

MFG: HUSS-HEINER, WILHIEM,
CO.

NAME: RAINBOW

TYPE: NON-KIDDIE

FEB-18-91 MON 12:11 NORTHERN AMERICAN & HUSS OFF P. 81



TELEFAX

MASCHINENFABRIK

Fax.-No.: 0421-9140

P.O. BOX 110206 · STRESEMANNSTR. 58 · D-2800 BREMEN (GERMANY) · ☎ 0421-498000 · TELEX 245120 · TELEFAX 4290040

AN: Amusements of America
TO:

SEITEN: 1
PAGES:

ZIT: Ed
ALL:

VON: Walter Heidbrink
FROM:

DATUM: 18.02.91
DATE:

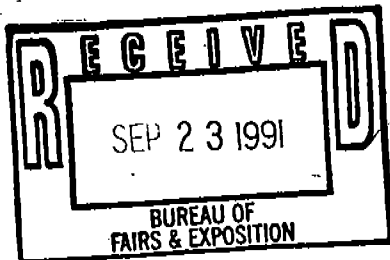
BEI: I-91017 / RE: Rainbow 61311 Gondola Platform Pins, flag pins on scenery
NE:

according to our Mr. Böhm, customer can use bolts instead of pins.
The quality of steel for the bolts must be 8.8 and safety pins must be used
to secure the nuts.

Kind regards
Walter Heidbrink

Wald
Service Dept.

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Operating Instructions

1

for

Amusement Ride Typ "RAINBOW" , Order-No.:

I.	General References	pages 1 - 4
	1. Contents	
	2. Responsibility of Managers and Operators	
	3. Handing Over Confirmation	
II.	Erection	pages 5 - 11
III.	Dismantling	12
IV.	Daily Putting into Operation and Shutting Down	pages - 13
V.	Defects in Operation	page 14
VI.	Maintenance and Lubrication	pages 15 - 23
	A) Parallel Motion Guide System	
	B) Ropes and Lifting Tackle	
	C) 90 kW Electric Motor	
	D) Reduction Gear	
	E) Drive Ring	
	F) Bearings	
	G) Flanged Connections	
	H) Hydraulic System	
	H1 Axial Piston Variable Displacement Pump	
	H2 Axial Piston Motor	
	H3 Oil Tank and Filters	
	H4 High-pressure Filter	
	H5 Hose Lines	
	H6 Erecting Cylinder	
	H7 Hydraulics for Locking Device	
	H8 Hydraulics for Assembly	
	H9 Hydraulics for Gondola Transport Trailer	
	K) General	
	K1 Tightening Torques for Screw Connections	
	K2 Weights and Loads	
	K3 Running the Ride Equipment Prior to Fitting the Gondola	
	K4 Instructions for Applying the Adhesive Paint	
VII.	Safety Regulations for "RAINBOW"	pages 24 - 26
VIII.	Maintenance Instructions for Fiberglass Surfaces	page 27
IX.	Drawing	
	No. 1-11.0 "Rainbow"	page
	No. A1-10.23.00 Transport Chassis Connections	page
	No. 1-11.16.G.00 Support for Gondola Transport	
	No. 1-11.16.F Alignment Layout for Gondola Transport Trailer	page



MASCHINENFABRIK

- 2 -

No.	1-11.D	Platform wirth Supports	page
	A1-11.E	Rear Wall	page
	4-11.4.G	Hydraulics Plan for Locking Device	page
	1-11.F	Hydraulics Plan	page
	4-20329	Ground Pressures for Travelling Model	page

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RESPONSIBILITY OF MANAGERS AND OPERATORS

The following remarks are a compulsory condition for the safe operation of the ride:

1. In all cases the manager is ultimately responsible for the safety of passengers during operation of the ride.
2. Selection of operators must correspond to the demands made on them regarding operation of the ride.
3. The operator must devote his undivided attention to the operation of the ride.
4. He must be acquainted with the functioning of the ride, its safety devices, emergency devices, operating instructions and regulations, and ensure the safety of passengers and safe running of the ride.
5. He must have complete and safe control over the unloaded ride before he operates it with passengers.
6. If a malfunctioning occurs operation must cease immediately.
7. Malfunctioning may often be detected by a change in noise during operation. If this occurs, one should look for the cause and, if necessary, get in touch with experts to find the reason for any malfunctioning.
8. The operator must insist on maintenance work being carried out, as it is described in detail in the operating instructions. If he does not, he is obliged to cease operation.
9. Before initiation the operator has to check the ride on its perfect working condition by performing the ordered controls and the trial runs.
10. The carrying parts as well as the motor driven parts are to be checked on perfect working condition before each initiation. Damaged parts are to be substituted by perfect ones. Furthermore it has to be observed that the ride is in safe upright position during erection and dismantling. After erection all parts have to be orderly connected and all connecting parts and necessary anchorages have to be mounted in a safe way.
11. The complete operating instructions provided by the manufacturer have to be kept at hand in the operator's stand so that the operator can have a look at them at any time. Upon loss, the manufacturer has to be immediately requested to provide a new copy of the complete operating instructions.
12. During repair and maintenance works, the ride must be currentless, i.e. the main switch in the switch cabinet must be switched off. Should it be necessary to carry out maintenance work while the ride is in operation, an additional person to control the switch board is required.



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5

II. ERECTION

1. Drive the base trailer with the tower (1) to the site on which the ride is to be set up.
2. Fold out the rear stabilizer (2), fit in the bracing stay (3) and secure the bolt with the spring pin.

Note:

All other bolts on the amusement ride must also always be secured by spring pins, even when this is not specifically mentioned in the instructions.

3. Release both tie rods (4) from the front stabilizer (5) to the base, see Drawing No. A1-10.23.00.
4. Using the 3 hydraulic cylinders in the base — 2 at the back (6) and 1 at the front (7) — lift the trailer until the front undercarriage is only just touching the ground (the controls for the 3 cylinders are located on the erection aggregate (8)).

IMPORTANT!

The rear cylinders (6) must be run out far enough to ensure that, when the centre section is fully levelled, the rear axle aggregate is clear of the ground.

5. Using cranks (9), undo the locknuts (10) on the front right-hand stabilizer and pull both bolts (11) out of the front stabilizer/undercarriage assembly, see Drawing No. A1-10.23.00.
6. Drive the undercarriage away from the ride.
7. For the erection procedures, the base (1) must be supported at the rear stabilizer (2) by means of the two rear support blocks (12) and at the front under the axles of the front stabilizer on the base (point (13)).

The point (13) must be the highest point of the terrain. The base (1) is standing correctly when that part of the rail on the base (14) is exactly horizontal.

For improved surface pressure, the ground area under the stabilizers must be filled with sand and graded.

8. Retract the 3 hydraulic cylinders (6) + (7) into the base.
9. Swivel the front stabilizer (5) to the side through 90°.
10. Unscrew the sealing cap from the gate valve (44) and screw the gate valve (44) in up to the stop. These measures must already be carried out on dismantling the ride and must be left as they are during transportation.



MASCHINENFABRIK

6

11. Using lifting tackle, first lift the gondola arm (18) away from the base (1). The arm must be swivelled to lie at the same angle as the counter-flange of the rotating structure (19).

The gondola arm is on the left side of the base looking in the direction of travel, and it must, still looking in the direction of travel, be fitted onto the left-hand flange of the rotating structure.


The superimposed flanges are identified by the stamped code numbers 1/1. The area in which these numbers are stamped is marked by coloured paint.

As long as only 1 arm is fixed onto the rotating structure, this arm must be supported at the other end against sagging, e.g. by a wooden block.

12. Prior to slipping the gondola arm onto the lugs on the flange of the rotating structure, check that the rub-resistant surface coating is clean, free of grease and in good condition. When mounting the arm, pay special attention to correct positioning of the coupling (17). The slot and key of the coupling must be 100 % clean and must be greased prior to fitting them together.

Note:

If the rub-resistant coating is partly or wholly missing at the three arm flange-mounting points, this must be properly renewed (no makeshifts).

13.  Bolt on the gondola arm using 18 bolts of type M 30-10.9 (20) and nuts (21). Use surface-hardened washers \varnothing 58 x \varnothing 31 x 15 (22). Only the hexagon nuts should be lightly greased without allowing any oil to penetrate into the joint surface of the flanges. Secure the bolts with spring pins (23).

Tightening torque 1475 ft lb = 2000 Nm

Connect the electrical cables.

14. Using lifting tackle, lift the counterweight arm (24) away from the base (1). The counterweight arm must be swivelled to lie at the same angle as the counter-flange of the rotating structure (19). Looking in the direction of travel, the counterweight boom is the one on the right of the base. Still looking in the direction of travel, it must be fitted onto the right-hand flange of the rotating structure.

The superimposed flanges are identified by the stamped code numbers 2/2. The area in which these numbers are stamped is marked with coloured paint.



MASCHINENFABRIK

15. Slipping the counterweight arm onto the flange lugs, bolting it on and securing it are identical procedures to those described above (step 13) for the gondola arm.

Connect the electrical cables.

16. Bolt on the mast (25) using 4 M16 bolts (26) and nuts (27) and secure with spring pins (23).

Tightening torque 155 ft lb / 210 Nm

17. Remove from the base the supports for holding the booms during transportation.
18. On the erection aggregate (8), run the erecting cylinder (28) out a little way so that the retaining pins of the tower support at the top of the tower head (point (29)) can be released. Swivel the support down into the base.
19. Raise the tower a little and attach the panelling frame (30).
20. Raise the tower a little further and attach the sun (31) and the top and side rays (32).
21. Raise the tower a little further still and attach the remaining rays.
22. Raise the tower (33) until it is at an angle of 60°. The erecting cylinder (28) is then at an angle of approx. 92° (duration of raising the tower approx. 12 mins.).
23. Using the rope (34), hold the pendulum support (35) with several people. One helper must guide the support (35) laterally so that it does not knock against the erecting cylinder (28) when being lowered. Remove the pins (36) at point (37) and carefully lower the support to the bottom bearing point (38). Anchor the pendulum support at point (39) using the $\varnothing 15/16"$ ($\varnothing 100$) pin (36). Secure with the spike (40) and the spring pin (41).
24. Take the load off the erecting cylinder (28): switch off the pump (8) and briefly actuate the control lever.
25. The vent (42) on the hydraulic tank (43) normally remains open. The air vent cock is only closed during rail transport when the front axle aggregate is dismantled. It is essential to make sure that the vent cock is opened after rail transport!
26. Unscrew the gate valve (44) once more.

CAUTION!

The arm falls to the vertical.

27. Switch on the hydraulic system and turn the rotating structure (19) through 180° at creeping speed so that the counterweight arm (24) is at the bottom.



28. Switch off the hydraulics system.
29. Screw the gate valve (44) in up to the stop.
30. Carefully slip on the rear counterweight (45). The eyebolt points towards the rotating structure (19). Prior to assembly, only the seating surface (46) must be lightly greased. The surface with the rub-resistant coating (47) must be and remain absolutely free of grease.

Insert 2 M30-10.9 bolts (48) and nuts (21) with surface-hardened washers $\varnothing 58 \times \varnothing 31 \times 15$ (22) from the inside - nuts from the outside. Here too, the hexagon nuts must be lightly oiled.

Secure with spring pins (23).

Tightening torque 1475 ft lb / 2000 Nm.

31. Unscrew the gate valve (44).
32. Switch on the hydraulic system and turn the rotating structure (19) with only the rear counterweight (45) through 180° at creeping speed until the gondola arm (18) points to the bottom.
33. Switch off the hydraulics.
34. Screw in the gate valve (44) up to the stop.
35. Drive the gondola transport trailer (46) up to the base (1) with as small a gap as possible (1 hand's width). The two sets of wheels (47) in the middle of the transport trailer (46) must be opposite the rails (14) on the base. Using the 4 lifting cylinders (48), raise the transport trailer so far that the wheelsets (47) come to rest over the rails (14). Supports must first be placed under the bottom ends of the lifting cylinders (48).
36. The frame of the gondola transport trailer (46) pointing towards the base (1) must be set down on the device (50) in the middle (point (49)), see Drawing No. 1-11.16.G.00.
37. The two lifting cylinders (48) pointing towards the base (1) must be retracted.
38. Swivel the front stabilizers (5) under the wheelsets (47). In order to balance out positioning errors resulting from shunting the trailer into position, the wheelsets (47) can be moved approx. 4 inch (100 mm) to either side.
39. Run out the lifting cylinders (48) which were retracted in step 37 and remove the device (50) set up at point (49) under step 36.
40. With the aid of the 4 lifting cylinders (48), lower the gondola transport trailer (46) until the wheelsets (47) reach the rails (51) on the front stabilizer (5).



MASCHINENFABRIK

9

41. Roll the gondola transport trailer (46) on the rails (14) and (51) up to the gondola arm (18).
 42. Prior to attaching the gondola (53) to the gondola arm (18), check the flange surfaces to make sure that they are clean and free of grease and that the rub-resistant coating is in good condition.
 43. Remove the pin (52). Place supports under the lifting cylinders (48) and move the transport trailer (46) with the gondola (53) with the aid of the 4 lifting cylinders (48) so that the gondola (53) can be hooked onto the arm (18) by the hook.
Tighten the bolts (54) to finger-tightness.
 44. With the aid of the 4 lifting cylinders (48), lower the gondola transport trailer (46) and run it forwards on the rails (14) and (51).
 45. Bolt the gondola on using 8 M30-10.9 bolts (54) and nuts (21). Use surface-hardened washers $\varnothing 58 \times \varnothing 31 \times 15$ (22). Secure the bolts with spring pins (23).
 46. Only the hexagon nuts should be lightly greased without allowing any oil to penetrate into the joint surface of the flanges.
Secure the bolts with spring pins (23).
- Tightening torque: 148 ft.lb / 200 Nm
47. Unscrew the gate valve (44).
 48. Switch on the hydraulics and turn the rotating structure (19) through 180° at creeping speed so that the counterweight arm (24) with the rear counterweight (45) comes to a standstill at the bottom over the base.
 49. Switch off the hydraulics.
 50. Screw in the gate valve (44) up to the stop.
 51. Attach the front counterweight (55) in exactly the same way and the rear counterweight (step 30).
 52. Attach the lettering (56) and secure in position. Connect up the electric cables.
 53. Unscrew the gate valve (44) up to the stop and screw the sealing cap back onto the spindle.
 54. Switch on the hydraulics and turn the rotating structure through 180° at creeping speed until the gondola is at the bottom.



MASCHINENFABRIK

55. Attach and secure the two halves of the rainbow (57) and (58) on the gondola (53).
56. Raise the gondola transport trailer (46) with the aid of the 4 lifting cylinders (48). First place supports under the lifting cylinders (48).
57. The frame of the gondola transport trailer (46) pointing towards the base (1) must be set down on the device (50) in the middle (point (49)), see Drawing No. 1-11.16.G.00.
58. The two lifting cylinders (48) pointing towards the base (1) must be retracted.
59. Fold the two front stabilizers (5) at right angles to the base (1), insert the struts (3), bolt on and secure.
60. Fit the pin (60).
61. Run out the lifting cylinders (48) which were retracted in step (58) and remove the device (50) set up at point (49) under step (57).
62. With the aid of the 3 lifting cylinders (6) and (7) in the base (1), finally align the amusement ride. The rails (14) of the base must be absolutely horizontal and the arms must be absolutely vertical.
63. Remove the support blocks from the axle (13), the front stabilizer (5) and on the base (1) at point (13).
64. Push the front support blocks (61) to their relevant positions under the stabilizer (5). For improved surface pressure, the area must be filled with sand and graded.
65. Raise the gondola transport trailer (46) by means of the 4 lifting cylinders (48). The correct height is determined by the height of the folding spacers (62) on the gondola transport trailer (46), which are laid on the rail (51) of the stabilizer (5). See Drawing No. 1-11.16.F.
66. Place supports under the transport trailer at point (63) as per Drawing No. 1-11.00. The ground under the support blocks must first be graded with sand.
67. Precise final adjustment of the gondola transport trailer as regards parallelism and the correct angle to the centre section is effected by means of the threaded spindles (64) and (65), as per Drawing No. 1-11.16.F.
68. Attach the front gondola limiter (66) and secure with slide pins and spring pins.

Flooring

69. Place supports under the floor posts and frame as per Drawing No. 1-11.D, bolt and secure.



MASCHINENFABRIK

11

70. Fit the flooring sections, steps and barriers and secure in position.

Rear Wall

71. Lay out the base for the rear wall as per Drawing No. A1-11.E.
72. Attach and bolt the rear wall stanchions and bracing struts as per the drawing.
73. Lay out and attach the anchoring rods as per Drawing No. A1-11.E
74. Attach the facade panels and then attach the lighting strip.



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12

III. DISMANTLING

The ride should be dismantled in exactly the reverse order.

However, before letting down the tower the boom arms should be brought into a horizontal position at crawling speed with the counterweight boom arms on the right-hand side looking in the direction of motion.

Open ball cock (44) and adjust mushroom heads accordingly.

For each assembly manoeuvre carried out with the boom arms, counterweights or ship the mushroom heads must be pressed in, i.e. the hydraulic motor must be blocked.

After dismantling of the rotary unit cantilever it is strictly forbidden to turn the rotary unit (19) as well as the fixture flange for the gondola at the cantilever (18).

Particular care should be taken to ensure that all the electric lines are disconnected in good time.

The same applies to the closing of the ventilation valve on the tank before the tower is let down for rail transport.

All electric plugs and sockets must be protected from dirt !

Sockets must be kept shut !

In order to dismount the counterweights (45) and (55) , use the 2 screws M 30 to pull them away.



DAILY PUTTING INTO OPERATION AND SHUTTING DOWN
"RAINBOW"

Putting into operation:

1. Prior to putting the ride into operation check for correct phase sequence resp. direction of rotation of the electric motor.
2. Check that all safety signs are put up in such a way that they can be easily read.
3. Check for the proper state of the ride, its supports, junction points etc.
4. Check the oil level, i.e. the oil sight glass of the oil tank must be filled up to the center with oil.
5. Switch on the electric main switches and actuate the 6 green push buttons for electrical control and cooler at the righthand outside of the switch cabinet when starting operation for the first time or after malfunctions.
6. Switch on hydraulic system at the control panel and prior to starting any manoeuvres let the pumps run at no load for a reasonable length of time.
At normal outdoor temperatures approx. 10 minutes
At low outdoor temperatures approx. 1 hour
7. Grease tothing of live ring and the bevel wheels of the parallel guidance daily - at the latest as soon as bare patches show on the tooth profile.
8. Run at least 3 complete ride sequences with the unoccupied gondola using all control facilities and at the same time check the support blocks.
9. After the trial runs have been successfully completed, commercial operation of the ride can be started.
10. After the passengers have embarked, the operator has to make sure that prior to lowering the locking bars all passengers are seated correctly in a upright position. When the locking bars have been let down, the operator must check once more that they are properly locked, i.e. that the bars are at their lower stop. If necessary, the switch button "Closed" for the bars must be pressed again.
11. During operation persons are not allowed to stand on the platform directly next to the gondola.

Shutting down:

1. Run the gondola properly to its lowest embarkation position.
2. Switch off the electric main switches.
Lock control panel and switch cabinets.



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14

V. Defects in Operation

A) Power Failure

If there is a power failure, the ship will swing and finally come to rest at the bottom.

B) Safety bars in the ship will not open

Use the solenoid valve on the hydraulic unit to raise the safety bars. Insert plug-in hand jack through slit in plastic covering.

C) Hydraulic hose for the safety bars leaks

In the foot area unscrew the short-circuit screws on the safety bar hydraulic cylinders and open safety bars manually.

D) Ship remains in the 180° position

In this case the flagpole will be at the bottom within easy reach.

If the ship is already slightly inclined to one side, several persons should pull or push the flagpole until the ship moves.

If the persons are not capable of moving the ship, attach the chain hoist supplied to the flagpole, thus obtaining the necessary force.

WARNING !

As soon as the ship is set in motion, the area underneath the ship transporter should be cleared immediately in order to prevent accidents caused by the ship swinging down!



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15

VI. MAINTENANCE AND Lubrication

A) Parallel Motion Guide System

A1) Bevel-Gear Drive

Accommodated in the rotating structure (19) is 1 bevel-gear drive (68), which is accessible via a door (68). The second bevel-gear drive (70) is located in the bottom arm (18) and is accessible through a flap (71).

The toothing must be lubricated approx. every day — at the latest as soon as shiny bare metal appears on the tooth flanks — using gear grease MOLYKOTE 165 BR. In addition, the state of conservation and lubrication of the two bevel-gear drives must be kept under observation.

The bevel-gears must be exchanged after every 5000 hours of operation at the latest.

A2) Coupling

The coupling (17) must be lubricated with ESSO General-Purpose Grease "BEACON 2" after approx. every 300 hours of operation. 4 grease nipples (72) are provided for this purpose.

For lubrication, the gondola arm (18) must be run round to the top. If the grease nipples are not to be seen through the opening, rotate the gondola arm until they do become visible.

On travelling models, the coupling must be lubricated prior to insertion.

A3) Bearings

All bearings must be lubricated prior to each season using ESSO General-Purpose Grease "BEACON 2". Grease nipples (73) - (77) are provided for this purpose.

B) Ropes and lifting tackle

The lifting tackle for transporting the boom arms should be checked prior to use. If necessary, faulty ropes should be replaced by new ones of the same quality and absolutely identical length because the boom arms must be in a particular position during transport and flanging.

Grease ropes at reasonable intervals.

Check nylon cord \emptyset .3/8" (\emptyset 10) prior to letting down the pendulum support and replace if necessary. Minimum tensile force
600 lbf = 2600 N.

C) 90 kW electric motor

If the motor is subjected to dust, it should be blown free at reasonable intervals using dry air in order to remove accumulated dust from the inside and from the vents. The 2 lubricating nipples should always be kept clean. Regreasing should be carried out every 2000 operating hours using ESSO multi-purpose grease "BEACON 2".

D) Reducing gear

For the reducing gear ESSO gear lubricant oil GP 90 HYPOID (SAE 90 EP) should be used. Refilling requires approx. 203 floz (6 l.) The first oil change should be carried out after approx. 50 operating hours, then every 1500 operating hours. The filling and outlet screws are marked accordingly.

D) Drive ring

The toothing of the ring should be lubricated with MOLYKOTE 165 LT toothed-gear grease approx. every day as soon as bare patches can be observed on the tooth profiles.

The ball-bearing track of the toothed ring should be lubricated with ESSO "BEACON 2" multi-purpose grease every day, or at least every 30 hours of operation. For this there are 6 grease nipples provided. Turn bearing when lubricating.



MASCHINENFABRIK

17

The M20 fixing bolts on the drive ring must be checked at reasonable intervals to make sure that they are properly tight. For this purpose, use the torque wrench supplied with the ride. The individual bolts must first be undone and then retightened with 580 Nm = 428 ft lb.

The drive ring must be exchanged after 5000 hours of operation at the latest.

When the drive ring is exchanged, on assembly the screw-on surfaces of the construction must be coated with Loctite No. 0586 (Type AVX) (Loctite 275).

F) Bearings

The 90 kW motor has two lubricating points. These bearings must be greased at reasonable regular intervals using ESSO General-Purpose Grease "BEACON 2".

Grease the tower bearing thoroughly via the grease nipples prior to each raising and lowering of the tower using ESSO General-Purpose Grease "BEACON 2".

Prior to inserting the bottom pin (36) in the pendulum support, it must be lightly greased.

G) Flanged Connections

At reasonable intervals, the bolts of all flange connections must be checked to make sure that they are properly tight. For this purpose, use the torque wrench supplied with the ride. The individual bolts must first be undone and then retightened with 580 Nm = 428 ft lb.

For the tightening torques see K1 .

H) Hydraulic System

The chief requirement for smooth operation is a clean hydraulic system.

Dirt which has entered the hydraulic system brings about a relatively rapid drop in performance of the pumps and the life of all the components is reduced. Dirt can also cause the control processes to be blocked.

One should always ensure that there is sufficient oil (up to centre of the oil level indicator). After relatively long shutdown periods (2 months max.) or after an oil change any air-locks in the system must be removed. For this there are various vents fitted.

H1) Axial Piston - Variable Displacement Pump

Renew paper filter each year. When changing oil clean the magnetic screw at the lowest point on the pump housing as well as the gauze on the distributor block.

H 2) Axial Piston Motor (4)

No special maintenance necessary.

H 3) Oil Tank (43)

There are approx. 7,06 ft³ (200 litres) of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire hydraulic system. The condition of the oil should first be checked after 50 operating hours. Filter the oil and change it if necessary. Further oil changes should be carried out every 1500 operating hours.

New oil should always be filled at the oil tank through a clean filter using a filter size of at least $\mu = 40$.

The magnetic needle (78) should be checked at reasonable intervals. During the initial operating period it should be cleaned at least once a week.



H 4) High-Pressure Filter ②

If the red button on the differential indicator trips ($\approx 0,16$ inch) (approx. 4 mm) during normal operation and will not remain in the original position when pushed in, the filter element must be changed.

When the system is cold the differential indicator may respond but when the operating temperature rises the indicator will switch back again.

H 5) Hose Pipes

All the hose pipes are marked with item numbers which should always be quoted when ordering replacements.

According to the recommendations of the manufacturer the hoses should be renewed every 5000 operating hours.

When changing or reconnecting a pressure hose always ensure that it is in the correct position (bending only on one plane) !

H 6) Erection Cylinder

The erection cylinder is fitted with a pipe-break safety device which cuts off the cylinder if the feed hose bursts. After erection the cylinder should be fitted with a protective bellwto prevent the piston rod from being damaged. The extended piston rod should always be well lubricated.

H 7) Hydraulics for Handrail Locking

The hydraulic unit 74 with oil tank is mounted on the ship. There are approx. 90 l of hydraulic oil ESSO NUTO H 68 ($\approx 3,2$ ft³) (SAE 20) in the entire system.



MASCHINENFABRIK

20

H7) Hydraulics for Handrail Locking

The hydraulic unit (80) with oil tank is mounted on the gondola. There are approx. 60 l of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire system. (= 2,1 ft³)

H8) Hydraulics for Assembly

The hydraulic unit (8) with oil tank is fitted to the frame (1). There are approx. 140 l of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire system. (= 5 ft³)

H9) Hydraulics for gondola transporter

The hydraulic unit (81) with oil tank is fitted at the end of the transporter. There are approx. 90 l of hydraulic oil ESSO NUTO H 68 (SAE 20) in the entire system. (= 3,2 ft³)



MASCHINENFABRIK

21

K 1) Tightening Torque for Screw Connections, which have to transfer loads:

Boom arm/Rotary unit	: M 30; Ma = 2000 Nm = 1475 ft lb
Gondola/Boom arm	: M 30; Ma = 2000 Nm = 1475 ft lb
Counterweight/Boom arm	: M 30; Ma = 2000 Nm = 1475 ft lb
Flagmast/Boom arm	: M 16; Ma = 210 Nm = 155 ft lb
Toothed ring	: M 20; Ma = 580 Nm = 428 ft lb

The threads should be oiled lightly and not greased, because with grease the tightening torque values cannot be maintained.

The contact surfaces of flange connections should be provided with a friction coating.

Under no circumstances may these surfaces be oiled or greased.

Damaged non-slide coating must be touched up (see treatment specification).

All the screw connections should be checked at reasonable intervals to ensure that they are secure. For this the torque spanners supplied should be used.

Checking tightening torque:

1. Undo screws
2. Retighten screws



MASCHINENFABRIK

K 2;) Weights and Loads

For assembly the following individual weights have to be moved:

Gondola boom arm	4350 kg	= 9590 lb
Counterweight boom arm	1950 kg	= 4300 lb
Counterweight per disk	2200kg/2800 kg	= 4850 / 6175 lb
Weight of the gondola	4600 kg	= 10150 lb

Ground loads for touring rides: see drawing 4-20 329

park rides: see special foundation plan

K 3;) Driving the equipment prior to installation of the gondola, i.e. during assembly or dismantling:

Operating maintenance switch on the right-hand side of the switch cabinet. Press "Crawl" button on transportable control panel.



K 4) Treatment Specification for Adhesive Coating between Flange Connections

Manufacturer: Dr. Schumacher & Co.
DESCO Lacquer Chemistry
Kronbachstr. 100
4600 Dortmund

Type of paint:
"DESCOSIL"

When using zinc silicate the surface must be dry, dust-free and sandblasted in accordance with RoSt 2.213.

For at least half an hour the paint applied must be protected from spray water and dripping water.

When sandblasting one should ensure that the entire cross-section is covered uniformly in layers so that when any remaining parts are being reblasted coating which has already been applied will not be blasted again.

It is advisable to apply the coating as soon as possible after the sandblasting, 2 to 4 hours later but certainly on the same day before a film of rust is allowed to form.

Mixing the zinc powder into the medium should be done as evenly as possible, finishing off using a mixer, so that the paint is free of lumps.

The paint must be deep and should be applied using new brushes; for large areas it is advisable to use new lamb's wool rollers for application. The required layer thickness of approx. 80 μ is attained when there are deep, filled, continuous brush lines or when there is a coarse orange peel effect. Dripping time will be 3 hours at the most. The paint is still workable after this time but it will no longer bind because of chemical reactions. For this reason, tools should also be thoroughly washed in water



MASCHINENFABRIK

24

VII.
SAFETY REGULATIONS
FOR
"RAINBOW"

1. The ride design has not been calculated for snow loads during operation. If the ride is operated outside of the snow-free season, any snow that settles on the ride must be continuously swept off.
2. The ride must be underpinned by support blocks at the bearing points as shown in plan no. 1-11.D "Platform with supports". The given sizes of the supports are valid for a permissible soil pressure of $p = 29 \text{ lb/in}^2$ ($.20 \text{ N/cm}^2$).

Keep the supports between soil and base structure low and make sure that they are stable and immobile.

3. The bracing stays of the outermost rear wall stanchions of the façade must be anchored for a vertical tensile force of 2400 lbf (10,7 kN).

In case of densely compacted sands and gravels and stiff to semi-solid soils the anchors stated in plan 1-11.E.1 "Rear Wall" are sufficient.

At wind force 8 (twigs broken off trees, walking against wind difficult), each of the two outermost rear wall stanchions must also be anchored on both sides.

4. The M30 bolts (grade 10.9) at the flange connections of the arms must be pretensioned with a torque of 1475 ft lb(2000 Nm) in accordance with plan no. 1-11.00 every time the ride is erected. At the same time, the bolts must be slightly oiled (do not grease).
5. The M16 bolts (grade 8.8) of the tower bearing (see plan no. 1-10.13) must be pretensioned with a torque of 62 ft lb (84Nm).The bolts must be slightly oiled (do not grease).
6. The connecting surfaces of flange connections must be coated with a rub-resisting surface coating. These surfaces must not be oiled or greased.

Damaged rub-resistant surface coating must be repaired (see working instructions).

7. Prior to starting daily operation, the ride must be checked for safe functioning. The principal connections as well as the moving parts and the machine parts must be observed during operation; any defects must be remedied immediately. If necessary, operation must be discontinued. Repair works which might be hazardous to the public or the operating personnel are not permitted during operation of the ride.



8. The ride must be erected in such a way that in every position of the trajectory of the gondola a sufficient distance, at least 20 inch (0,5m), is maintained from houses, trees electrical cables etc. so that the passengers are not endangered.
9. The operator's stand is to be located so that the operator can easily supervise embarkation and debarkation of passengers as well as closing and opening of locking bars.
10. For each erection, the frame of the vehicle transporting the gondola and the base frame must be brought onto the same height by means of the brackets of RR 4,33 x 2,36 inch (110 x 60 mm) which are hinged onto the vehicle frame. The correct position in the plan is set with the aid of catches welded onto the brackets.
11. All connections must be secured against unintentional loosening. Railings must be secured against coming loose from their supports.
12. The gondola may not be loaded with more than 36 persons, calculated load = 165 lb (75 kg) / person. The gondola must be loaded as symmetrically as possible on either side of the center axis.
13. It is prohibited to lean out of the gondola, to stretch out arms and legs, to smoke and to enter the gondola with animals, umbrellas, sticks or other bulky or pointed objects.
14. Drunken persons and children under 6 years and of a height less than 4 ft (122 cm) are excluded from the ride.
15. Children under 10 years and of a height of less than 5 ft (152 cm) may only use the ride when accompanied by an adult.
16. By principle, children must never use the ride sitting alone in the seats.
17. All seats which have no back or railing in front of them, i.e. seats which have no possibility of support for the feet (all seats ending in an aisle) must be occupied by adults only.
18. Notices announcing the prohibitions and conditions or regulations 13 to 17 above must be prominently displayed.
19. The operator must not switch on the drive power until
 - a) all passengers are properly seated in the seats,
 - b) all locking bars have been locked hydraulically,
 - c) the public has left the entrance and exit platforms.



MASCHINENFABRIK

26

20. The locking bars may only be opened after the gondola has reached a position sufficiently near to the 0° position.
21. The supervising personnel has to make sure that passengers step on the embarkation platform only after the gondola has come to its standstill.
22. The preset electronic power regulator and the limitation of the speed of rotation to max. 10 rpm must not be changed.

The following values may serve as guidelines:

- a) when the gondola is empty, the minimum duration of one full circle should not be less than 6,2 seconds.
 - b) when all seats in the gondola are occupied, a pressure of approx. 4200 psi (290 bar) should not be exceeded when starting from the 90° position.
23. The following preset values of the overpressure valves must be left unchanged:
 - a) high-pressure valve 4640 psi (320 bar)
 - b) braking valve 2175 psi (150 bar)
 - c) hydraulics of the locking bars 435 psi (30 bar)
 24. The following applies to the control of proper functioning of the ball bearing slewing rim:

For program "creeping" with an empty gondola, the pressure shall not exceed approx. 1300 psi (90 bar) when the gondola is in an 90° position (hydraulic oil at operating temperature).

25. In order to retrieve the gondola from the 180° position in the event of a catastrophe, a chain tackle or similar with suitable attachment facilities must be kept instantly available, required tensile force < 3370 lbf (15 kN).

This tackle must be attached to the \emptyset 3 inch (76,1 mm) rod at the head of the counterweight arm using a self-releasing clip.



MASCHINENFABRIK

27

VIII.

Maintenance Instructions for Fiberglass Surfaces

We use only first-class materials to produce the surface finish of our fiberglass components. Although these require very little maintenance, they cannot do entirely without maintenance. To retain the brilliant surface gloss for a long time we recommend you to:

1. Clean the surfaces at least every 14 days with clear water and then polish with a leather cloth.
2. Never rub dust or dirt off the surfaces when dry.
3. Clean the surfaces with a solution of water and household washing-up liquid or similar as required but at the latest every 3 months; after drying, apply a good automobile wax and polish with a soft cloth.
4. If you use a high-pressure steam jet, never work with chemicals which are more aggressive than soapy water.
5. If you use a high-pressure steam jet with chemicals which comply with Point 4, wax and polish the surfaces again afterwards.
6. Stubborn spots and stains can be swiftly removed with moist acetone cloths; keep the contact time with acetone to a minimum.
Immediately after working with acetone or cleaning benzine, wash the surface well with clear water and then wax and polish.

HUSS

SERVICE LETTER RAI-01
ISSUED BY HUSS MASCHINENFABRIK
JUNE 1984

RE: Rainbow - Maintenance Bulletin

Proper care and maintenance of our rides ensure a long service life and operational reliability and also save costly repairs.

From recent service reports we note that some of our customers are regrettably lax in carrying out the necessary maintenance work - especially maintenance of the booms and the bevel gear drives of the rotating body.

We herewith expressly draw your attention to the fact that the bevel gear drives must be greased with the prescribed gearwheel grease, Molykote 165 BR, at regular intervals - at least every two (2) days.

At the same time, prior to applying the grease it is important to check the good condition of the gear teeth.

We would ask you to make a special point of ensuring that this is done.

enclosure: Maintenance & Lubrication sheet

V. MAINTENANCE AND LUBRICATION

A) Parallel Motion Guide System

A1) Bevel-Gear Drive

Accommodated in the rotating structure (19) is 1 bevel-gear drive (68), which is accessible via a door (68). The second bevel-gear drive (70) is located in the bottom arm (18) and is accessible through a flap (71).

The toothing must be lubricated approx. every day — at the latest as soon as shiny bare metal appears on the tooth flanks — using gear grease MOLYKOTE 165 BR. In addition, the state of conservation and lubrication of the two bevel-gear drives must be kept under observation.

The bevel-gears must be exchanged after every 5000 hours of operation at the latest.

A2) Coupling

The coupling (17) must be lubricated with ESSO General-Purpose Grease "BEACON 2" after approx. every 300 hours of operation. 4 grease nipples (72) are provided for this purpose.

For lubrication, the gondola arm (18) must be run round to the top. If the grease nipples are not to be seen through the opening, rotate the gondola arm until they do become visible.

On travelling models, the coupling must be lubricated prior to insertion:

A3) Bearings

All bearings must be lubricated prior to each season using ESSO General-Purpose Grease "BEACON 2". Grease nipples (73) - (77) are provided for this purpose.

SERVICE LETTER RAI-01B
ISSUED BY HUSS MASCHINENFABRIK
DECEMBER 13, 1985

HUSS

RE: POSSIBLE PROBLEMS ON RAINBOW - MAIN TURNING SECTION

After extended operation, it is possible that cracks may develop on the main turning section.

For immediate repair, you can grind out completely the cracks and weld them by a certified welder.

A permanent solution would be to strengthen the specific area. For this case, we are enclosing repair instructions which can be done locally by a professional machine shop and certified welder.

DRAWING #1-21992

SERVICE LETTER RAI-03
MAY 1988



RE: Rainbow - Bolts on Bearing Cover Plate
(only applicable to plates with 8 bolts)

Huss Maschinenfabrik requires all customers to change the (8) bolts, M12x30, Pos 84 on the bearing cover plate (see enclosed drawing) located on the bearing arm directly behind the gondola and secure them with loctite.

The reason for the change is to upgrade the quality from 8.8 to 10.9.

enclosure: Drawing #1-11.8.A



SERVICE LETTER RAI-04/RA-03
ISSUED BY HUSS MASCHINENFABRIK
FEBRUARY 1989

RE: Ranger and Rainbow - BEARINGS IN GEARBOXES

We recommend that the bearings at the four (4) planetary gearboxes be replaced after five years of service.

This change will expand the lifetime of the gearbox.

When ordering the bearings, we will need the individual serial numbers of all four (4) gearboxes to insure proper replacement parts.

HUSS

SERVICE LETTER RAI-05
ISSUED BY HUSS MASCHINENFABRIK
MAY 13, 1987

RE: Rainbow - Mirror Decoration

We are now able to offer you an attractive colored mirror decoration for the mainboom of the Rainbow.

If you are interested, please call or notify us.

enclosure: Brochure



MASCHINENFABRIK

VII.
SAFETY REGULATIONS

FOR

"RAINBOW"

**RETURN RECEIPT
REQUESTED**

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MASCHINENFABRIK

26

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This tackle must be attached to the Ø 3 inch (76,1 mm) rod at the head of the counterweight arm using a self-releasing clip.

SERVICE LETTER
RAI-07



MASCHINENFABRIK

Huss Maschinenfabrik GmbH & Co. KG · Postfach 110206, D-2800 Bremen

Stresemannstr. 56 · Telex 2 45 180 huss d
☎ (04 21) 49 00 00 · Telefax 4 99 00 40

Ihre Zeichen/Nachricht

Unser Zeichen

Telefon-Durchwahl / Kommission / Tag

RE: Rainbow #

11.09.89

Dear Customer:

As an amendment to our safety regulations sent to you on July 22, 1989, we would like to explain that the height recommendation is based on european experience.

Our recommendation and your experience is important, but it is still up to the State Inspector to make the final decision as to the height restriction on your particular ride.

HUSS MASCHINENFABRIK
GmbH & Co.KG

SERVICE LETTER RAI-08
ISSUED BY HUSS MASCHINENFABRIK
JANUARY 1990

HUSS

**RETURN RECEIPT
REQUESTED**

RE: RAINBOW/SLIDING GATES FOR GONDOLA

Huss Maschinenfabrik has designed a sliding gate package for the entrance and exit areas of the gondola.

This is a recommendation (NOT A REQUIREMENT), but due to a few inquiries Huss has designed this kit.

The kit includes one (1) set of sliding gates with 4 limit switches as well as installation instructions.

CARNEYTOWN.COM



MASCHINENFABRIK

**RETURN RECEIPT
REQUESTED**

"R A I N B O W"

Recommended check procedure after 5000 hours of operation

1. Ball bearing slewing rim:

- a) According to the manual the ball bearing slewing rim should be renewed after 5000 hours of operation.
- b) The ball bearing slewing rim can be used again, if the check of the bearing play acc. to the recommended specification shows a permissible value.
Maximum permissible tilting play = 1 mm, i.e. maximum permissible axial play = 0,5 mm.

The condition of the tooth profile must also be faultless.

2. Coupling at balancer shafts:

If an increase of wear and abrasion at this coupling has been discovered, the coupling has to be renewed.

The reason for an increase of wear and abrasion can be a deficient lubrication.

3. Bevel gear drive:

- a) According to the manual the bevel gears should be renewed after 5000 hours of operation.
- b) Differing from this procedure and according to the experience up to now, the bevel gears can be used again after having been checked and certified by the manufacturer, Carl Hurth, Munich.
This check can also be done by a local specialised company which manufactures the GLEASON-hypoid-tooth system.

4. Balancer shafts (upper and lower part):

The bearings of the balancer shafts are calculated for a life of at least 13900 hours at full load, i.e. full load unbalanced at one side of the gondola provided lubrication has been done sufficiently.
It must also be ensured that dirt and humidity could not penetrate into the bearings.

Since it is not possible to make a check from the outside, a satisfactory control can only be made by completely dismantling the balancer shafts.
If possible, the dismantling and re-assembling should be done at the premises of the manufacturing company, as there may arise complications.



MASCHINENFABRIK

- 2 -

It is recommendable to take new bearings for re-assembly.

5. Reinforced new bearing shell for gondola bearing:

In any case, it is recommendable to exchange the existing bearing shell, item # 32 of drawing A1-11.8.A, against a new reinforced bearing shell.

Bremen, January 5, 1990

Böhme/Dreier/rel.

Huss Maschinenfabrik
GmbH & Co. KG

CARNYTTOWN.COM

SERVICE LETTER RAI-10
ISSUED BY HUSS MASCHINENFABRIK
SEPTEMBER 5, 1990

HUSS

**RETURN RECEIPT
REQUESTED**

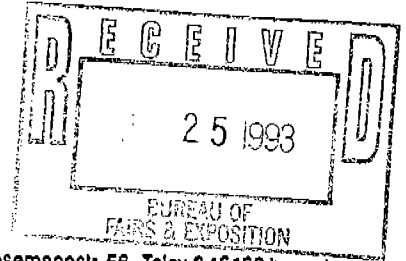
RE: New molded bench for Rainbow

In response to the request of several customers, Huss Maschinenfabrik has developed a new bench for the Rainbow which has individual seat-moldings.

This should help reduce the sliding sideways - if only one person uses the bench.

If you are interested in this modification kit, please let us know.

SERVICE LETTER RB-11



Huss Maschinenfabrik GmbH & Co. KG · Postfach 110206, D-2800 Bremen

Stresemannstr. 56 · Telex 2 45 180 huss d
☎ (04 21) 49 90 00 · Telefax 4 99 00 40

TO: ALL RAINBOW CUSTOMERS

RETURN RECEIPT
REQUESTED

Ihre Zeichen/Nachricht

Unser Zeichen

Telefon-Durchwahl / Kommission / Tag
August 20, 1992

RE: Boom Arm Axle Cracks

Dear Customer:

During the process of replacing lower bevel gears in the gondola area, we have discovered cracks on the non-accessible boom arm axle (which were older than 8 years).

We have surmised that this is being caused by a combination of factors: frequent one-sided loading on the gondolas; stress caused by unusual hard conditions; erecting and tearing down of the ride.

At this point we want to direct your attention to the ride manual, paragraph 7, point 12, which requires the gondola to be loaded as symmetrically as possible on either side of the center axis.

To avoid any danger to passengers, all Rainbows that have been in operation longer than 5 years, must install a new, reinforced (modified) boom arm axle with bearings. This work must be done at the factory. Therefore, the whole boom arm must be shipped to Germany, at which time an evaluation of the arm will be done, and advisement of any additional repair work will be provided.

A second option is to install a complete new boom, with new housing, new mounting gondola plate, new boom arm axle, new bevel gears, new bearings, and completely new wired slip ring (shipped primed and painted).

Huss Maschinenfabrik
GmbH & Co. KG.

Post-It™ brand fax transmittal memo 7671 # of pages > 1

To	LEEROY PAFFORD	From	CHRIS GIEASON
Co.		Co.	NORTH AMERICAN REPAIR
Dept.		Phone #	
Fax #	(904) 488-9023	Fax #	

Rechtsform: Kommanditgesellschaft, Sitz Bremen, Registergericht Bremen HRA 19316
Persönlich haftende Gesellschafterin: Huss Maschinenfabrik GmbH,
Sitz Bremen, Registergericht Bremen HRA 10337
Geschäftsführer: Dieter Weinschenck, Hans-Karl von Winterfeld

Bremer Bank : (BLZ 290 800 10) Kto.-Nr. 211 301 000
Bankhaus Nealmeyer AG : (BLZ 290 200 00) Kto.-Nr. 8500
Postkcamt : Hannover (BLZ 260 100 30) Kto.-Nr. 1564 84-300

c/o NORTH AMERICAN COMPANIES

East Coast Tel: (716) 759-8351 Fax: (716) 759-8195
 West Coast Tel: (510) 846-3335 Fax: (510) 846-0380
 Florida Tel: (407) 392-9049 Fax: (407) 392-9172

RECEIVED
23 1993
BUREAU OF
FAIR RIDES INSPECTION
Memo
FAX/LETTER

TO: FLORIDA DEPT. OF AGRICULTURE
ATTN: MR. LOWELL PARRISH

DATE: NOVEMBER 23, 1993

PAGES INCLUDING COVER: 3

FROM: BARBARA

SUBJECT: RAINBOW 47718

COPY: PETER ZWICKAU

CONTACT:

904-488-9023

VISIT/TEL/FAX/MESSAGE:

Dear Mr. Parrish:

We inquired with the factory as to how the sun is attached to the Rainbow amusement ride. Their response is attached, and below is the translation:

"The sun holder, Pos. 30, is attached with 4 bolts pos. 29, and 1 bolt pos. 31 at the center. These bolts are secured by safety clips (pins).

The sun itself is attached with 4 bolts pos. 28, and 1 bolt pos. 30 on the sun holder. (both secured with safety clips (pins).

The sun beams are separately attached with 1 bolt pos. 33 and with safety clip (pin) pos. 34.

The pockets i.e. the eye, where the sun holder is attached, are welded to the center!

If all bolts and safety clips (pins) are positioned properly, the sun cannot fall down, therefore manufacturing defect is not possible."

Regards,

Otto Dreier
Service Department
Huss Maschinenfabrik



TELEFAX

MASCHINENFABRIK

Fax.-No.: Dr-93/171

POSTANSCHRIFT: P.O. BOX 110206 · D-28082 BREMEN (GERMANY) · ☎ (0421) 499000 · TELEFAX (0421) 4990040 · TELEX 245180 huss d
FIRMENSITZ: STRESEMANNSTR. 56 · D-28207 BREMEN (GERMANY)

AN: North American Companies
TO:

FAX NO. 001 407 392 9172

SEITEN 2
PAGES:

Z. HD. B.P. Zwickau
ATT.:

VON: Otto Dreier
FROM:

DATUM 23.11.93
DATE:

BETR. RAINBOW -47718-, Reithoffer, Unfall durch Sonne
RE.:

Sehr geehrter Herr Zwickau,

die Sonnenhalterung, Pos.30 im Manual, ist mit 4 Bolzen Pos.29 und 1 Bolzen Pos.31 auf dem Drehkörper befestigt. Diese Bolzen sind mit Sicherheitsnadeln Pos.34 gegen Herausfallen gesichert.

Die Sonne selbst ist mit 4 Bolzen Pos.28 und mit 1 Bolzen Pos.30 auf dieser Halterung befestigt. Diese Bolzen sind ebenfalls mit Sicherheitsnadeln Pos.34 gegen Herausfallen gesichert.

Die Sonnenstrahlen sind einzeln in die Sonne eingesteckt und werden jeweils durch 1 Bolzen Pos.33 gehalten der, auch durch Sicherheitsnadel Pos.34 gesichert wird.

Die Taschen, bzw. das Auge in die der Sonnenhalter (Pos.30 Manual) eingesteckt wird, sind am Drehkörper angeschweißt.

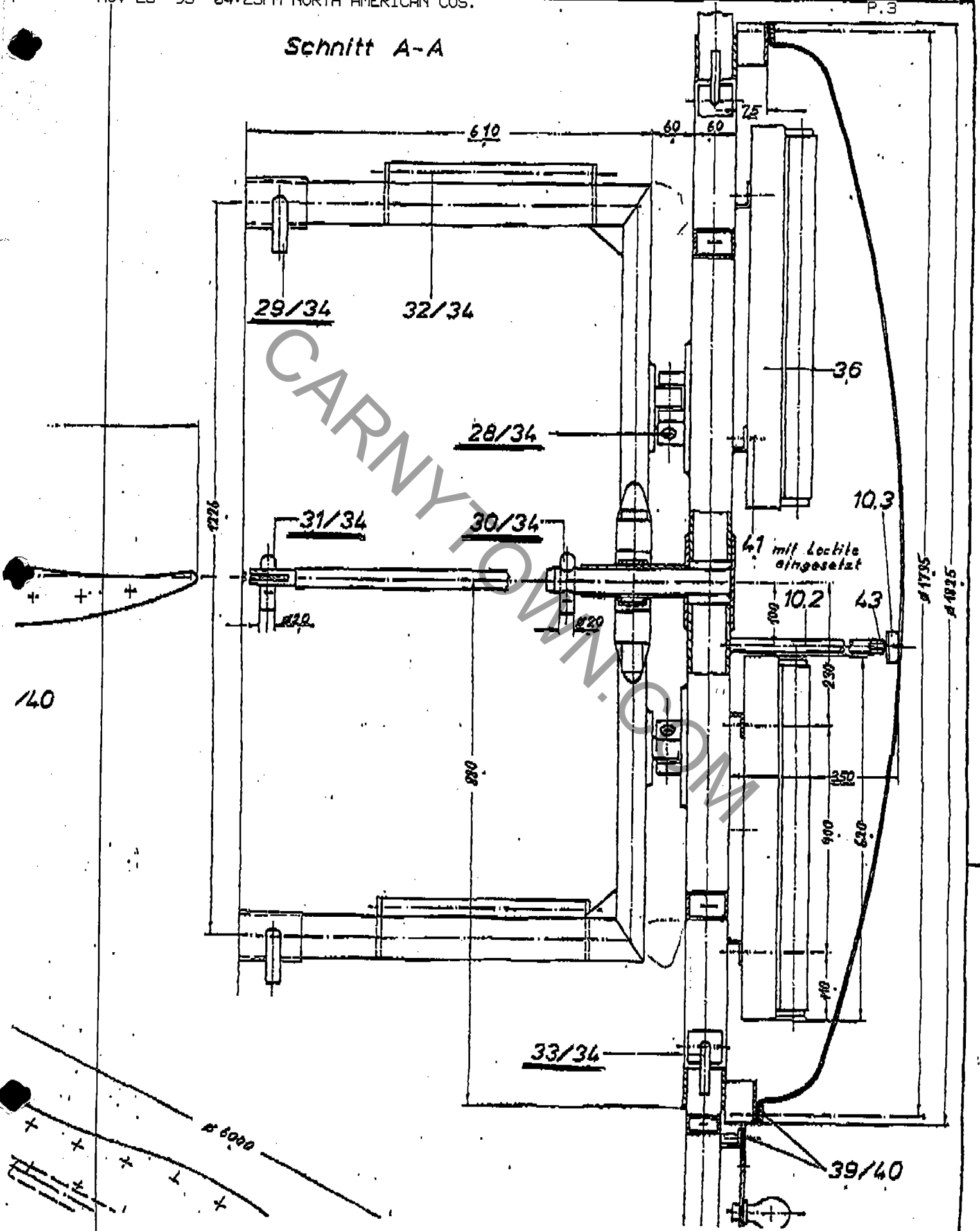
Sofern alle Bolzen und Sicherheitsnadeln ordnungsgemäß eingesteckt waren, kann die Sonne nicht herunterfallen, d.h. es kann kein Herstellungsfehler vorliegen.

Siehe beigefügte Zeichnungskopie.

Mit freundlichen Grüßen

Otto Dreier
Service Dept.

Schnitt A-A



140

6000

41 mit Loctite eingesetzt

39/40

NOV-07-1994 15:17

Fax Transmittal Memo 7672

To: RON SAFFORD
Company: BUREAU OF FAIR RIDE SAFETY
Location:

Fax # 488-9023

Telephone # 488-9790

Comments

PER OUR DISCUSSION

Walter

No. of Pages 1

From: RICH WÖRNER

Company: OPPAGA

Location:

Fax # 487-3804

Original Disposition:

Destroy

Return

Call for pickup

9044873804 P.01

11/7/94 3:15 PM

Dept. Charge

Telephone # 487-9217

OCT 31 '94 12:03PM NORTH AMERICAN COS.

28'S 118539

P.2

CARVIN-TOWN.COM



MASCHINENFABRIK

TELEFAX

Fax.-No. 487-94/224

POSTANSCHRIFT: P.O. BOX 110206 · D-28082 BREMEN (GERMANY) · B (0421) 499000 · TELEFAX (0421) 4890040 · TELEX 245180 huss d
FIRMENSITZ: STRESEMANNSTR. 56 · D-28207 BREMEN (GERMANY)

AN: North American Companies

TO:

FAX NO. 001 716 759 8195

SEITEN: 1
PAGES:

Z HD.: Don Harath

ATT:

VON: Walter Heidbrink

FROM:

DATUM: 31.10.94
DATE:

BETR.: Rainbow -47 718-

RE:

Dear Don,

of course can the customer use bolts with double nut and safety clips instead of pins. The pins are normally only used for saving time during erection.

RECEIVED

NOV 7 1994

BUREAU OF
FAIR RIDES INSPECTION

Kind regards

Walter
Walter Heidbrink
Service Dept.