grassbox (mm)	1850
Length without Grassbox (mm)	1450
Height (mm)	950
Weight (Kg)	102
Cutting Width (mm)	20" (510mm)
Engine	GX160
Hand Arm Vibration (m/sec <sup>2</sup> )	4.85
Measured Sound Power Level (dB(A))	79
Guaranteed Sound Power Level (dB(A))	98

## Important Safety Instructions



### **WARNING**

*WHEN WORKING WITHOUT THE GRASS BOX, LOWER THE DEFLECTOR TO PROTECT THE OPERATOR AND ENGINE AIR INTAKE FROM FLYING DEBRIS.*



### **CAUTION**

*READ THE INSTRUCTIONS CAREFULLY AND ALSO THE SEPARATE INSTRUCTION DETAILS ON THE ENGINE.*

### **NEVER**

- carry out adjustments with the engine running.

### **ALWAYS**

- read the operating instructions carefully and understand the controls before commencing work.
- be extra careful to avoid spillage, when using petrol or diesel fuel. **DANGER** no smoking or naked lights
- use safety guards and make sure they are correctly in position. they are supplied for your protection
- visually check machines before starting work for damage or wear to working parts such as blades, tines or loose fasteners
- respect powered machines. always keep hands and feet clear of moving parts and remember that tine cylinders or drums can continue to rotate even after the power unit is switched off
- switch off the power before making adjustments or repairs and never lift or carry a machine whilst any parts are moving

### **EYE PROTECTION**

In dry, dusty or windy conditions it may be necessary to wear eye protection to protect your eyes from flying debris.

### **FIRE HAZARD**

ALWAYS CLEAN THE MACHINE. REMOVE ALL DEBRIS FROM AROUND THE ENGINE. BLOCKED ENGINE COOLING FINS CAN CAUSE THE ENGINE TO OVERHEAT

# Important Safety Instructions

In order to operate the machine safely please follow these Health and Safety guidelines.

## TRAINING



### **CAUTION**

*READ THE INSTRUCTIONS CONTAINED IN THIS MANUAL WITH CARE. IF YOU ARE IN ANY DOUBT PLEASE ASK YOUR EMPLOYER OR CONTACT US DIRECT AT **SISIS**.*

- Be familiar with the controls and the proper use of the equipment.
- Never allow children or people unfamiliar with these instructions to use the machine. Local regulations or insurance may restrict the age of the operator.
- Never operate while people, especially children, or pets are nearby.
- Keep in mind that the operator or user is responsible for accidents or hazards occurring to other people or their property.

## PREPARATION

- While operating always wear substantial footwear and long trousers. Do not operate the machine barefoot or in open sandals.
- Thoroughly inspect where the equipment is to be used and remove all stones, sticks, wire, bones and other foreign objects.



**WARNING** *PETROL IS HIGHLY FLAMMABLE AND WILL DAMAGE GRASS IF SPILT.*

- A) Store fuel in containers specifically designed for this purpose.
  - B) Refuel out doors and do not refuel whilst smoking.
  - C) Add fuel before starting the engine. Never remove the cap of the fuel tank or add petrol while the engine is running or when the engine is hot.
  - D) If petrol is spilled do not attempt to start the engine but move the machine away from the area of spill and avoid creating any sources of ignition until the vapours have dissipated.
- Replace damaged or faulty silencers.
  - Before using the machine always inspect the safety devices including the cut off switch and the blades for excessive wear or damage. Replace if necessary.

## OPERATION

- Do not operate the engine in a confined space where dangerous **CARBON MONOXIDE** fumes can collect.
- Operate only in daylight or good artificial light.
- Always be sure of your footing on slopes.
- Walk. Never run.
- Exercise extreme care on slopes when changing direction.
- Do not operate excessively steep slopes.
- Use extreme caution when reversing or pulling the machine towards you.
- Stop the blades if the machine has to be tilted for transportation when crossing surfaces other than grass and when transporting the machine to and from the area to be mown.
- Never operate the machine with defective guards or shields or without the safety devices, for example without the deflector plate or grassbox in place.
- Do not change the engine governor settings or overspeed the engine.
- Disengage all blades and drive clutches before starting.
- Start the engine carefully following the instructions with feet well away from the blades.
- Do not tilt the machine when starting the engine.
- Do not put hands or feet near or under rotating parts. Keep clear of the discharge opening at all times.
- Never pick up or carry the machine while the engine is running.



## **CAUTION**

*PLEASE READ THESE OPERATING INSTRUCTIONS CAREFULLY BEFORE COMMENCING WORK.*

We want you to obtain the best performance from this machine. If you have any difficulty in carrying out the following instructions please contact SISIS direct or your local SISIS Territory Manager or SISIS Dealer.

## **OPERATING PRINCIPAL**

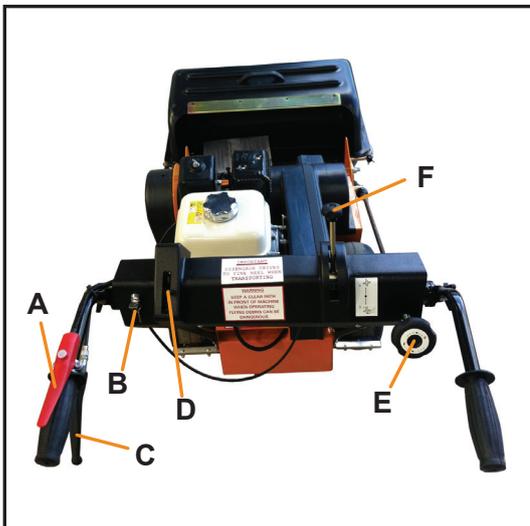
Power from the engine is transmitted through a vee belt clutch mechanism. One belt powers the tine reel through a cross shaft with a final chain drive. Forward travel power is supplied through a cross shaft, spur gearing and a differential gear box, to the ground wheels. The depth of cut is simple to alter with the micro-adjuster on the handle connecting through to the front roller frame.

## **CONTROLS**

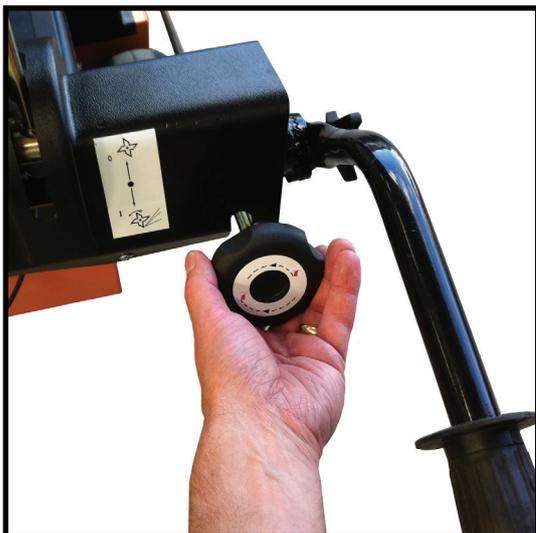


## **CAUTION**

*DISENGAGE THE REEL CLUTCH BEFORE STARTING THE ENGINE. RAISE THE TINE REEL CLEAR OF THE GROUND TO PREVENT CONTACT.*

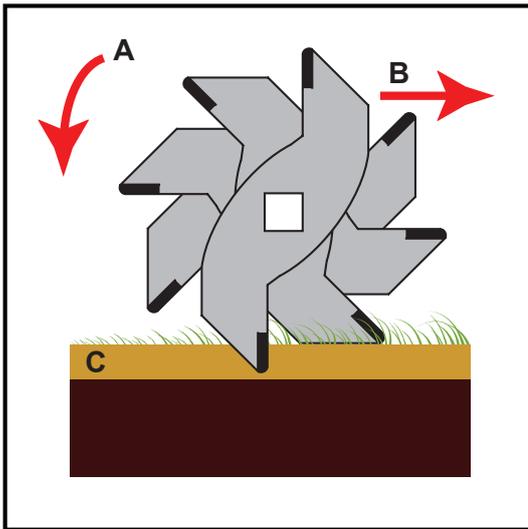


- A = Engine Cut-out Lever**
- B = Engine Run / Stop Key**
- C = Drive Lever**
- D = Throttle**
- E = Cut Depth Micro Adjuster**
- F = Tine Drive Lever**



The blades must be **CLEAR** of the ground before adjustment commences. The depth of cut is adjusted by varying the height of the front rollers, using the micro adjuster. Start the engine and allow to warm up. Engage the ground wheel and reel drives and lower the reel using the micro adjuster until the required amount of thatch is being removed. Always disengage the reel drive when the machine is stationary on the green.

## SISIS CONTRA-ROTATION PRINCIPLE



The Rotorake principle incorporates a series of blades rotating at high speed in the opposite direction to that of the conventional cylinder mower. The blades therefore cut upwards, continuously taking grass fibre away from the surface rather than pushing it into the surface of the turf. This also ensures that the machine is held to the ground and a regular working depth maintained.

**A = Direction of Rotation**

**B = Direction of Travel**

**C = Thatch Layer**

**THATCH REMOVAL REEL** Reference ARR5/TR



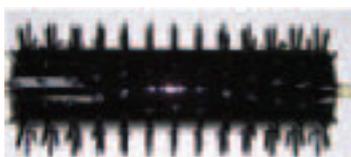
Fitted as standard. Comprises 24 heavy duty, 1.6mm tipped “hook” blades for end-of-season removal of excess thatch. Working width 50cm.

**THATCH CONTROL REEL** Reference ARR5/TCR



Triangular blades for use to control the build-up of thatch, to remove broad-leaved grasses and to control the speed of greens during the playing season. The blades have offset tips to give 6mm spacing.

**ROLASPIKE REEL** Reference ARR5/RS



Light surface spiker with 96 tines penetrating to a depth of 10mm-15mm (3/8in-5/8in). Used to assist in the absorption of water, air and nutrients.

**BRUSH REEL** Reference ARR5/BR



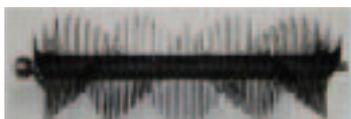
Spiral brush for grooming and collecting debris from the surface. Can also be used to raise the grass blades prior to mowing, or for removing sand splash around bunkers. Brush height is fully adjustable to provide desired effect, from severe remedial treatment to the lightest contact for cosmetic striping.

**BRUSH REEL FOR SYNTHETIC SURFACES** reference ARR5/SSR



Stiff-bristled brush for grooming synthetic surfaces

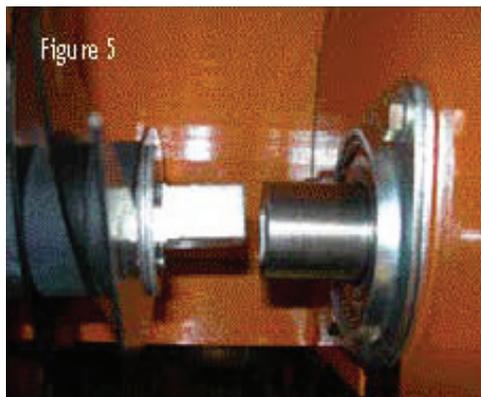
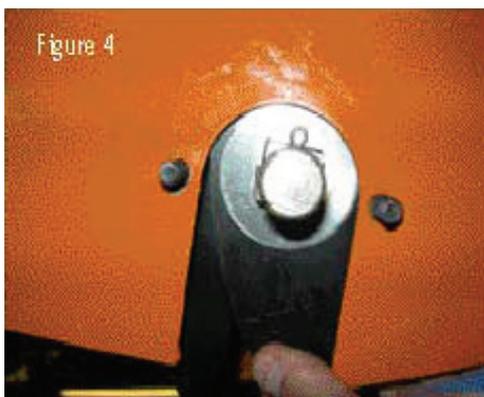
**LIGHT SCARIFYING REEL** Reference ARR5/LSR



Comprises 1mm tipped blades with 12mm spacing, for year round routine scarification. Regular use removes thatch as it accumualtes. Registered design

**CHANGING REELS** See Figures 4 & 5

**To Remove the Tine Reel**



Raise the reel completely clear of the ground using the micro adjuster. Remove the nuts and washers, securing the bearing to the sideplate. Slide the tine reel out of the socket on the stub shaft (Item 32). Lower it to the ground and remove it from the machine. Reverse the procedure to fit alternative reel.



## **CAUTION**

ALWAYS SWITCH OFF THE ENGINE BEFORE ATTEMPTING ANY MACHINE MAINTENANCE WORK.

## **REPLACING BLADES**



## **NOTE**

CARRY OUT THE PROCEDURE FOR REMOVING THE REELS. FOR CONVENIENCE PLACE THE REEL ON A BENCH WHEN WORKING ON IT.

**THATCH REMOVAL REEL** reference ARR5/TR

**THATCH CONTROL REEL** reference ARR5/TCR

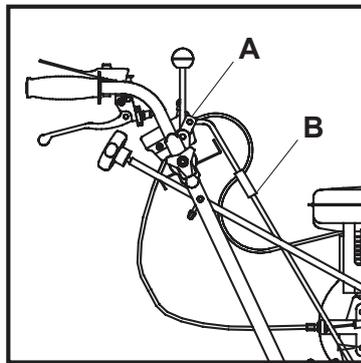
Remove the washer and split pin at the end of the reel (opposite end to which the bearing is fitted) and strip off the knives and rubber spacers. Replace the knives making sure that you follow the original spiral pattern, which is shown on the drawing. Replace the washer and split pin. You will find it necessary to compress the assembly in order to replace the split pin. Use the compression tool supplied with the machine. Replace the reel, reversing the procedure for removal.

It is not advisable to fit a few new knives. Always replace with a full set of new knives. On the thatch control reel **ONLY**, it is possible to maintain even wear on the blades by removing the reel and replacing the blades in the reverse position on the shaft.

## **ADJUSTING BELT TENSION**

The ground wheel drive belt tension is adjusted by slackening the lock nuts on the cable adjuster, turning and then re-locking adjuster under guard. **See figure 6.**

The reel drive belt tension is adjusted by slackening the lock nut on the barrel of the pull rod. **See figure 7.** Remove split pin, turn rod to desired position. Replace split pin and tighten lock nut.



**A = Split Pin**  
**B = Lock Nut**

## **FRONT ROLLER ADJUSTMENT** Figure 8

An adjustment pivot nut is fitted at one side of the front roller frame assembly. This has been factory set, during assembly and should not require further adjustment. However, if the machine has been dismantled for maintenance purposes or mishandled at any time, the front roller can be adjusted by placing the machine on a level surface, with the tine reel removed and rotating the pivot nut. The front roller is aligned correctly with the rear ground wheels when all three are resting on the surface.



Figure 8



## **CAUTION**

*ALWAYS SWITCH OFF THE ENGINE BEFORE ATTEMPTING ANY MACHINE MAINTENANCE WORK.*

### **FITTING NEW REEL DRIVE V BELTS**

Ensure engine is switched off and key is removed. Remove covers (2 top and 1 side). Slacken engine bolts and move engine forward. Undo 2 setscrews securing the brake calliper and lift up and pull away clear of the disc. Place some packing (cardboard is ideal) in between the brake pads to keep them in position. Remove belts on the bearing that is close to the disc and slacken the bolts on the bearing near the large chain pinion. **See figure 12.** This allows the shaft to be tilted up and the belt can be removed. Fit a new belt and put shaft back into position. Replace and tighten the bolts.

Disconnect brake rod from brake lever with the engine turned off. Put the tine reel into drive with the over centre lever. Ensure that belt fingers on engine are not more than 2mm and not less than 1mm away from the tensioned tine drive belt. Take the over centre lever out of drive and start engine. Put the over centre lever into drive and ensure that the belts stop driving. When the over centre lever is out of drive. If the belt stops driving, turn off the engine and refit the brake rod.



Figure 12



**NOTE**

ENSURE THAT THE ENGINE IS FILLED TO THE CORRECT LEVEL WITH THE RECOMMENDED GRADE OF OIL. ALWAYS CHECK THE OIL WITH THE ENGINE LEVEL.

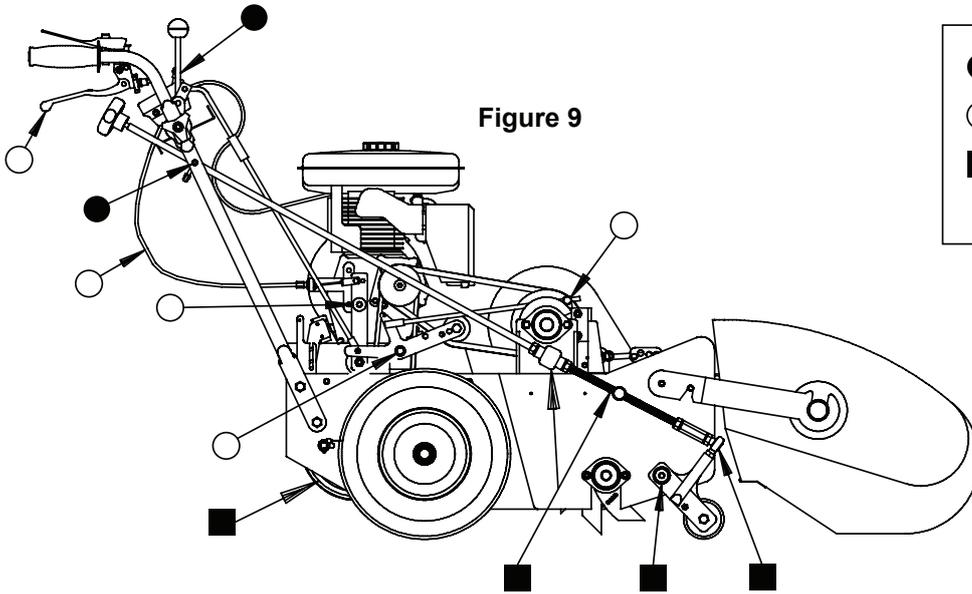


Figure 9

- = Oil every 10 working hours
  - = Oil every 40 working hours
  - = Oil every 10 working hours
- Engine - See Engine Manual

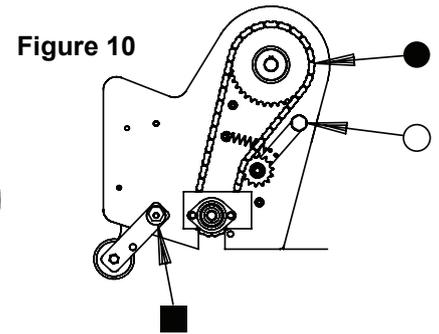


Figure 10

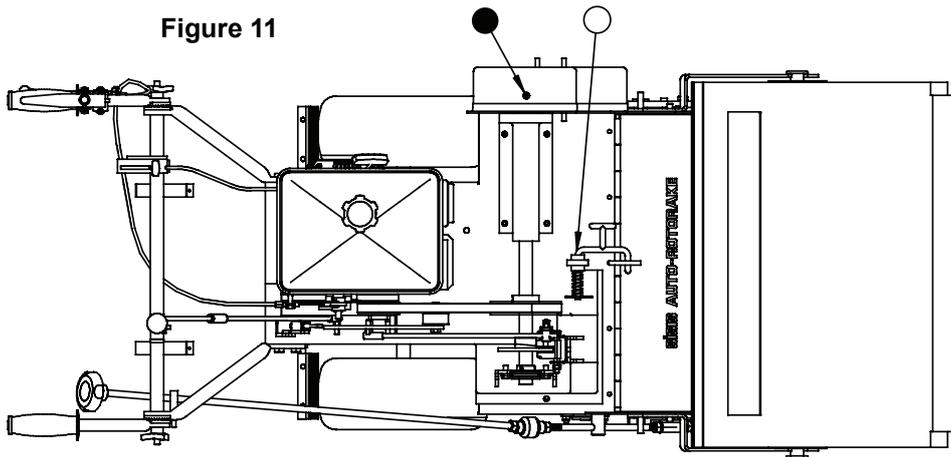
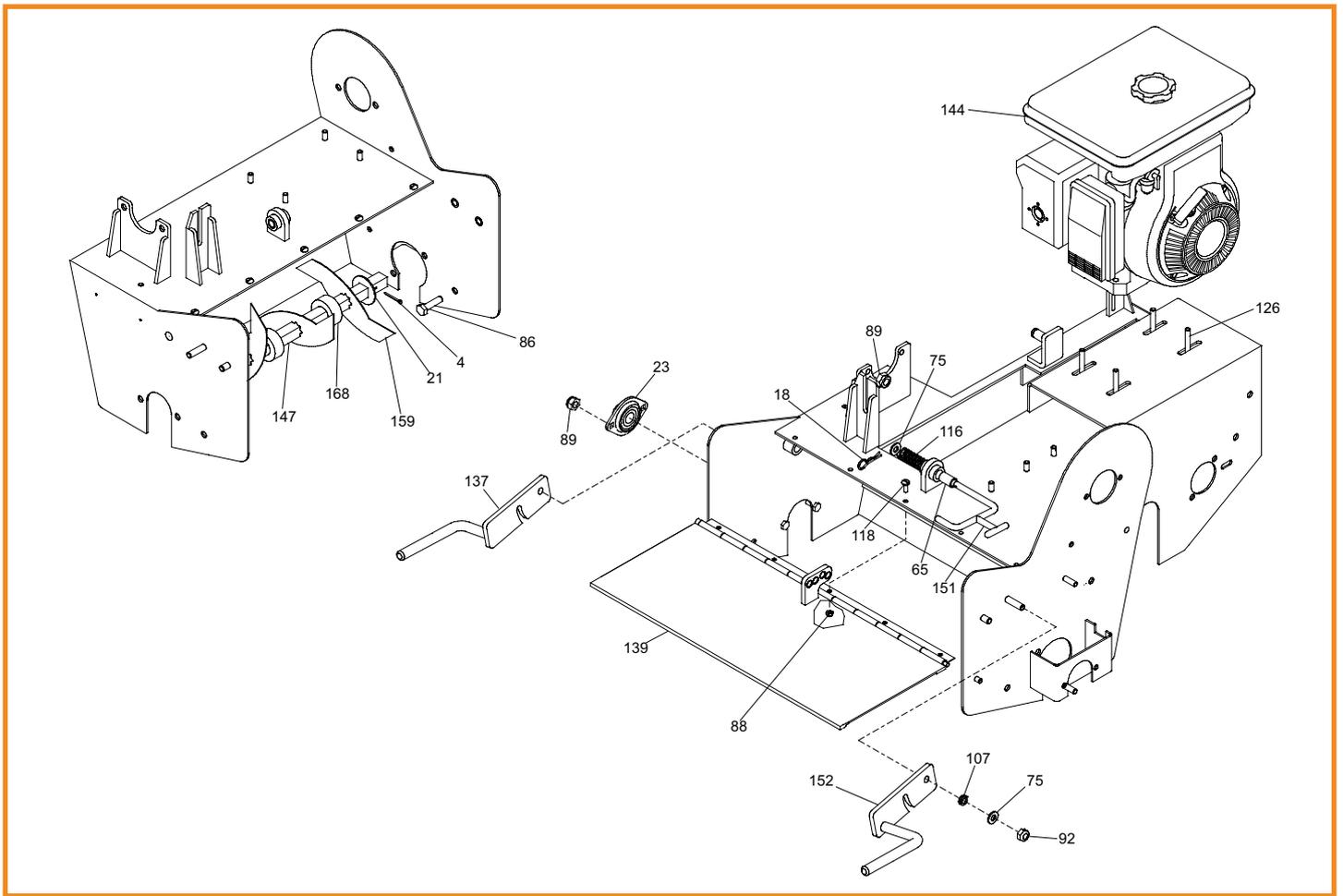


Figure 11

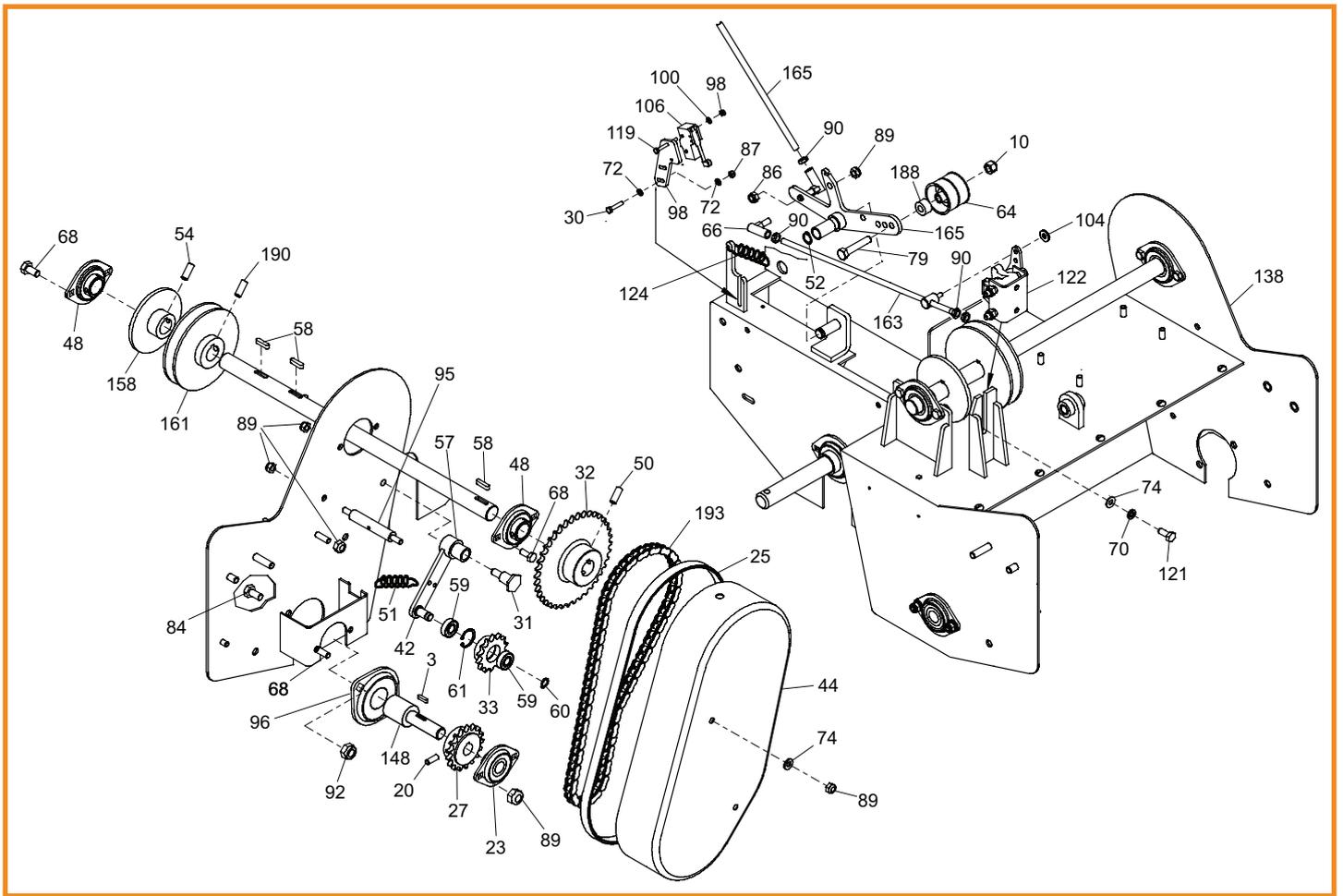




## 1.01

## Chassis Assembly

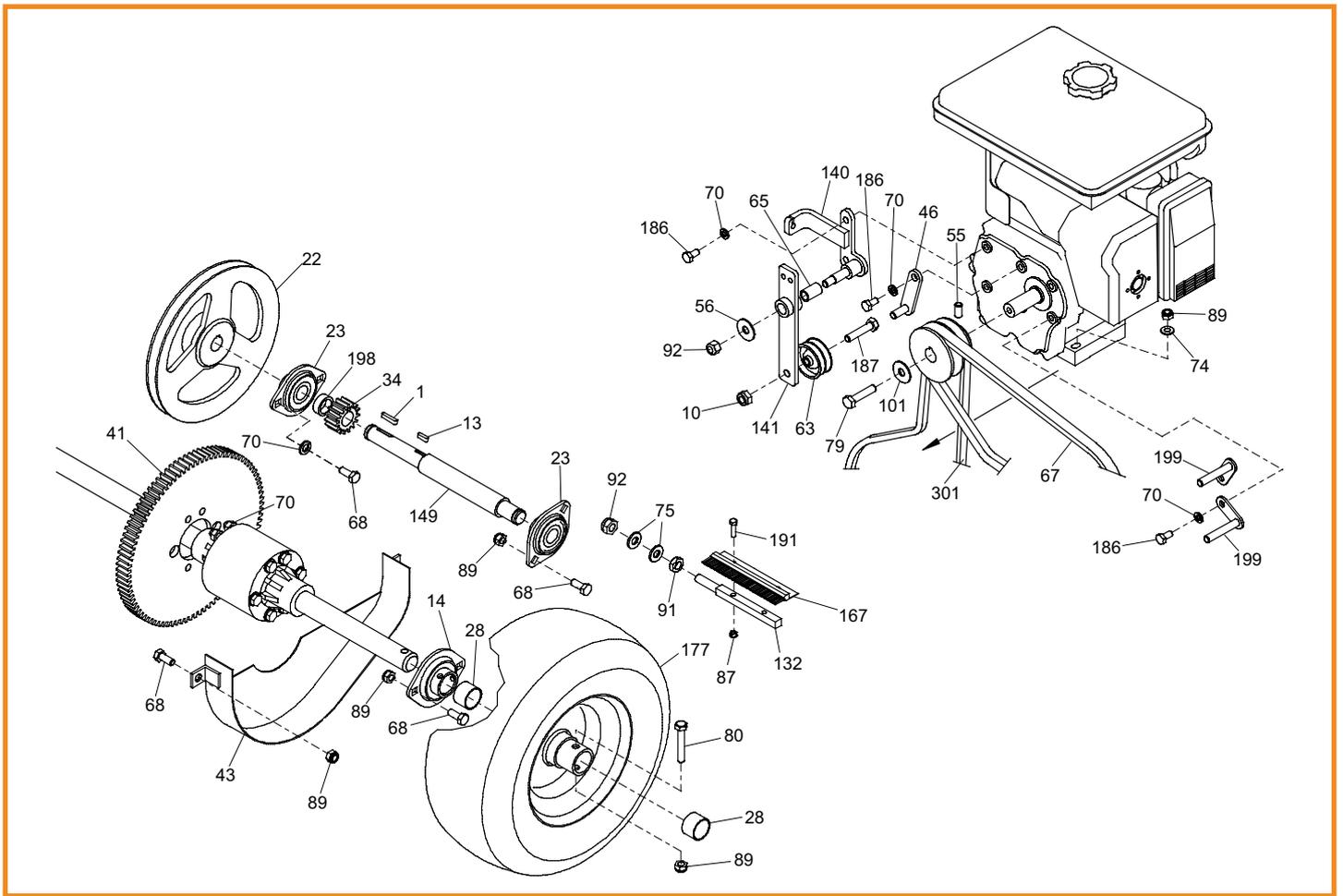
Item No.	Part No.	Description	Quantity
4	1034	Cotter Pin	2
18	1899	R-Clip	1
21	2390	Sq. Bore Washer	2
23	2991	Bearing	2
65	8484	Oilite Bearing	1
75	1/1073	Plain Washer	3
84	1/1118	Setscrew	1
86	1/1122	Setscrew	2
88	1/1218	Nyloc Nut	5
89	1/1220	Nyloc Nut	2
92	1/1223	Nyloc Nut	2
107	21805	Double Coil Washer	1
116	22132	Compression Spring	1
118	22134	Pan Head Screw	6
137	37832	Frame Mount RH	1
139	36630	Grassbox Flap	1
144	22464	Honda Engine	1
147	36693	Tine Shaft	1
151	36700	Flap Adjuster	1
152	37834	Frame Mount LH	1
159	37057	Tine Shaft	24
168	37094	Tine Rubber Spacer	1



## 2.01

## Reel Drive Assembly

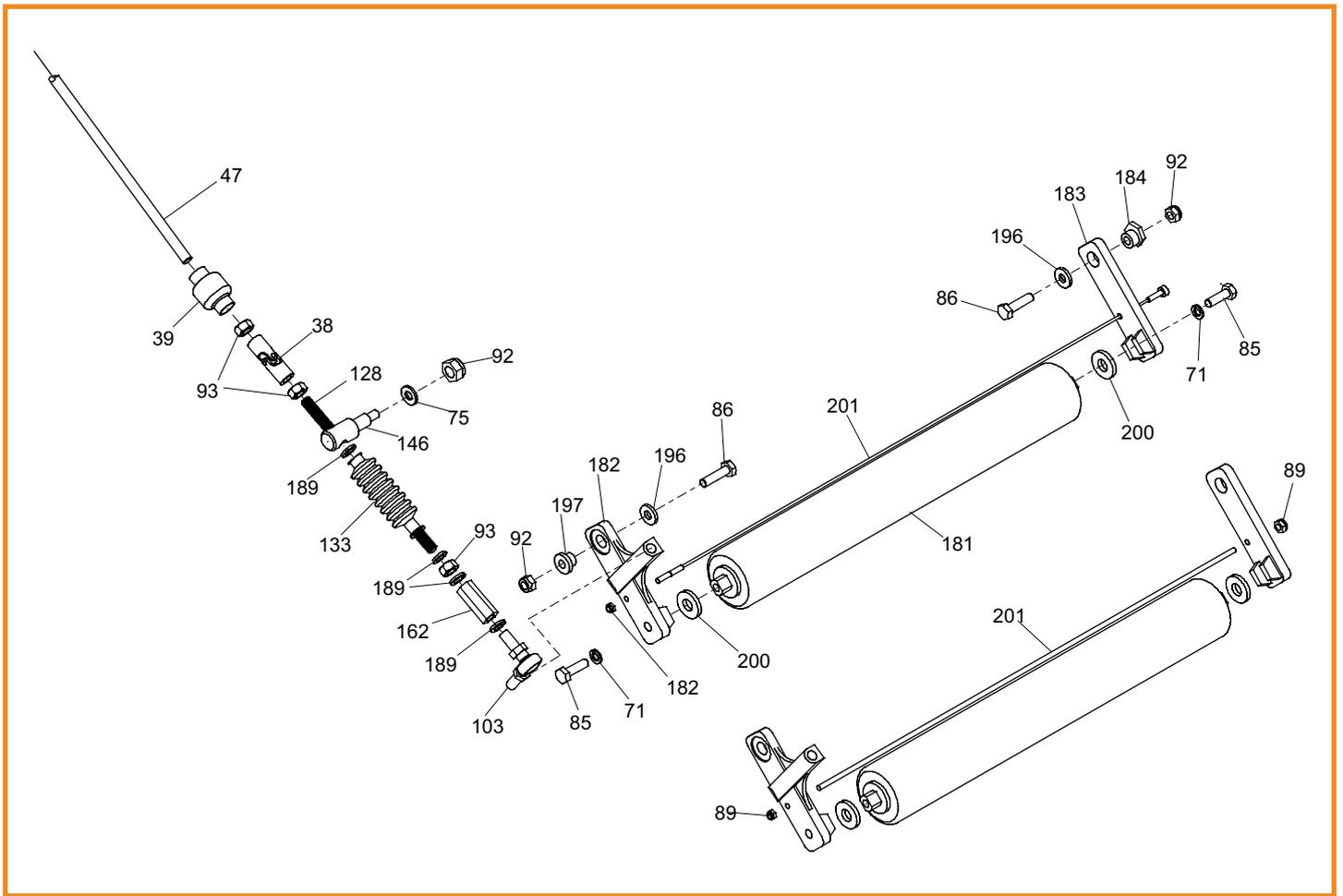
Item No.	Part No.	Description	Quantity	Item No.	Part No.	Description	Quantity
3	1019	Parallel Key	1	100	20803	Plain Washer	2
10	1223	Nyloc Nut	1	104	21534	Starlock Washer	1
20	1989	Grubscrew	2	106	21748	Microswitch	1
23	See 1.01	Bearing	4	119	22237	Setscrew	2
25	3171	Rubber 'U' Strip	1.2m	121	22240	Setscrew	2
27	4317	Pinion	1	122	22241	Brake Caliper	1
30	5571	Setscrew	6	124	22252	Tension Spring	1
31	6182	Pivot Shaft	1	148	36694	Stud Shaft Assembly	1
32	6186	Sprocket	1	158	37055	Disc Brake	1
33	6189	Tensioner	1	161	37082	Pulley	1
42	7979	Tension Arm	1	163	37084	Brake Adjustment Rod	1
44	7986	Chain Guard	1	165	37086	Belt Tension Arm	1
48	8032	Bearing	2	188	37171	Spacer	1
50	8036	Grubscrew	2	190	8153	Grubscrew	2
51	8042	Spring	1	193	1558	Chain	1
52	8056	Circlip	1				
54	8068	Grubscrew	2				
57	8158	Oilite Bearing	1				
58	8165	Parallel Key	3				
59	8173	Bearing	2				
60	8175	Circlip	2				
61	8177	Circlip	1				
64	8435	Idler Pulley	1				
66	8485	Ball Joint	2				
68	1/1039	Setscrew	6				
70	1/1062	Spring Washer	1				
72	1/1070	Plain Washer	4				
74	1/1072	Plain Washer	3				
79	1/1105	Setscrew	1				
84	See 1.01	Setscrew	1				
86	See 1.01	Setscrew	2				
87	1/1217	Nyloc Nut	10				
89	See 1.01	Nyloc Nut	9				
90	1/1221	Half Nut	4				
92	See 1.01	Nyloc Nut	2				
95	1/1523	Chain Guard Stud	2				
96	20077	Bearing	1				
98	20431	Nyloc Nut	3				



## 2.02

## Main Drive Assembly

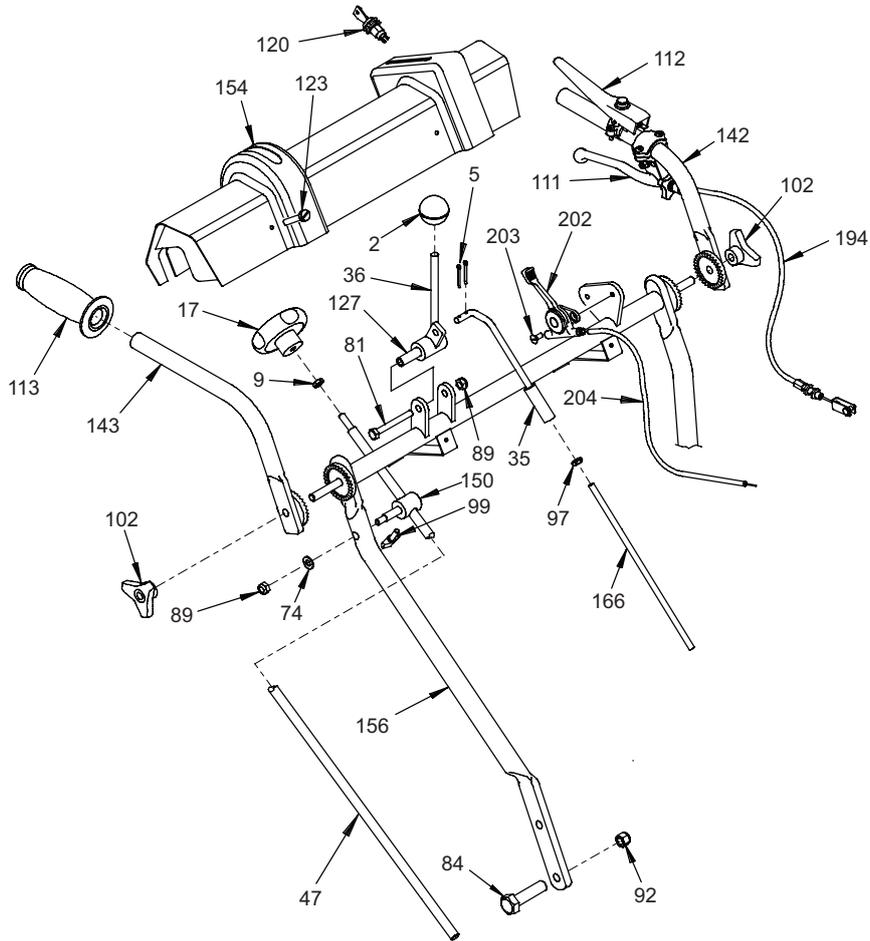
Item No.	Part No.	Description	Quantity
1	1013	Parallel Key	1
10	1223	Nyloc Nut	1
13	1572	Parallel Key	1
14	1588	Bearing	2
22	2924	8" Pulley	1
23	2991	Bearing	2
28	5155	Oilite Bearing	4
41	7977	Spur Gear	1
43	7982	Gear Cover	1
46	7991	Belt Pin	1
55	8091	Grubscrew	1
56	8123	Washer	4
63	8295	Idler Pulley	1
65	8484	Oilite Bearing	1
67	8989	V-Belt	1
68	See 2.01	Setscrew	8
70	See 2.01	Spring Washer	9
74	See 2.01	Plain Washer	4
75	1/1073	Plain Washer	4
79	See 2.01	Setscrew	4
89	See 1.01	Nyloc Nut	11
91	1/1222	Half Nut	2
92	See 1.01	Nyloc Nut	3
101	20933	Washer	1
132	34110	Wheel Scraper	2
140	36635	Tensioner Bracket	1
141	36636	Tension Arm	1
149	36695	Gear Shaft	1
167	37088	Brush Strip	2
177	37135	Wheel Scraper	2
186	1/1436	Setscrew	4
187	1123	Bolt	1
198	37158	Spacer	1
199	37161	Belt Pin	3
301	1801	Belt	1



### 3.01

## Height Adjustment Assembly

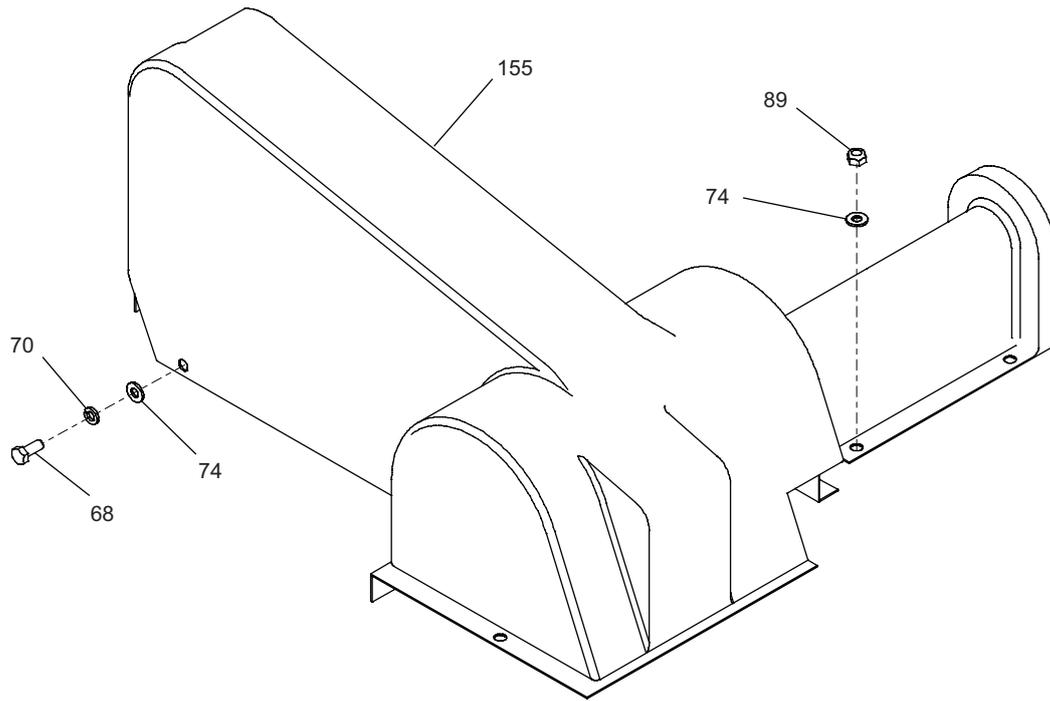
Item No.	Part Number	Description	Quantity
38	7907	Universal Joint	1
39	7908	Protective Cover	1
47	7993	Adjustment Rod	1
71			
75	1/1073	Plain Washer	1
85	1/1119	Setscrew	1
86	1/1122	Setscrew	2
89	1/1220	Nyloc Nut	2
92	1/1223	Nyloc Nut	3
93	1/1227	Half Nut	5
103	21064	Studded Rod End	1
128	32151	Depth Adj Screw	1
133	34214	Protective Cover	1
146	37172	Middle Pivot	1
162	37083	Connector	1
181	37138	Roller	1
182	37141	Roller Arm	1
183	37140	Roller Arm	1
184	36680	Offset Ferrule	1
189	1/1065	Spring Washer	2
196	37157	Spacer	2
197	4917	Ferrule	1
200	37170	Spacer	2
201	37273	Scraper	1



## 4.01

## Handle Assembly

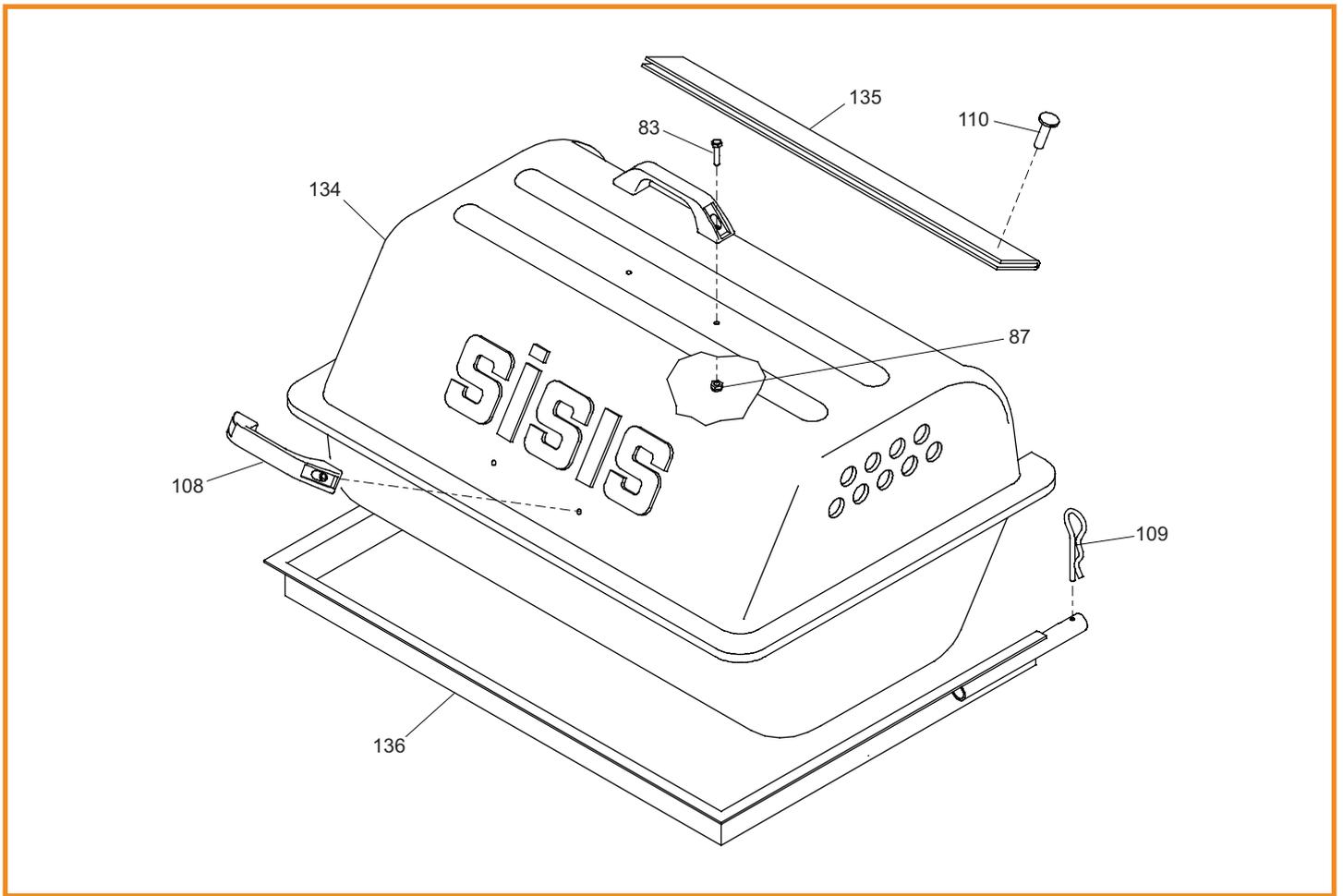
Item No.	Part No.	Description	Quantity
2	1015	Knob	1
5	1040	Split Pin	2
9	1221	Half Nut	1
17	1879	Handwheel	1
35	6619	Over Centre Rod	1
36	6620	Drive Lever	1
47	See 2.01	Adjustment Rod	1
74	1/1072	Plain Washer	1
81	1/1114	Bolt	1
84	See 1.01	Setscrew	4
89	See 1.01	Nyloc Nut	2
92	See 1.01	Nyloc Nut	4
97	20214	Half Nut UNF	1
99	20714	Wing Screw	1
102	21063	Lock Knob	2
111	22281	Clutch Lever	1
112	21905	Deadmans Handle	1
113	22019	Hand Grip	2
120	22238	Switch & Key	1
123	22242	Self Tapping Screw	1
127	30963	Pivot Shaft	1
142	36639	Upper Handle LH	1
143	36640	Upper Handle RH	1
154	37029	Handle Shroud	1
156	37051	Lower Handle Assembly	1
166	37087	Belt Adjusting Rod	1
194	37166	Clutch Cable	1
202	8271	Throttle Lever	1
203	21511	CSK Head Setscrew	2
204	37379	Throttle Cable	1



## 5.01

## Guard Assembly

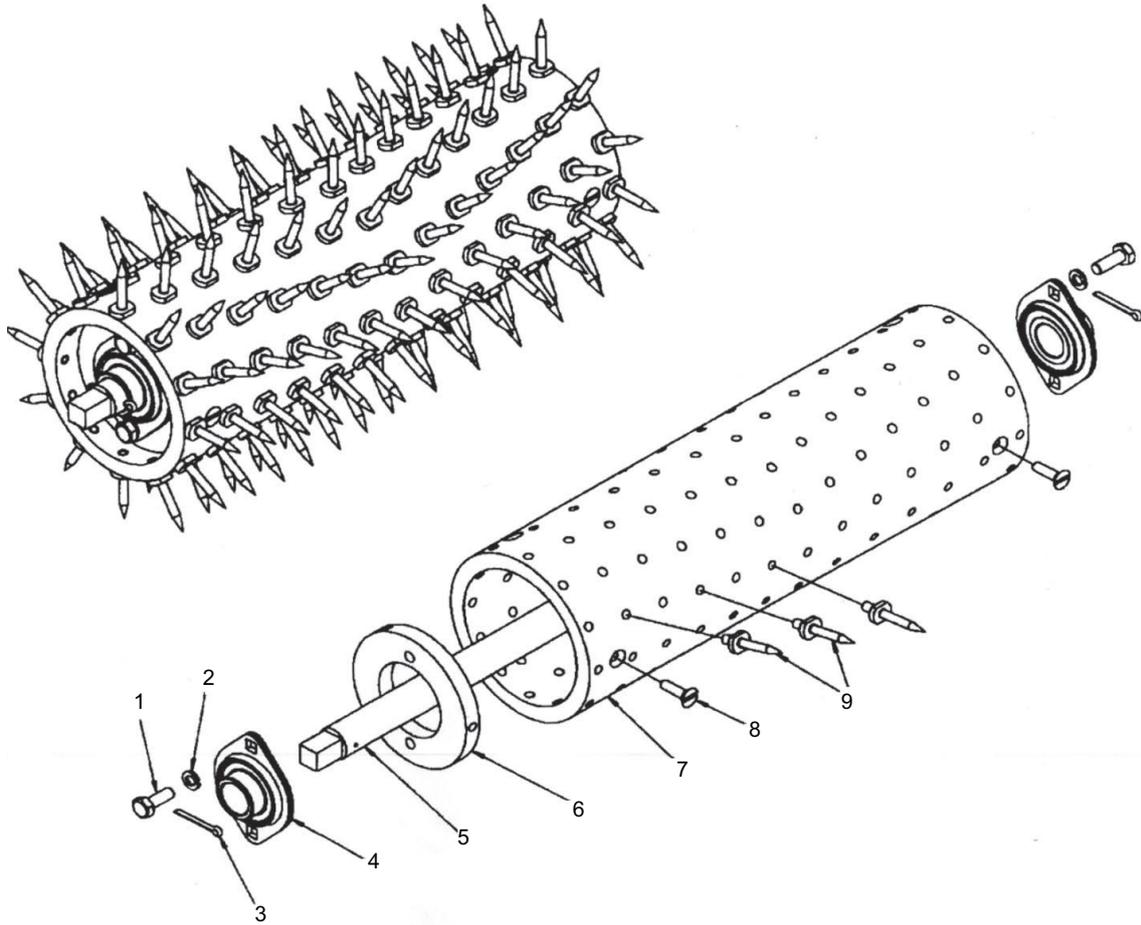
Item No.	Part Number	Description	Quantity
68	See 2.01	Setscrew	4
70	See 2.01	Spring Washer	4
74	See 2.01	Plain Washer	8
89	See 1.01	Nyloc Nut	4
155	37047	Belt Guard	1



## 6.01

## Grass Collector Assembly

Item No.	Part No.	Description	Quantity
83	21149	Setscrew	4
87	See 2.01	Nyloc Nut	2
108	20491	Handle	2
109	22465	R-Clip	2
110	20997	Pop Rivet	8
134	37713	Grassbox	1
135	37790	Edging Strip	2
136	37795	Grassbox Frame	1



## 7.01

## Reels

### ROLASPIKE REEL FS1113 ARR/5H

Item No.	Part No.	Description	Quantity
1	1/1117	Bolt	4
2	1/1063	Washer	4
3	1043	Cotter Pin	4
4	1921	Bearing	2
5	37293	Shaft	1
6	37295	Spacer	2
7	37294	Reel	1
8	1/1200	Bolt	6
9	37287	Spike	156

### THATCH REMOVAL REEL FS1093 ARR/5TR

Item No.	Part No.	Description	Quantity
-	1034	cotter pin	2
-	2390	square bore washer	2
-	36693	tine shaft	1
-	37057	hook tine	24
-	37094	tine rubber spacer	23

### THATCH CONTROL REEL FS1095 ARR/5TCR

Item No.	Part No.	Description	Quantity
-	2991	bearing	1
-	2390	square bore washer	2
-	36693	tine shaft	1
-	1034	cotter pin	2
-	2355	tine rubber spacer	23
-	4926	thatch control blade	24

### LIGHT SCARIFYING REEL FS1098 ARR/5LSR

Item No.	Part No.	Description	Quantity
-	1034	cotter pin	2
-	2390	square bore washer	2
-	2991	bearing	1
-	36235	rubber tine spacer	40
-	36693	tine shaft	1
-	37058	3 tipped tine	41

### BRUSH REEL FS1088 ARR/5BR

Item No.	Part No.	Description	Quantity
-	1034	cotter pin	2
-	2390	square bore washer	2
-	2991	bearing	1
-	35377	helical rotary brush	1
-	36693	tine shaft	1

### SYNTHETIC BRUSH REEL FS1090 ARR/5SBR

Item No.	Part No.	Description	Quantity
-	1034	cotter pin	2
-	2390	square bore washer	2
-	2991	bearing	1
-	35919	synthetic helical brush	1
-	36693	tine shaft	1

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