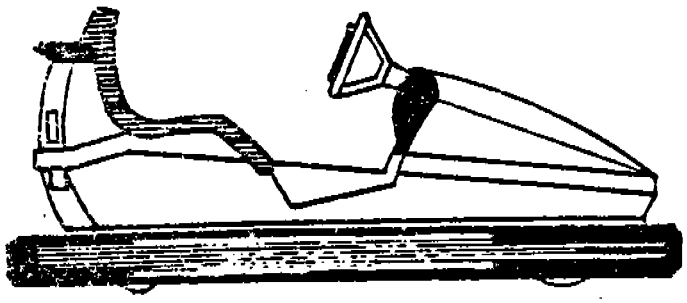
MFG: DUCE
NAME: BUMPER CARS
TYPE: NON-KIDDIE

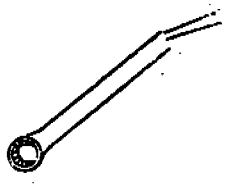
DUCE
Mark of Excellence
DALLAS, TEXAS
U.S.A.

BUMPER CAR MAINTENANCE

AND

PARTS CATALOGUE





Exsaco Corporation

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TABLE OF CONTENTS

INTRODUCTION

FLOOR PICKUP BUMPER CAR ELECTRICAL OPERATION

Floor pick up bumper cars operate by receiving current from (+) and (-) energized floor plates, which are arranged on the floor in rows connected to a low voltage (maximum 48 volts DC) power supply. The floor plates are spaced apart with a plastic insulator between each row.

There are four (4) pick up contacts located underneath the car which are so placed that at any one time the pick up point will be in contact with two (2) different polarity floor plates. The current is then directed via rectifier to the positive and negative supply wires of the bumper car motor. The control of the motor is accomplished through a mechanical foot switch, which, when closed, allows the current to travel to the motor therefore allowing the car to operate.

STANDARD BUMPER CAR ELECTRICAL OPERATION

Standard bumper cars operate by receiving current (80-110 VDC) from energized ceiling panels usually mounted 8'-9' above a steel or aluminum floor. The current is picked up through a wiper assembly mounted on an insulated pole. This pole is then electrically connected to a mechanical foot switch, which when pressed by rider, allows current to be supplied to motor, which allows the car to operate.

OPERATING PROCEDURES AND INSTRUCTIONS

I. Number of Operators

Bumper cars are normally operated with one (1) person who has access to controls, entrance gates, and exit gates at all times. It may become necessary in certain instances to add extra personnel to assist with the operation of the ride during times of high usage in order to safely control traffic flow.

II. Safety Equipment

1. Safety Shoulder Straps - Each bumper car is supplied with two (2) shoulder straps. It is mandatory that a shoulder strap be worn by each rider for the duration of the ride. The shoulder straps are worn by inserting one arm through loop and allowing the strap to rest on the patron's shoulder. Failure to comply with these instructions could cause possible injury to the riders.

2. Cushioned Steering Wheel - This cushion, which is located in the center of the steering wheel, is mandatory. No bumper car should be allowed to operate without one.

3. Cushioned Trolley Pole - (Standard model cars only). - This cushion is required on all standard model bumper cars with trolley poles. This cushion is designed to absorb shock in the event that a rider's head comes in contact with the trolley pole.

4. Headrest Cushion (Certain models) - Provides protection for rider's head and neck areas.

5. Dash Pad - This cushion is required along the front edge of the seating compartment in order to provide protection for legs and knees.

6. Padded Seats - The padded seat is provided for passengers comfort. **It is not recommended** to replace this seat with a hard surface material (fiberglass, plastic, etc.).

III. Rider Instructions

The following instructions should be mounted in a place that is easily readable by all potential riders. These instructions must be strictly enforced.

1. No food or drinks allowed on ride.
2. Shoes must be worn at all times.
3. No riders under 42 inches permitted.
4. Children under the age of 7 years must be accompanied by an adult.

5. No head-on bumping allowed.
6. All riders must wear shoulder straps at all times.
7. Limit 2 riders per car.
8. No running on floor at any time.
9. Remove all loose articles before entering ride.
10. No pregnant women
11. No rider with history of neck or back injury.

IV. **Special Conditions for Large Floors**

When floors exceed 40 feet in continuous length, it is recommended that signs be posted to indicate the riders should operate the cars in one circular direction around the floor. This is to discourage excessive speed and long run intentional head-on bumping.

OPERATION OF RIDE CYCLE

I. Before operating any ride cycle, operator must be aware of the following:
   1. All riders are seated.
   2. All riders have shoulder straps in place.
   3. No patrons standing on floor.
   4. Both entrance and exit gates must be closed with patrons behind gates.

II. Adjust timer for desired length of ride.

III. Start ride.

IV. Monitor ride

During operation of ride, observe riders. If anyone is acting in an unsafe manner, stop the ride, warn rider. Restart ride. If problem persists, stop ride and request patron to leave ride.

If a situation arises, such as patron leaves car during operation, a spectator climbs over the fence, loose articles are found on the floor, etc., **STOP RIDE IMMEDIATELY**. Do not start ride again until situation has been corrected.

In the instance of a "jam up", stop ride, manually push cars free, then restart ride.

V. End of Ride

When ride time elapses and cars stop moving, allow the riders to exit the floor completely and close exit gates before allowing new riders to enter the ride.

DAILY OPERATOR MAINTENANCE AND INSPECTIONS

The inspections and maintenance points listed below are to be completed daily by the person(s) responsible for the operation of the ride with patrons. It should be understood that these inspections should be done in conjunction with those outlined in the ride maintenance checklist section.

I. Inspections

1. * Check floor for any large objects that could cause damage to the cars or injury to patrons.
2. * Check all cars and make certain all safety equipment is installed and in proper working condition.
3. * Check floor plates for any screws that are loose or missing.
4. Check operation of controls and emergency stop.
5. Check condition of entrance and exit gates.
6. * Report any problems or questions to proper personnel.

* To be monitored continually during the operating day.

MAINTENANCE FREQUENCY LIST

The maintenance points listed below are to be completed daily by the person(s) responsible for maintenance of the ride.

I. Daily Maintenance and Inspections

1. Check operation of each car.
2. Check all bolts, wires, motor, etc, for security.
3. Check all safety equipment on cars.
4. Inspect floor, bump rail, electrical service for any damage or abnormal conditions.
5. Check operation of ride control system.
6. Inspect fiberglass body and repair if necessary.
7. Apply talc to outside surface of bumper tire (every two (2) days).
8. Sweep floors at least twice daily (more if necessary) with dust mop or equivalent.

II. Weekly Maintenance

1. Lubricate switch pedal with silicon base lubricant.
2. Check wear on contact points (pick up style only). Replace contact when worn down flush with holder.
3. Check condition of contact spring.
4. Check condition of rubber wheel(s) 1/4" rim thickness of rubber.
5. Check seats, fiberglass, body, bumper tube, frame for unusual conditions or damage.
6. Check operation of foot pedal. Inspect insulators and copper blocks. If blocks are pitted, file to smooth finish.
7. Remove wiper blade assembly and lubricate rod with light coating of moly type lubricant (standard models only).
8. Check rear iron wheel for clean contact surface.

III. Yearly Maintenance

1. Remove Motor
   a. Inspect clutch, replace if necessary.
   b. Replace armature carbon brush.
   c. Check condition of external commutator and brush.
   d. Check armature bearings. If condition is rough, replace.
2. Inspect and replace worn wheels.
3. Check steel frame for any cracks or unusual damage.
4. Check condition of pneumatic rubber bumper tire.
5. Check all bearings in wheels, inner/outer housings, and motor. Replace if necessary. (All bearings are sealed - do not require lubrication.)
6. Check steering column for backlash. Adjust if play exceeds 2" rotation of steering wheel.
7. Replace any damaged or worn safety equipment.

MAINTENANCE PROCEDURES

MAINTENANCE PROCEDURES

I. Initial Set-Up

After first few days of operation, check tightness of all electrical connections and bolts on bumper cars. This is necessary because of vibrations during shipping and initial setting of components.

II. Lubrication

A. DC Motor

1. Bearings - All bearings in motor are sealed and require no additional lubrication. It is a good practice to inspect armature bearings on an annual basis since they travel at a higher speed than the other bearings. It is recommended that these bearings be replaced every two (2) years.

B. Transmission

1. The transmission is filled and sealed at the factory. Unless there is evidence of leakage through transmission seals, only yearly lubrication is required. At this time, open the inspection bolt on the end of the transmission and inject approximately two (2) slots of grease into the opening. Caution: Overfilling will cause seals to leak. This unit requires only one-half (1/2) cup when filled. It is recommended that the transmission be dissembled and cleaned and grease replaced every two (2) years.

C. Inner/Outer Housing Steering Unit

1. Inner Housing Ball Bearings (Part Number 402-0104) - These ball bearings (72 individual balls) must be lubricated at least once per year. In older models, this requires separation of inner/outer housing in order to lubricate. In newer models, there is a grease fitting installed to lubricate these bearings. If it is desired to install a grease fitting in older models, please consult the manufacturer for instructions.

2. Steering Gear (Part Number 566-0105/566-0513) - This gear requires lubrication once per year. Inspection is accomplished by removing the steering column. Proper lubrication is accomplished when all teeth have an even coat of grease.

3. Top Tapered Bearing (Part Number 404-0209) - This bearing should be lubricated (re-packed) annually along with service of inner/outer housing ball bearings.

4. Steering Column Bearing - All bearings are sealed and do not require any regular lubrication.

D. Rear Axles - Rear axle bearings are sealed and require no additional lubrication. Since current passes through the steel wheel bearings, which could promote wear, it is recommended that these bearings be replaced every two (2) years.

E. Trolley Pole Assembly - It is necessary to lubricate wiper blade pivot rod with a light film of grease on a weekly basis. In order to allow wiper blade, or roller wheel assembly, to pivot freely, lubricate with three (3) shots of light oil weekly.

F. Switch Pedal - Lubricate all pivot hinges with a silicon base spray lubricant weekly.

G. Bumper Tire - During operation, excessive bumping of bumper tires will cause gouging of the rubber. Therefore, it is necessary to lubricate the tires. This is accomplished by preparing a mixture of talc and water to a consistency of latex paint. Then using a brush, paint a heavy coat of the mixture on the bumping surface of the bumper tire and bump rail. This will allow the tires to slide against each other creating less friction. This will also reduce the severity of the bumping. This process should be done a minimum of every two (2) days or daily on busy or long days.

III. *Component Information*

A. DRIVE UNIT

1. Clutch - This clutch is a simple centrifugal unit that has only four (4) moving parts, resulting in a long trouble-free life. Clutch linings have a life expectancy of approximately 3,000 hours. It is important to inspect the clutch shoes once per year, replacing if clutch lining thickness is less than 1/3 inch. Failure to replace worn clutch shoes will cause wear and eventual failure of flywheel.

2. Armature Brush - These brushes should be changed whenever the ends of the brush wears enough that it is completely into the holder. Failure to replace could cause the copper wire, which is molded into brush, to wear on armature commutator causing damage. There should always be adequate spring tension on the brush. This is accomplished by turning the spring latch one-half (1/2) turn after the brush makes contact with the armature.

3. Exterior Commutator - This commutator requires very little maintenance because of the smooth surface on which the double brush holder travels. It is only important to see that it is aligned properly in the center of the commutator ring and that all connections and mounting to insulators are tight.

4. Drive Wheel - The wheel, located on the outside casing of the motor, requires no maintenance. It is important that the bumper car floor remain as flat and clean as possible during operation of the cars. Uneven floor plates or debris on the floor can cause the wheel to gouge. It is necessary to replace the wheel when rubber thickness is less than 1/4".

5. General Maintenance of Drive Unit - It is very important that at least once per week, the electric motor be blown out with compressed air. This will remove all dirt and carbon dust created by the operation of the motor. **This is probably the single most important maintenance procedure in caring for your bumper cars.**

B. Frame and Axles - The frame and the axles of the bumper car is designed to be maintenance free. It is important to inspect shock mounts of both inner outer housings and axles to assure there is no breakdown of the rubber. Tire rim in some cases can collect condensation and rust and it is recommended that every three (3) or four (4) years, the bumper tire and tube should be removed and the rim be cleaned and painted.

1. Wheels - It is recommended that both steel and rubber wheels be replaced when wear reduces flange thickness of wheel and/or rubber to 1/4".

C. Fiberglass Body and Trim - These components require minimum maintenance with attention mainly to cleaning and waxing of fiberglass body. Especially if the bumper cars are exposed to sunlight and weather.

IV. Electrical System - Standard

Standard trolley pole type bumper cars operate on a voltage of 80 - 110 VDC with fields wired in series. Current from the trolley pole connects directly to the moving contact of the foot pedal which when closed allows current to the motor via inner/outer housing commutator. The bumper car is designed so the fused electrical connection to the motor is positive (+), which in turn requires ceiling to be the positive connection. The negative connection (floor plates) is made through the steel wheel, which in turn connects to the chassis of the car. It is extremely important to assure that the negative (-) is connected to all frames and housings. Since the inner/outer housing has a rubber shock mounting block, a grounding wire is placed between the frame and the outer housing. This is also true for the rear axle.

A. Trolley Pole - In order to assure proper electrical connections between ceiling and bumper cars, it is necessary to inspect the trolley pole on a daily basis. Assure that the trolley pole is tight in the socket. If loose, this could cause a poor connection resulting in poor performance of the bumper car. To tighten, insert spanner wrench into socket or collar at the point where the trolley pole fits into car. Tighten until the trolley pole is snug and will not turn by hand.

B. Ceiling Wiper - There are three (3) different types of wipers available - each for a different type of ceiling.

1. Wiper Blade - This system is designed for expanded metal or solid sheet ceilings. This unit should be inspected on a daily basis. The blade should be replaced when a small hole is worn through the contact surface. If the hole is allowed to enlarge, the blade could catch on the ceiling and break off. If the ceiling is not level, it may be necessary to bend the end of the blade down. This will prevent the blade from catching on an uneven ceiling panel when a bumper car is forced backwards. If blade breaking is a problem, it is recommended that a safety cable be installed by drilling a small hole in the end of the blade and inserting a small cable and attaching it to the blade attachment bracket. This will hold the blade from falling on the floor if it breaks.

2. Wiper Wire - This system is designed for chicken wire type ceilings. Failure to use this type of wiper on a wire ceiling could cause damage to the ceiling. Inspection should be made on a daily basis. Wire should be replaced when the wire at the contact point is no thicker than 1/16". Always bend down end of wire to prevent wire wiper from going up into ceiling when car is backing up.

3. Roller Wheels - This system is designed for sheet metal or expanded metal ceiling with openings smaller than 1/2 inch. These wheels should be inspected weekly for wear and should be replaced when wheel surface is approximately 1/4" from the wheel bearing. The roller wheel is equipped with a lubrication access hole on the axle bolt. It is necessary to shoot a few drops of oil into the wheel bearing at least once a week.

Spring - Springs should always have enough tension on the contact assembly so the wiper is in continuous contact with the ceiling. It should move up and down as the ceiling height changes. Replace spring when wiper starts to have an area where contact is lost.

Height Adjustment - Using the set collar, adjust height so that when the car moves around the floor, the wiper remains in contact with the ceiling. It is recommended that the spring and blade holder be set at least four (4) inches from the ceiling.

C. Switch Pedal - This unit is purposely simple in design. The switch is an "on center unit" that snaps on or off quickly in order to cut arcing to a minimum.

1. The copper blocks serve as the electrical contact point. It is important to inspect these blocks weekly to assure that the contact surfaces are clean. Occasionally, it is necessary to resurface the contact with a small file.

2. Check insulators weekly and replace if burning or cracking.

3. Check all screws holding pedal together. Excessive bumping and use could cause screws and nuts to loosen.

4. Check to see if spring moves smoothly and does not bind on hooks. If binding occurs, bend hook to a position which reduces binding.

D. Fuses - A fuse is located between the switch pedal and commutator on top of outer steering housing. This fuse is rated at 20 amps for standard cars and 30 amps for floor pick-up cars.

E. Commutator (Inner/Outer Housing) - This unit is located on top of the outer housing. This allows current to pass to the motor while the housing is turning. Located inside is a brush holder and brush. Replace brush when body length is less than 3/8". Fixed to the inner/outer housing spindle is a bolt with a brass head on which the carbon brush contacts. On the opposite end is a wire connection going to the motor. It is important to check this bolt for tightness and condition of insulators annually. On newer models, this commutator is replaced with a single wire that travels through the inner housing stud. It is important to have motor stops set properly to prevent twisting and breaking of power wire.

F. Lights - All lighting (if equipped) is wired in series. In some models, the front lights are wired independently of the rear lights; and in others, the front and back lights are in two (2) separate circuits. This means if one bulb burns out, the circuit is broken and none of the bulbs will burn. The defective bulb must be located and replaced before lighting can be restored.

G. Rear Iron Wheel - It is extremely important that this wheel be kept clean. It is sometimes necessary to clean surface of wheel with wire brush. Build up on wheel will cause excessive arcing and power loss to motor. It is important to keep the floor clean at all times to prevent build up on wheels.

H. General - Due to the action of the bumper car (i.e., jolts and vibration), it is important to check all bolts on a weekly basis to assure all bolts, nuts, and electrical connections are tight. Loose connections can cause damage to drive unit.

V. ELECTRICAL SYSTEM - FLOOR PICK-UP CARS

All information on electrical systems of standard bumper cars applies to the floor pick-up system in addition to the following:

A. Motor Wiring - The floor pick-up motor operates on a maximum of 48 VDC with an approximate draw of 14 amps running and 23 amps when locked. The fields are wired in parallel. Operation in excess of 48 VDC will cause damage to the motor.

B. Phase Controller - This controller consists of eight (8) diodes fixed to heat sync. Two (2) diodes (one reverse and one forward) are for each pick-up point during operation. Depending on which plate the particular contact is located, current is divided through diodes to either the negative (frame) or positive (switch) wires of the motor. It is extremely important that the heat sync plate be kept clean and all wire connections kept tight.

C. Phase Controller Fuses - These fuses are rated at 30 amps - one (1) fuse for each contact.

D. Floor Contacts -

1. Ball Contacts - There are two (2) ball contacts located on the center line of the car frame. These balls are held in a polyurethane holder. These balls must be replaced when they wear flush with the surface of the polyurethane. Spring tension is only to be slight. Designed only to keep contact from bouncing. Replace only when broken. It is important that the spring does not touch the ball contact stud. This will cause a short circuit and damage to the spring.

2. Wheel Contacts - Inspect wheels for dirt accumulation. Wheels must be kept very clean. Check daily and clean if necessary with wire brush or sand paper. It is absolutely necessary that the steel floor be kept clean and free of dirt. Wheels rolling on a dirty floor will pack and press dirt making it more difficult to remove the dirt, also causing the cars to lose power.

The floor pick-up bumper car requires more attention than the standard car with the combination of the phase controller, extra wiring, contact balls, and wheels. It is necessary to inspect cars more often. Cars should be turned over at least every two (2) days and checked for wiring problems and cleanliness of contacts. Failure to do this will cause future problems with cars.

ELECTRICAL TROUBLE SHOOTING

This guide will assist in determining and isolating malfunctions of the bumper car electrical system. When trouble shooting the electrical system, use the following guidelines to determine the fault:

1. Beeper type continuity tester
2. Battery charger or other low voltage DC source

Motor will not start when pedal is pushed	Check motor fuse. Using continuity meter, check to assure motor and iron wheel are grounded to frame. Check to see if power is to copper contact on foot pedal. If not, inspect wire from trolley rod joint to pedal. With pedal depressed, check power to motor. If there is no current, remove and inspect commutator located on top of outer housing. If necessary, connect battery charger directly to motor. If motor will not operate, remove and inspect.
Motor runs but with reduced power	Inspect rear iron wheel. Clean if necessary. Check condition of copper blocks on foot pedal. Resurface with file if necessary. Make sure trolley pole is tight and wiper assembly connection is well lubricated and free. If necessary, adjust brush plate in motor.

Fuse blows continuously	Disconnect power wire from motor. Using continuity meter, determine if wire is shorted to frame. If not, remove motor and inspect insulators on commutator and armature brush. Remove both wire connectors on field and test to ground. If shorted, replace field coils. If problem is still present, have armature tested. Armature can be field tested by checking for continuity between commutator and armature frame or commutator bars. If shorted, replace.

BUMPER CAR SPECIFICATIONS

	FLOOR PICK-UP	STANDARD
Motor Type	Direct Current	
Voltage Min/Max	35 - 48 Volts DC	80 - 110 Volts DC
Wattage	0.672 Watts	0.736 kw
Amperage	25 Amp Max 14 Amp Operating	14 Amps Max 7 Amps Operating
Horsepower	.92 HP	1 HP
RPM	261 Max	261 Max
Speed	10.5 FPS Max	10.2 FPS Max
Capacity (Persons)	2 Adults 350 Lbs	2 Adults 350 Lbs
Vehicle Weight	475 Lbs	475 Lbs
Maximum Load Per Wheel	286 Lbs	286 Lbs
Ride Duration (Suggested)	2 Minutes	2 Minutes
Passenger Restrictions	42 Inches Under 7 yrs of age unless accompanied by adult	42 Inches

DIMENSIONS

Narrow Body (Cosmo, Comet, Gemini)	6'6" Length 3'8" Width 2'7" to 2'11" Height
Wide Body (Mack I, Mach V)	6'5" Length 3'11" Width 2'7" to 2'11" Height

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S.D.C., srl
Via E. Lazzaretti 2/A
42100 Reggio Emilia, Italy
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Barbieri. srl
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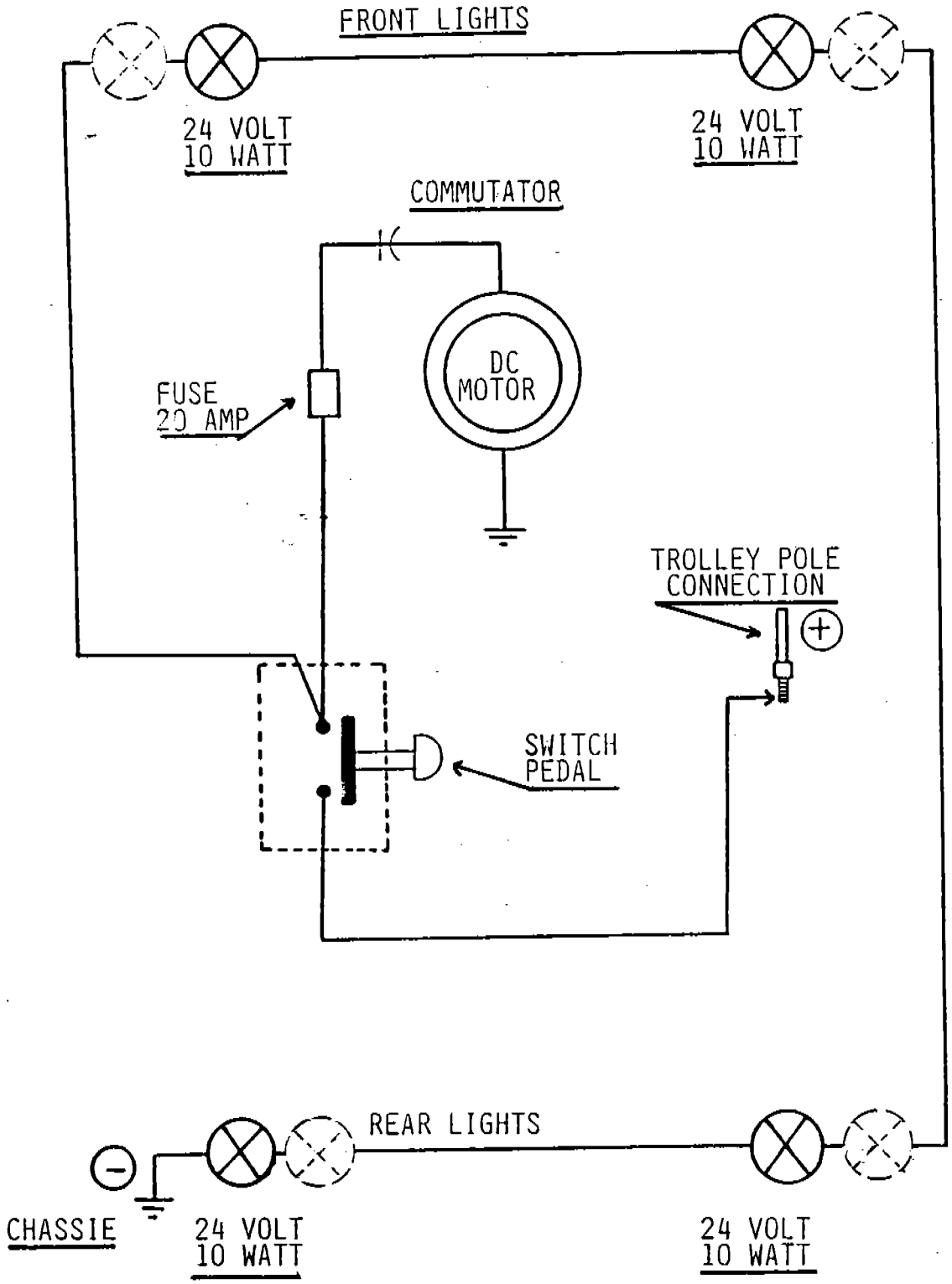
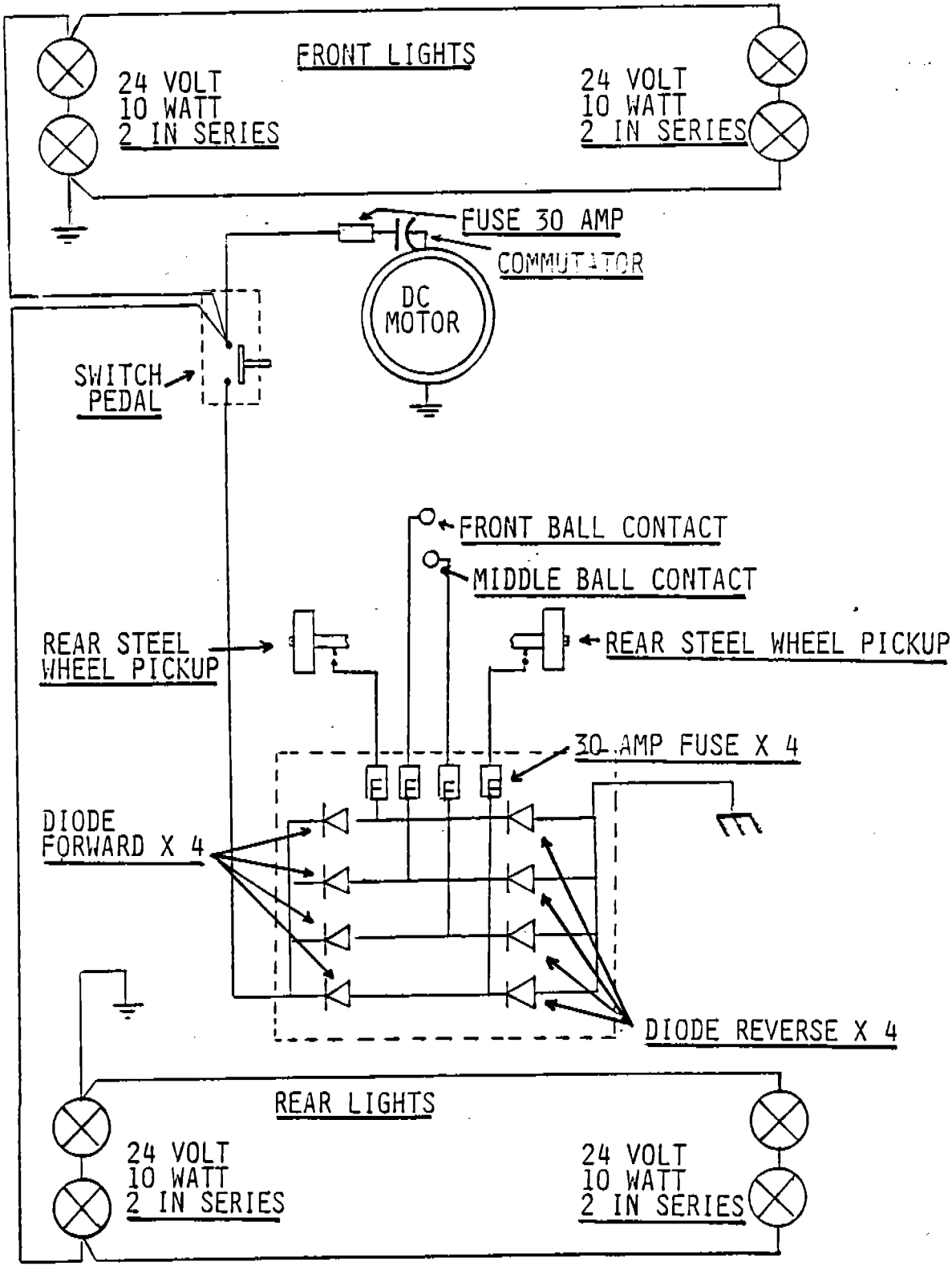
ELECTRICAL SCHEMATICS

STANDARD BUMPER CAR
WIRING SCHEMATIC



FLOOR PICK-UP BUMPER CAR
WIRING SCHEMATIC



PARTS INFORMATION

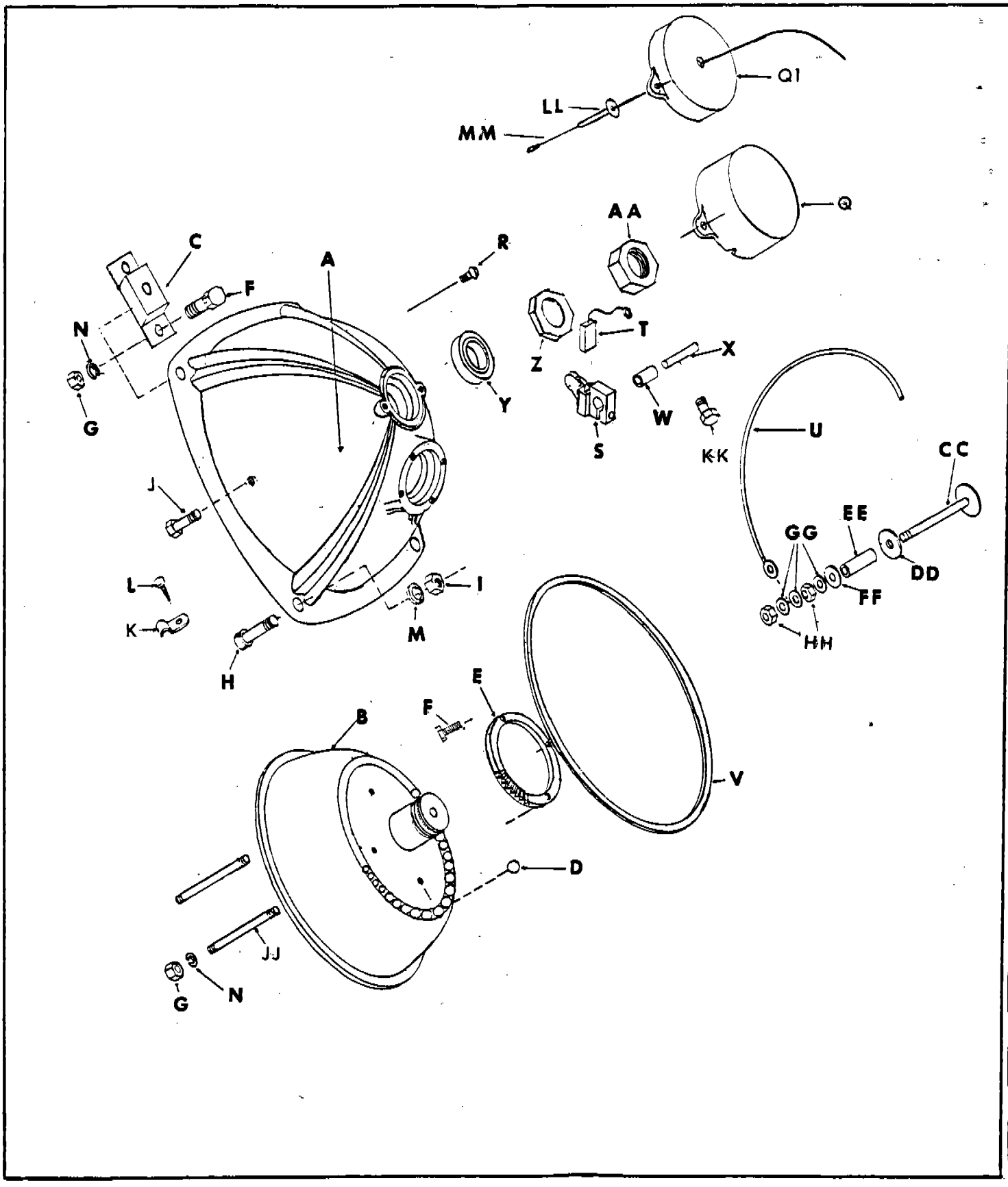


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PLATE 1 & 2
INNER - OUTER HOUSING

PLATE 1 - INNER AND OUTER HOUSING DETAILS

A	564-0101	Outer Housing	1
B	564-0102	Inner Housing (Includes 718-0220 studs)	1
C	910-0103	Mounting Block (Rubber)	4
D	402-0104	Ball Bearings (Set of 72)	1
E	566-0105	Steering Ring Gear	1
F	700-0107	Hex Bolt	8
G	702-0109	Hex Lock Nut (Use with 0107/0220)	12
H	700-0110	Allen Head Bolt (Mounts 0101 to 0103)	4
I	702-0111	Hex Lock Nut (Use with 0110)	4
J	700-1112	Hex Bolt, Grounding	1
K	726-0113	Wire Clamp (Holds 0205 in place)	2
L	716-0114	Drive-type Screw (Mounts 0113)	2
M	704-0115	Lock Washer (Use with 0110/0111)	4
N	704-0116	Lock Washer (Use with 0107/0109/0220)	12

PLATE 2 - COMMUTATOR DETAILS

P	112-0200	Commutator, Complete (Incl. 0201/0203/0204 0207/0208/0221)	1
	198-0200	Commutator Replacement Kit	1
Q	148-0201	Commutator Housing	1
Q1	148-1201	Commutator Cover (Plastic)	1
R	700-0202	Machine Screw (Use with 0201/0101)	2
S	112-0203	Single Brush Holder	1
T	112-0204	Carbon Brush With Wire	1
U	144-0205	Power Wire (Use with 0200/0212)	1
V	462-0206	Dust Shield	1
W	114-0207	Insulator Tube	1
X	722-0208	Rod Support	1
Y	404-0209	Bearing	1
Z	702-0210	Hex Nut	1
AA	702-0211	Jamb Nut	1
BB	112-0212	Contact Assembly, Complete (Incl. 0213/0214/ 0215/0216/0217/0218)	1
CC	110-0213	Commutator Bolt, Brasshead	1
DD	114-0214	Insulator Washer, Large	1
EE	114-0215	Insulator Tube	1
FF	114-0216	Insulator Washer, Small	1
GG	704-0217	Flat Washer	3
HH	702-0218	Hex Nut (Lock Nut 702-0219)	2
JJ	718-0220	Stud, Modified for Replacement (Use with 0102)	4
KK	700-0221	Hex Bolt (Use with 2010/0208)	1
LL	114-1201	Tube Insulator, Power Wire	1
MM	070-0714	Power Wire, 2 Feet	1

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PLATE 3
MOTOR DETAIL

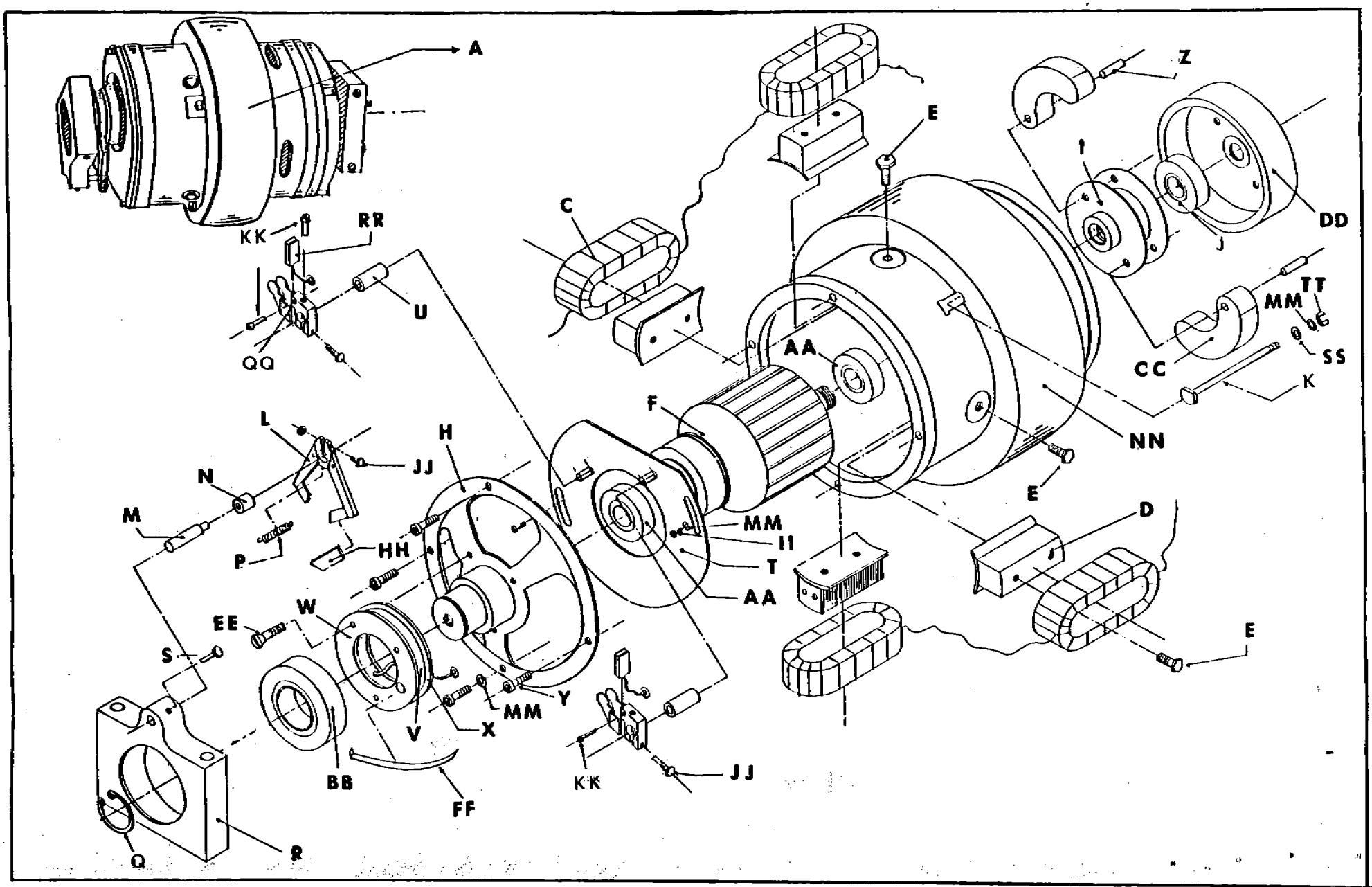

PLATE 3 - MOTOR DETAILS

A	102-0301	Drive Unit, Complete (Incl. 0350/0317/0423/0401)	1
	102-2301	Drive Unit - Floor Pick-up Model	1
C	108-0302	Field Coils (4 connected)	1
	108-2302	Field Coils - Floor Pick-up Model	1
D	106-0303	Laminated Block	4
E	700-0304	Hex Bolt (Use with 0303)	8
F	103-0307	Armature, 98 Volts	1
	103-2307	Armature, 48 Volts - Floor Pick-up Model	1
H	564-0308	Bell Housing	1
I	554-0309	Clutch Shoe Holder	1
J	402-0310	Bearing (Use with 0309)	1
K	700-0311	Wheel Bolt	4
L	112-0312	Double Brush Holder	1
M	722-0313	Stud (Use with 0312)	1
N	114-0314	Insulator	1
P	900-0315	Spring (Use with 0312)	2
Q	724-0316	Snap Ring, Expansion (Use with 0317)	1
R	822-0317	Motor Mounting Block (Use with 0308/0220/0102)	1
S	700-0318	Hex Bolt (Use with 0317/0313)	1
T	148-0319	Brush Plate Mounting	1
U	114-0320	Insulator (Use with 0319/0203)	2
V	110-0324	Commutator Ring	1
W	114-0325	Insulator, with 4 holes	1
X	114-0326	Insulator, with 3 holes	1
Y	700-0327	Allen Bolt	4
Z	714-0328	Clutch Shoe Retaining Pin (Use with 0309/0333)	2
AA	402-0330	Bearing, Sealed (Use with 0307)	2
BB	402-0331	Bearing, Sealed (Use with 0317/0308)	1
CC	554-0333	Clutch Shoe (Use pin 0328)	2
DD	552-0335	Flywheel, Clutch	1
	552-2335	Flywheel, Clutch (Finned) - Floor Pick-up Model	1
EE	700-0336	Machine Screw (For slip ring assembly)	3
FF	114-0337	Insulator (Used between 0326 and 0308)	1
GG	554-0338	Clutch Shoe Assy. (Incl. 1-0309/2-0328/2-0333)	1
HH	112-0339	Carbon Brush (Use with 0312)	2
II	700-0340	Machine Screw (For Brush Plate)	2
JJ	700-0341	Bolt (Use with 0203/0312)	3
KK	700-0342	Bolt (Use with 0203)	2
LL	702-0343	Nut	2
MM	704-0344	Lock Washer	2
NN	420-0350	Drive Wheel, Rubber	1
QQ	112-0203	Single Brush Holder	2
RR	112-0204	Carbon Brush with Wire (Use with 0203)	2
SS	704-0217	Flat Washer	4
TT	702-0218	Hex Nut	4
	182-0375	Motor Brush Kit (Incl. 2-0203/2-0204/1-0312/ 1-0314/2-0320/2-0339/1-0313)	1

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PLATE 4
TRANSMISSION DETAILS

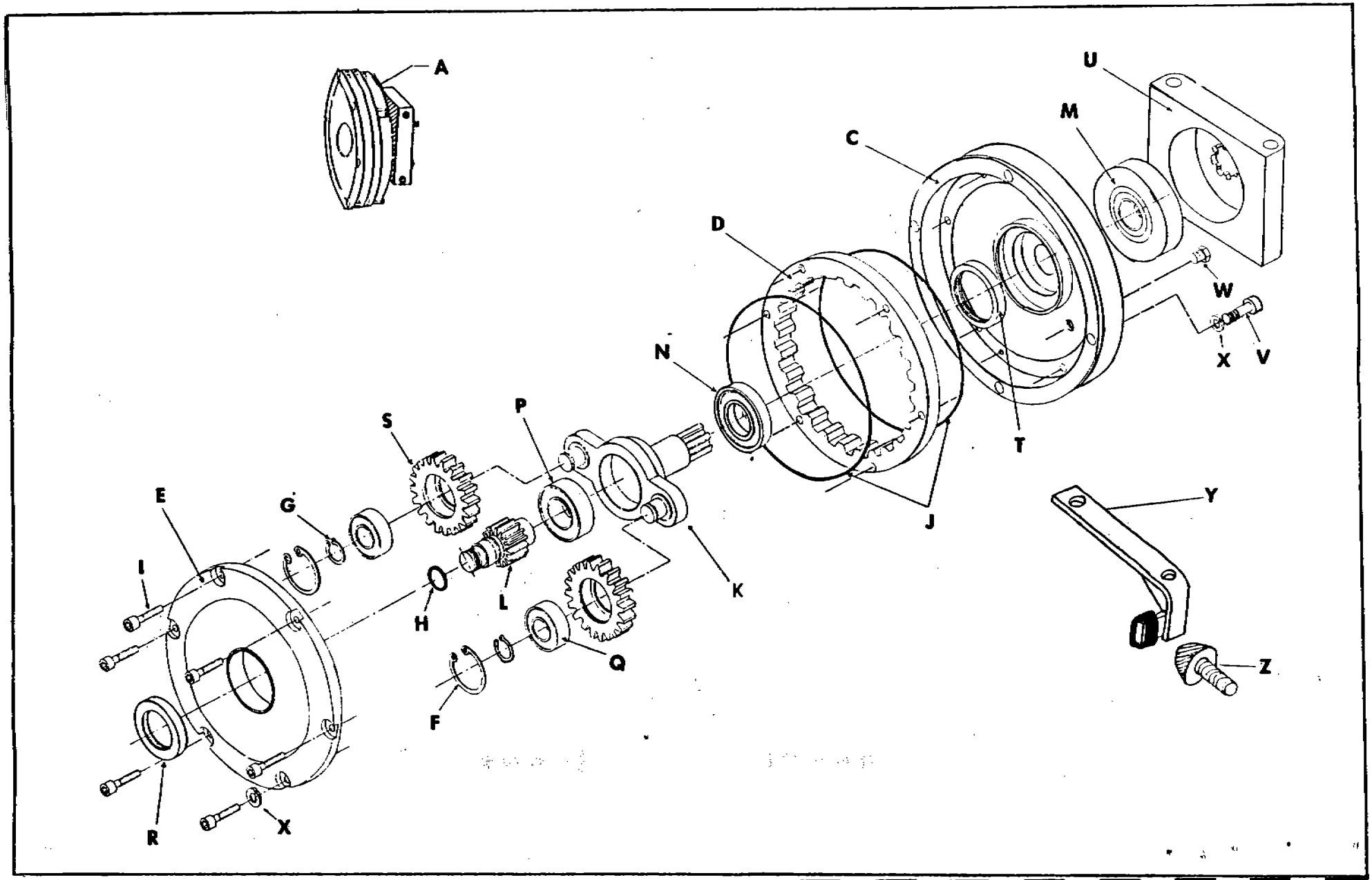

PLATE 4 - TRANSMISSION DETAILS

A	576-0401	Transmission Assy., Complete (Incl. 0335)	1
	458-0475	Seal Kit (Incl. 1-0410/2-0412/1-0420/1-0422)	1
C	582-0402	Transmission Case	1
D	566-0403	Ring Gear	1
E	582-0404	Transmission Cover	1
F	724-0408	Snap Ring, Expansion, Large (Use with 0421)	2
G	724-0409	Snap Ring, Compression, Small (Use with 0413)	2
H	456-0410	"O" Ring Seal, Small (Use with 0414)	1
I	700-0411	Allen Bolt (Use with 0402/0404)	6
J	456-0412	"O" Ring Seal, Large (Use with 0403/0404/0402)	2
K	566-0413	Mounting Gear (Use with 0421)	1
L	566-0414	Spur Gear	1
M	402-0331	Bearing, Sealed (Use with 0423)	1
N	402-0416	Bearing, Open (Use with 0413)	1
P	402-0417	Bearing, Sealed (Use with 0413/0414)	1
Q	402-0418	Bearing, Sealed (Use with 0421)	2
R	460-0420	Grease Seal, Small (Use with 0404)	1
S	566-0421	Intermediate Gear	2
T	460-0422	Grease Seal, Large (Use with 0402)	1
U	564-0423	Transmission End Block	1
V	700-0424	Allen Bolt	4
W	716-0425	Plug, Hex, Inspection (Use with 0402)	2
X	720-0460	Lock Washer (Use with 0424/0411)	10
Y	918-0390	Motor Stop Bracket with rubber	1
Z	918-0395	Rubber Bumper with Stud	2

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PLATE 5
STEERING DETAILS

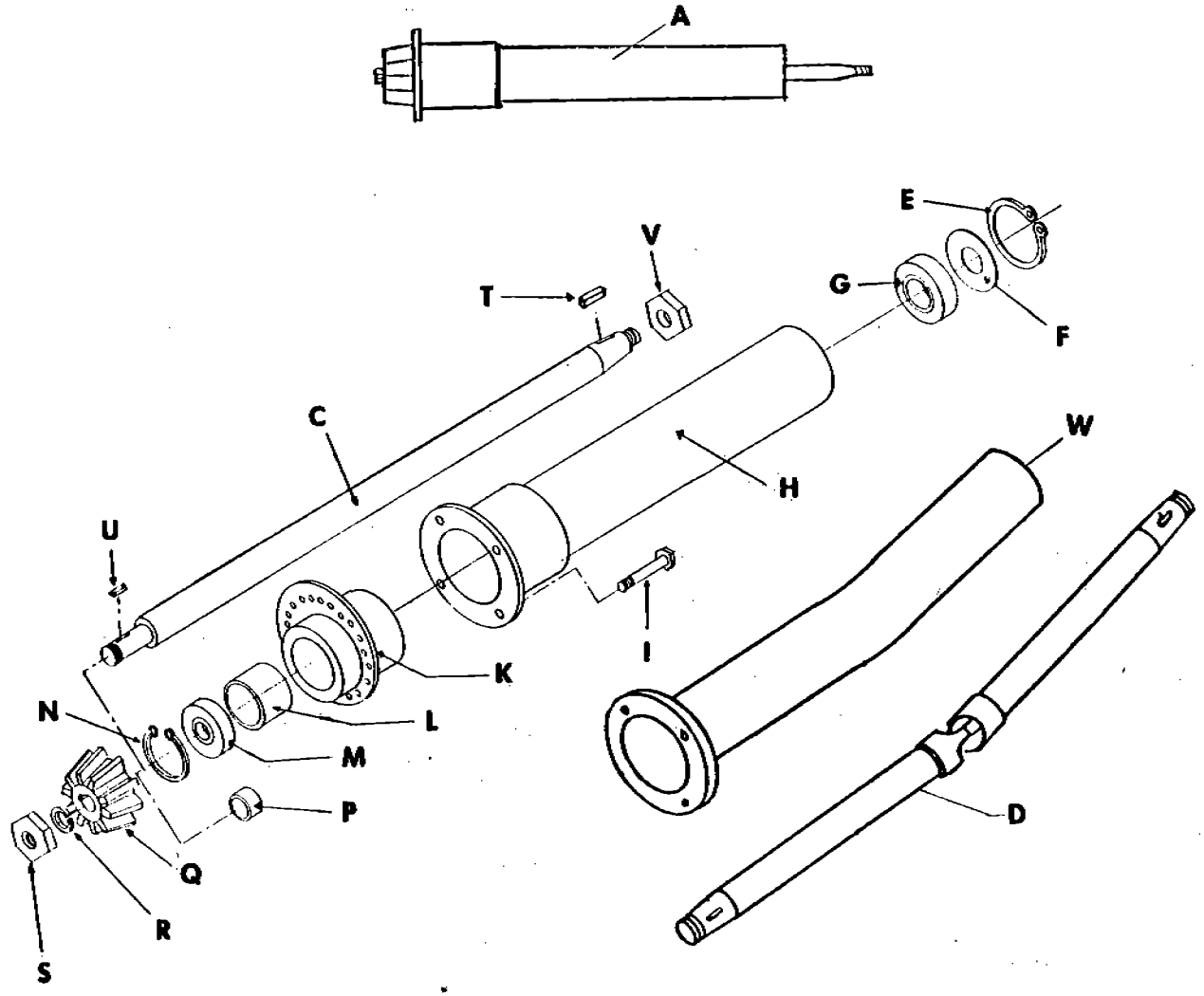

PLATE 5 - STEERING DETAILS

A	578-0501	Steering Column Assy., Complete and ready to attach to 564-0101 (less steering wheel)	1
B	578-0502	Steering Assembly Offset	1
C	584-0502	Steering Shaft - Long 20"	1
	584-0503	Steering Shaft - Short 17.25"	1
D	584-0504	Steering Shaft with Universal Joint	1
E	724-0503	Snap Ring, Expansion	1
F	462-0504	Dust Shield	1
G	402-0505	Bearing	1
H	584-0506	Steering Column Case	1
I	700-0507	Hex Bolt (Use with 5060/1010)	4
J	704-0116	Lock Washer	4
K	584-0508	Gear Adjuster	1
	584-0509	Gear Adjuster with Bearing Race	1
L	728-0509	Spacer Sleeve, Large	1
M	402-0510	Bearing, Sealed	1
N	724-0511	Snap Ring, Expansion	1
P	728-0512	Spacer Sleeve, Small	1
Q	566-0513	Bevel Gear	1
R	704-0514	Lock Washer	1
S	702-0515	Hex Nut	1
T	722-0516	Key, Upper	1
U	722-0517	Key, Lower	1
V	702-0518	Hex Nut, Steering Wheel	†
W	584-0507	Steering Column Case, Offset	1

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PLATE 6
REAR AXLE DETAILS

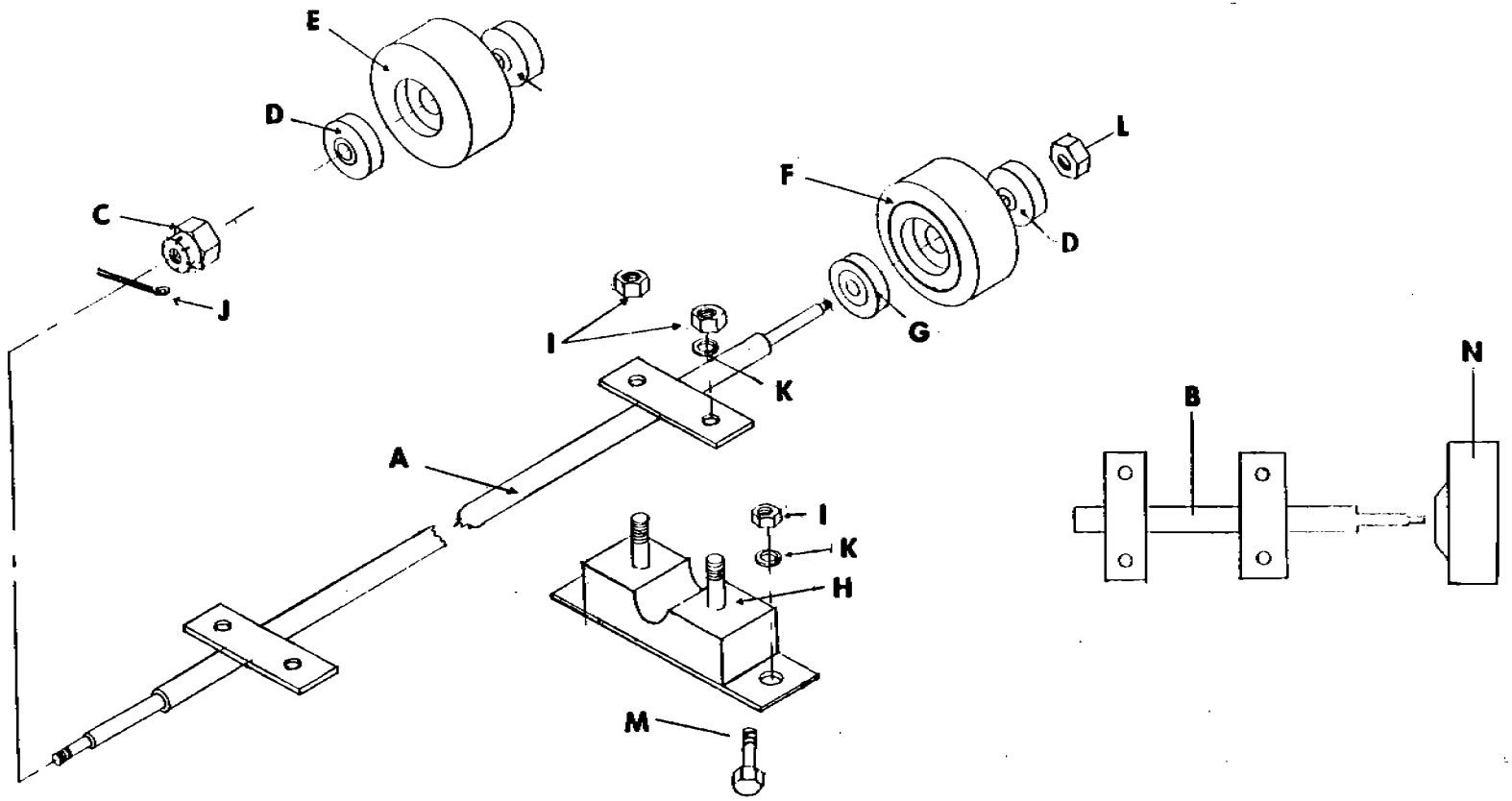

PLATE 6 - AXLE DETAILS

A	557-0601	Rear Axle (Cosmo, Comet, Gemini - 31" long)	1
	557-0602	Rear Axle (Mach 1-5 Wide Body-33" Long)	1
B	557-0604	Rear Axle - Floor Pick-up Model, Right or Left	1
C	702-0602	Castle Nut	2
D	402-0330	Bearing, Sealed	1
E	420-0605	Iron Rear Wheel, Standard	1
F	420-0606	Rubber Rear Wheel	1
G	402-0607	Bearing, Sealed	2
H	910-0609	Pillow Block	1
I	702-0109	Hex Nut (Use with 6090 to fasten to frame)	1
J	720-0611	Cotter Pin	2
K	704-0116	Lock Washer (Use with 6090/1090)	4
L	702-0603	Nylon Lock Nut	2
M	700-0107	Hex Bolt	4
N	420-0604	Rear Iron Wheel - 1-7/8" Wide, Floor Pick-Up	2

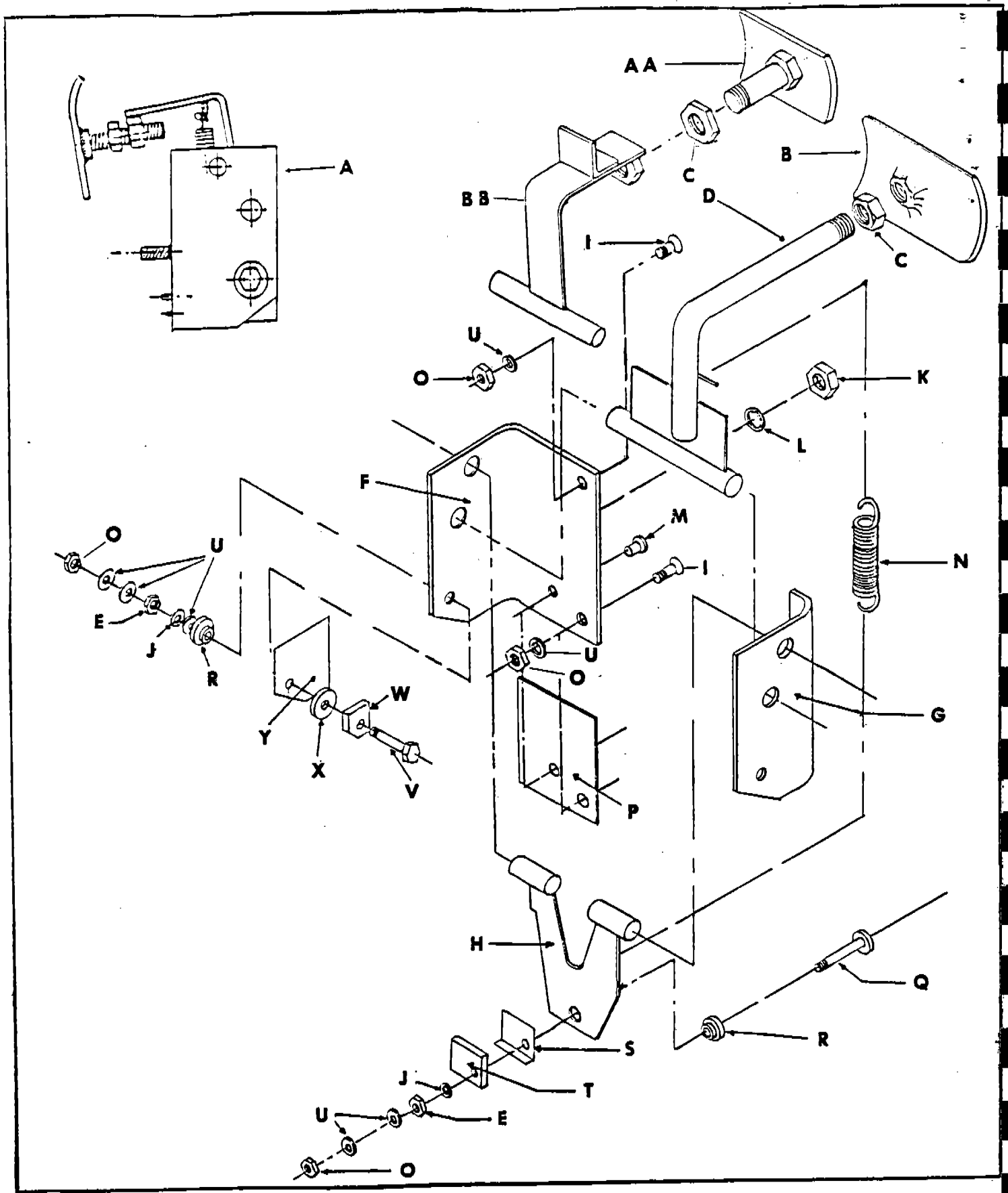

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PLATE 7
PEDAL DETAILS

PLATE 7 - SWITCH PEDAL DETAILS

A	130-0701	Switch Pedal, Complete	1
B	902-0703	Foot Pad	1
C	702-0705	Jamb Nut	1
D	916-0706	Hinge, Pedal	1
E	702-0218	Hex Nut	2
F	916-0707	Bracket, Large	1
G	916-0708	Bracket, Small	1
H	916-0709	Hinge, Switch	1
I	706-0711	Machine Screw	2
J	704-0344	Lock Washer	2
K	702-0109	Hex Lock Nut (Locks pedal to car floor)	1
L	704-0116	Lock Washer (Use with 1090)	1
M	918-0715	Rubber Bumper	1
N	900-0716	Extension Spring	1
O	702-0219	Hex Lock Nut	4
P	114-0717	Flat Insulator, with 2 Holes	1
Q	700-0718	Round Headed Bolt	1
R	114-0719	Fiber Insulator, with Shoulder	2
S	114-0720	Fiber Insulator	1
T	112-0721	Large Copper Block	1
U	704-0217	Flat Washer	7
V	700-0723	Hex Bolt	1
W	112-0724	Small Copper Block	1
X	716-0725	Fiber Washer	1
Y	114-0726	Insulator with Cut Corner	1
	182-0750	Pedal Rebuilding Kit (Incl. 5-0217/1-0716/ 1-0721/6-0218/1-0717/1-0723/4-0344/1-0718/ 1-0724/2-0711/2-0719/1-0725/1-0715/1-0720/ 1-0726)	1
AA	902-0704	Foot Pad with Stud	1
BB	916-0710	Hinge, Switch New Style	1

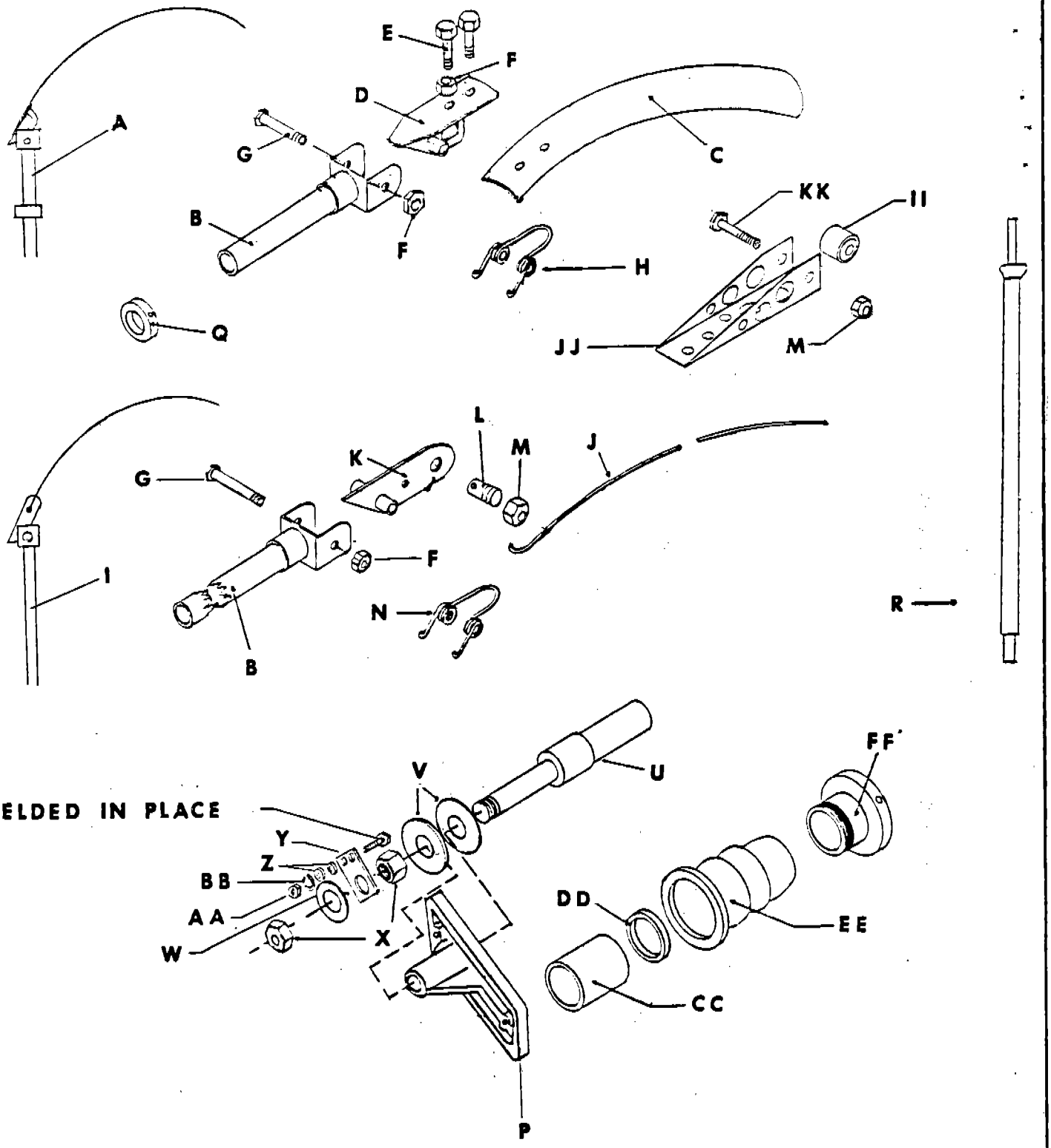

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PLATE 8
TROLLEY DETAILS

PLATE 8 - TROLLEY DETAILS

A	112-0800	Wide Wiper Blade Assembly, Complete (Incl. 0801/0802/0803/0804/0805/0806/0808/0830)	1
B	112-0801	Trolley Rod End (Use on all applications)	1
C	112-0802	Wide Wiper Blade	1
D	916-0803	Connecting Bracket	1
E	700-0804	Hex Bolt	2
F	700-0805	Hex Nut (Use with 0804/0806)	3
G	700-0806	Hex Bolt (Use with 0801)	1
H	900-0808	Trolley Spring (Use with 0803/0802)	1
I	112-0820	Wire Wiper Assembly, Complete (Incl. 0801/0806/0821/0823/0830/0822/0827/0109)	1
J	112-0821	Wire Wiper	1
K	916-0822	Connecting Bracket (For wire wiper)	1
L	700-0823	Headless Bolt	1
M	702-0109	Hex Nut (Use with 0823)	1
N	900-0827	Trolley Spring (For wire wiper only)	1
P	114-0829	Insulator Block (Use with 0851) Plastic	1
Q	414-0830	Set Collar (Use with 0801)	1
R	112-0840	Trolley Pole, Complete	1
T	150-0850	Trolley Rod Joint, Complete Assembly (Incl. 0851/0855/0705/0857/0860)	1
U	150-0851	Trolley Rod Joint	1
V	710-0855	Flat Washer	2
W	710-0857	Flat Washer	1
X	702-0705	Hex Nut (Use with 0851)	2
Y	142-0860	Washer, with Electric Stud Terminal	1
Z	704-0217	Flat Washer	2
AA	702-0218	Hex Nut	1
BB	704-0344	Lock Washer	1
CC	716-0875	Compression Sleeve, Rubber	1
DD	728-0876	Compression Ring	1
EE	624-0877	Rubber Flange	1
FF	716-0878	Rail Fitting (All Cars)	1
GG	700-0806	Hex Bolt (Holds 0829 to car)	1
HH	112-0890	Aluminum Roller Wheel Assembly (Incl. 0891/0892/0893/0109)	1
II	420-0891	Aluminum Wheel	1
JJ	916-0892	Roller Wheel Bracket	1
KK	716-0893	Roller Wheel Bolt	1

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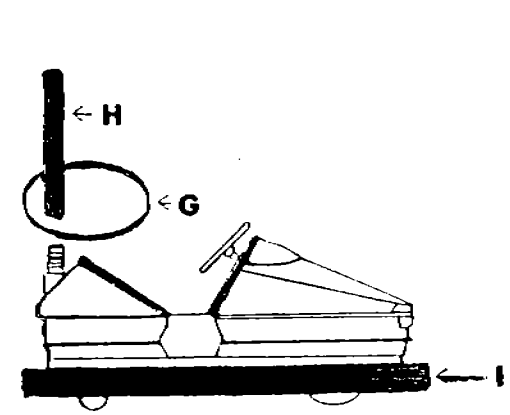
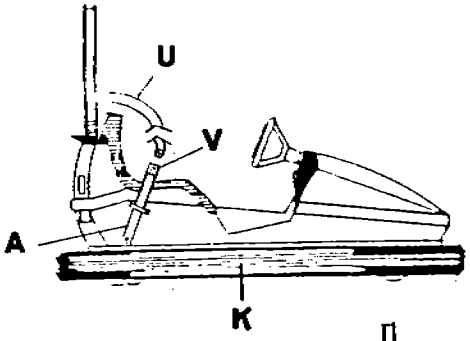
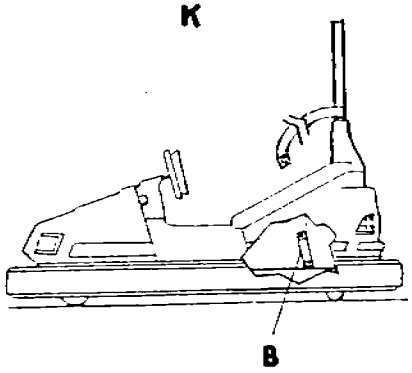
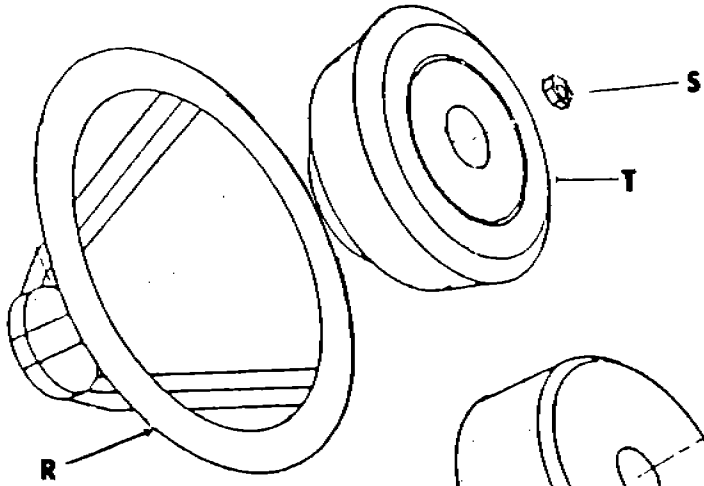
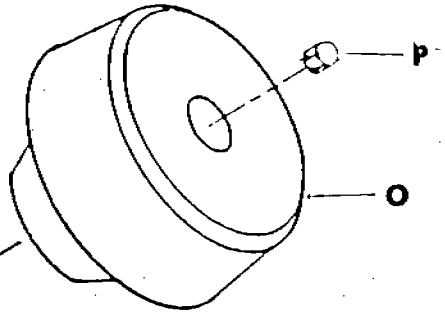
PLATE 9
SAFETY EQUIPMENT

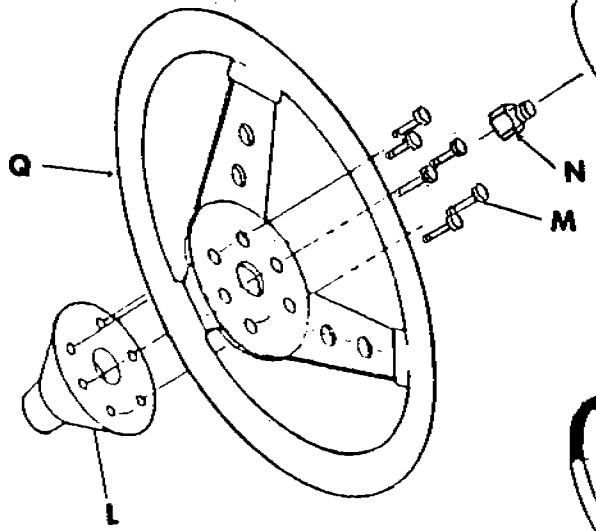












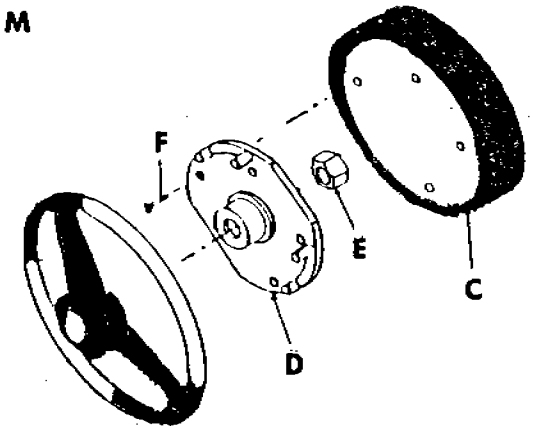


PLATE 9 - SAFETY EQUIPMENT

A	620-0896	Seat Belt Attachment Kit, Upholstered Seat	1
B	620-0887	Seat Belt Attachment Kit, Formed Seat	1
C	618-0902	Steering Wheel Pad (Only)	1
D	584-0903	Mounting Bracket (For steering wheel pad 0902)	1
E	716-0904	Nut, Special (For steering wheel mounting bracket 0903)	1
F	700-0905	Machine Screws (For mounting 0902 to 0903)	4
G	620-0906	Seat Belt, Loop Style	2
H	618-0908	Pole Cushion	1
I	560-0910	Bumper Tire - Standard	1
J	560-0911	Bumper Tire - Dune Buggy	1
K	562-0912	Bumper Tube (All types)	1
L	584-0520	Adapter Flange for 580-0551	1
M	700-0521	Screws for Attaching Adapter	6
N	700-0522	Adapter Bolt for Attaching Cushion	1
O	618-0526	Steering Wheel Cushion, 6"	1
P	702-0526	Acorn Nut	1
Q	580-0551	Steering Wheel, 3 Chrome Spokes	1
R	580-0527	Steering Wheel, Mach 5	1
S	702-0603	Steering Wheel Nut, Mach 5	1
T	618-0527	Steering Wheel Cushion, Mach 5	1
U	620-0897	Flip Latch Seat Belt, 2 Sewn Together	1
V	620-0898	Seat Buckle	2

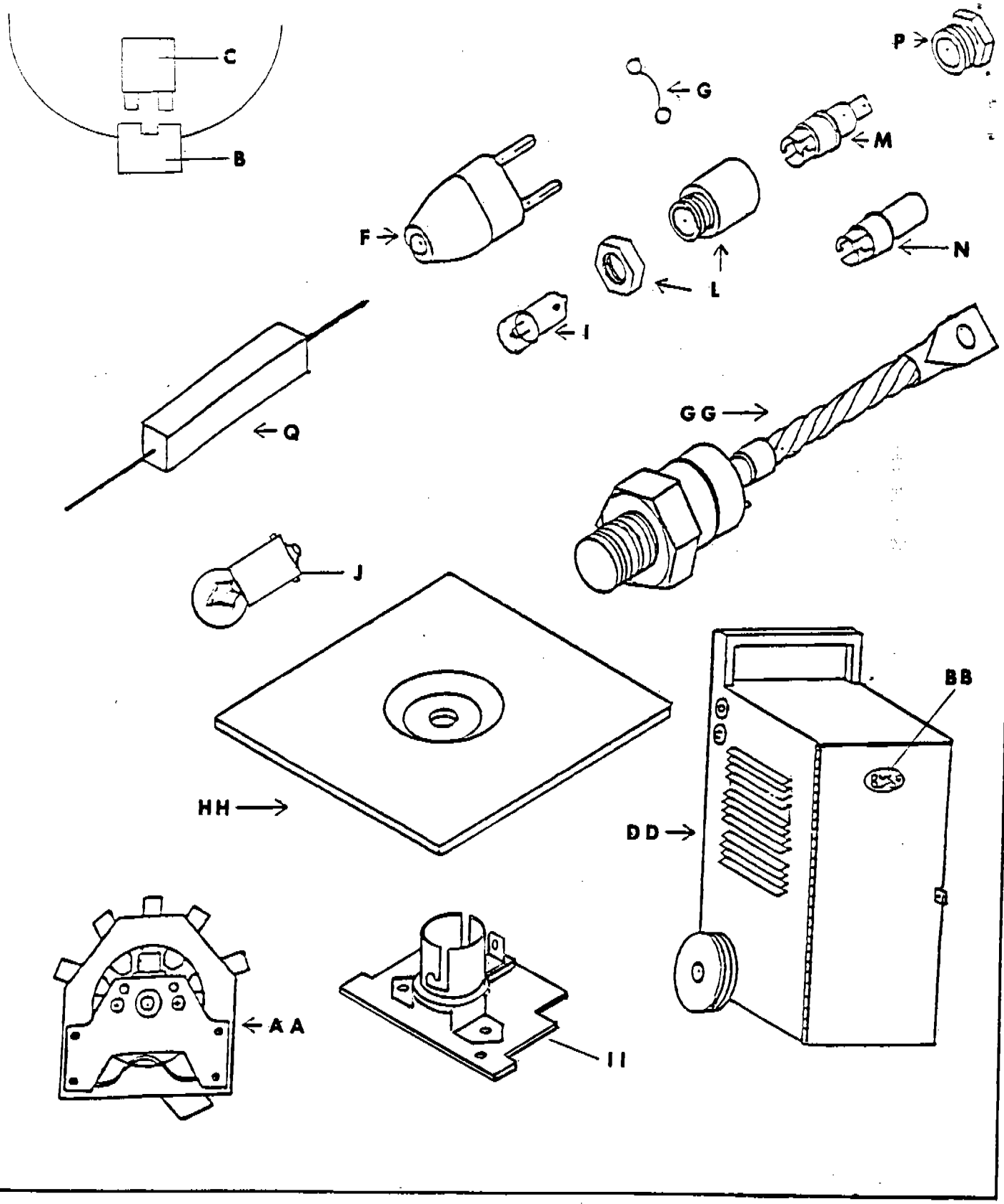


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PLATE 10
ACCESSORIES

PLATE 10 - ACCESSORIES

A	624-0915	Talc for lubricating bumper tires (25 lb. drum)	
B	124-0916	New Fuse Holder for New Cars	1
C	124-0917	New Fuse	1
D	124-0918	New Fuse Holder Assembly (Incl. 0916/0917)	1
F	124-0920	Fuse, Complete (For lights)	1
G	144-0921	Fuse, Wire (for 0920)	1
I	*162-0923	Light Bulb (12 volt, 3 watt)	8
J	*162-0924	Light Bulb (24 volt)	4
M	166-0928	Bulb Holder, tab type	4
N	166-0929	Bulb Holder, pin socket type	4
P	702-0929	Locking Nut (for light socket)	1
Q	174-0930	Resistor (for lights on Cosmo and Mach 1)	1
AA	130-0940	Selector Switch (for all types converter)	1
BB	624-0941	Oval Emblem - "Duce, Mark of Excellence"	1
DD	104-0943	Converter - 20 kva, Complete (220 volt AC, Single-phase 70-110 volt DC)	1
GG	174-0950	Diode for Duce Converter (all sizes) incl. nut/washer)	1
HH	156-0951	Heat Sync Plate for Converter (all sizes)	1
II	166-1965	Bayonet Type Light Socket	

* If other type of bulb is required, please specify when ordering.

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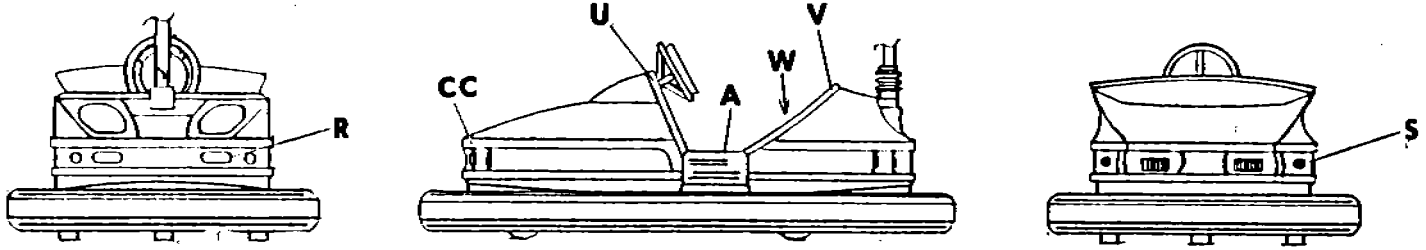
PLATE 11
CAR BODY ACCESSORIES BY MODEL

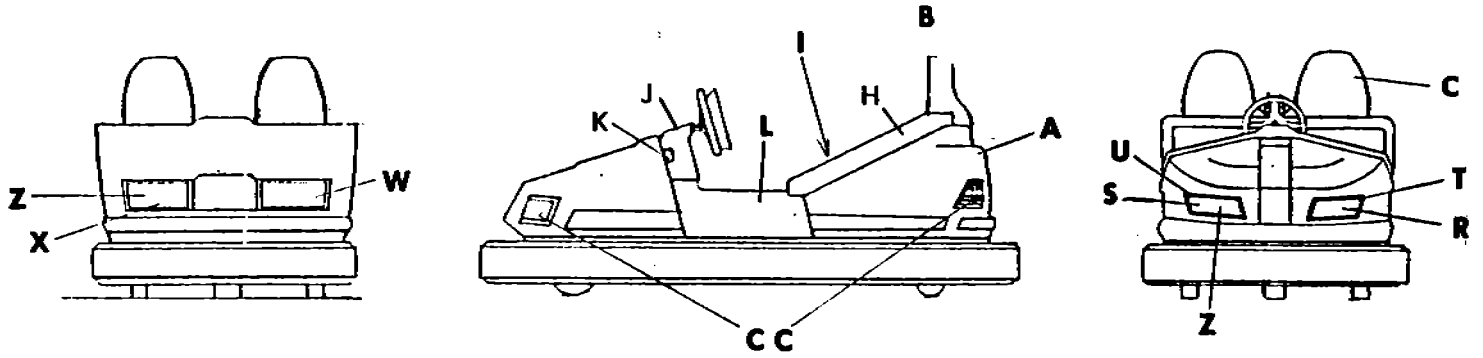
COMET

SEE PAGE 39



GEMINI

SEE PAGE 40



MACH 5

SEE PAGE 41

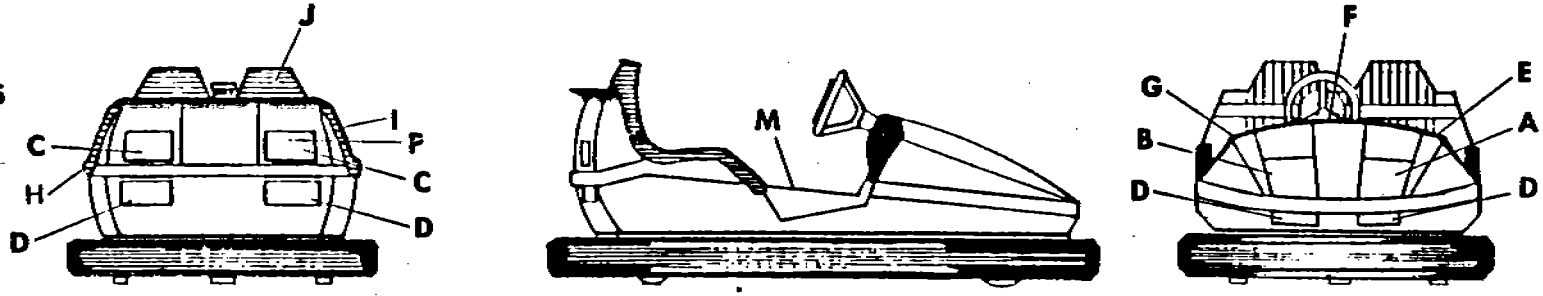


PLATE 11 - CAR BODY ACCESSORIES BY MODEL

	COSMO	**NOT PICTURED**	
A	164-0954	Head Light Assembly	2
B	702-0954	Nut - (for attaching light assembly to car body)	4
C	610-0955	Headlight Lens	2
D	700-0955	Screw (for attaching light lens to light frame)	4
E	164-0956	Tail Light Assembly (use two 0954 nuts)	2
F	610-0957	Tail Light Lens (Use two 0955 screws)	2
G	610-0960	Windshield, Non-transparent fiberglass	1
I	614-0965	Dash Pad	1
J	614-0966	Seat Back	1
K	614-0967	Seat Bottom	1
L	708-0969	Nut (for body tie down)	2
M	164-0971	Marker Light, Front (Clear/Round)	2
N	164-0972	Marker Light, Back (Red/Round)	2
Q	624-0942	Emblem - "Duce, Made in Italy"	1
	COMET		
R	612-0961	Reflector, Oblong (Specify red or amber)	4
S	612-0962	Reflector, Round (Specify red or amber)	4
T		Screw (for reflector)	16
U	614-0965	Dash Pad	1
V	614-0966	Seat Back	1
W	614-0967	Seat Bottom	1
Y	708-0969	Nut (For Body tie down and seats)	6
Z*	626-0977	Kick Plate, Right	1
AA*	626-0978	Kick Plate, Left	1
BB	624-0979	Vinyl Insert for Trim (per foot)	
CC	608-0980	Aluminum Trim (per foot)	
DD	714-0981	Rivets for Aluminum Trim	
EE	624-0941	Emblem - "Duce, Mark of Excellence"	1
	MACH 1	**NOT PICTURED**	
FF	164-0956	Tail Light Assembly (use two 0954 nuts)	2
GG	610-0957	Tail Light Lens (use two 0955 screws)	2
HH	164-0958	Head Light Assembly	2
II	610-0959	Head Light Lens	2
KK	614-0964	Dash Pad	1
LL	614-0966	Seat Back	1
MM	614-0967	Seat Bottom	1
NN	708-0969	Nut (for body tie down)	2
PP	624-0975	Numbers, Chrome	1
RR	624-0942	Emblem, "Duce, Made in Italy"	1

* As viewed from REAR of car.

CONTINUATION OF PLATE 11 - CAR BODY ACCESSORIES BY MODEL

	GEMINI		
A	608-1903	Body w/Headrest-Metal Flake (Incl. lights, seat, dash)	1
B	608-1909	Chrome Trim for Headrest (specify length)	
C	618-1910	Headrest Pad	
E	712-1912	Screw (6 req/headrest, 4 req/dash pad, 18 req/ rear lens)	28
F	716-1913	Washer, Finish (Use w/1912)(6 req/headrest, 18 req/rear lens)	
H	614-1931	Seat Back	1
I	614-1932	Seat Bottom	1
J	614-1933	Dash Pad	1
K	716-1934	Black Finish Washers	4
L*	626-1940	Kickplate, Left	1
M*	626-1941	Kickplate, Right	1
N	714-1942	Rivets, Large Head (for kickplate)	4
P	710-1943	Back-Up Washers, Large (for kickplate)	8
Q	714-1944	Rivets, Small Head (4 req/kickplate, 16 req/ light socket)	
R**	610-1950	Lens, Right Front (Clear)	1
S**	610-1951	Lens, Left Front (Clear)	1
T**	626-1952	Trim, Right Front (Black)	1
U**	626-1953	Trim, Left Front (Black)	1
V	706-1954	Screw, Black (For Front Lens)	6
W*	610-1955	Lens, Right Rear (Red)	1
X*	626-1955	Lens, Left Rear (Red)	1
Y	618-1958	Cushion, Tail Light (Per Rear Lens)	
Z	166-1959	Light Socket	4
AA	916-1960	Bracket (for light socket)	4
CC	162-1962	Light Bulb	4
DD	624-1970	Emblem	1
EE	624-1976	Numbers, Black (3" x 1-1/2")	1

* As viewed from REAR of car
** As viewed from FRONT of car

CONTINUATION OF PLATE 11 - CAR BODY ACCESSORIES BY MODEL

	Mach 5	
A*	610-1968	Right Front Head Light Lens, Clear
B*	610-1969	Left Front Head Light Lens, Clear
C	610-1967	Rear Tail Light Lens, Red
D	610-1966	Front and Rear Turn Signal Lens, Amber
E**	626-1953	Left Dash Trim, Black Plastic
F	626-1954	Center Dash Trim, Black Plastic
G**	626-1952	Right Dash Trim, Black Plastic
H**	614-1900	Seat Bottom, Formed, Left Side
I**	614-1901	Seat Bottom, Formed, Right Side
J	618-1900	Seat Headrest, Formed
K	624-1900	Stainless Trim between Headrest
L**	616-1900	Stainless Kickplate, Left
M**	616-1901	Stainless Kickplate, Right
N**	616-1902	Stainless Dash Trim, Left
O**	616-1903	Stainless Dash Trim, Right
P	162-0925	Bulb, 24v 10w

* As viewed from FRONT of car
** As viewed from REAR of car

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PLATE 12
SCOOTER CAR TOOLS

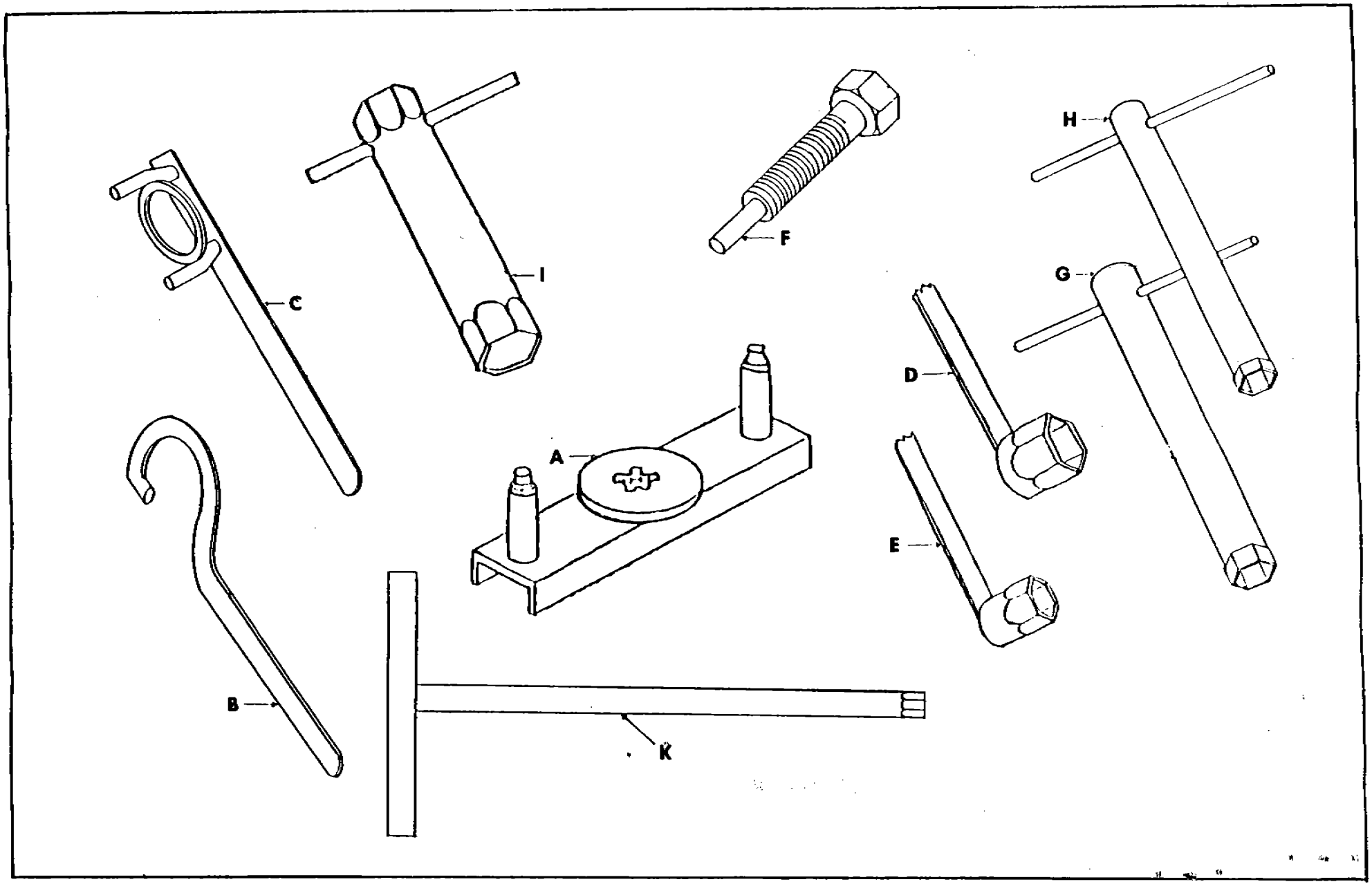

PLATE 12 - SPECIAL SCOOTER CAR TOOLS

A	930-1001	Transmission Mount (Holds transmission for removal of #0335 clutch flywheel)	1
B	930-1002	Spanner Wrench (tightens #0878 rail fitting)	1
C	930-1003	Spanner Wrench (for removal of #0335 clutch flywheel)	1
D	930-1004	Socket Wrench (for #0210 nut to separate 0101 from 0102)	1
E	930-1005	Socket Wrench (for removing #0211 locking nut)	1
F	930-1006	Bolt, reduced shank (for removal of #0308 motor end plate)	1
G	930-1007	Tee Wrench (for use with 0304/0425/0507/0805/0806) 13 mm	1
H	930-1008	Tee Wrench - 17 mm	1
I	930-1018	Socket Wrench (for use with #0904 nut)	1
J	930-1025	Tool Kit, Complete (includes all above tools)	1

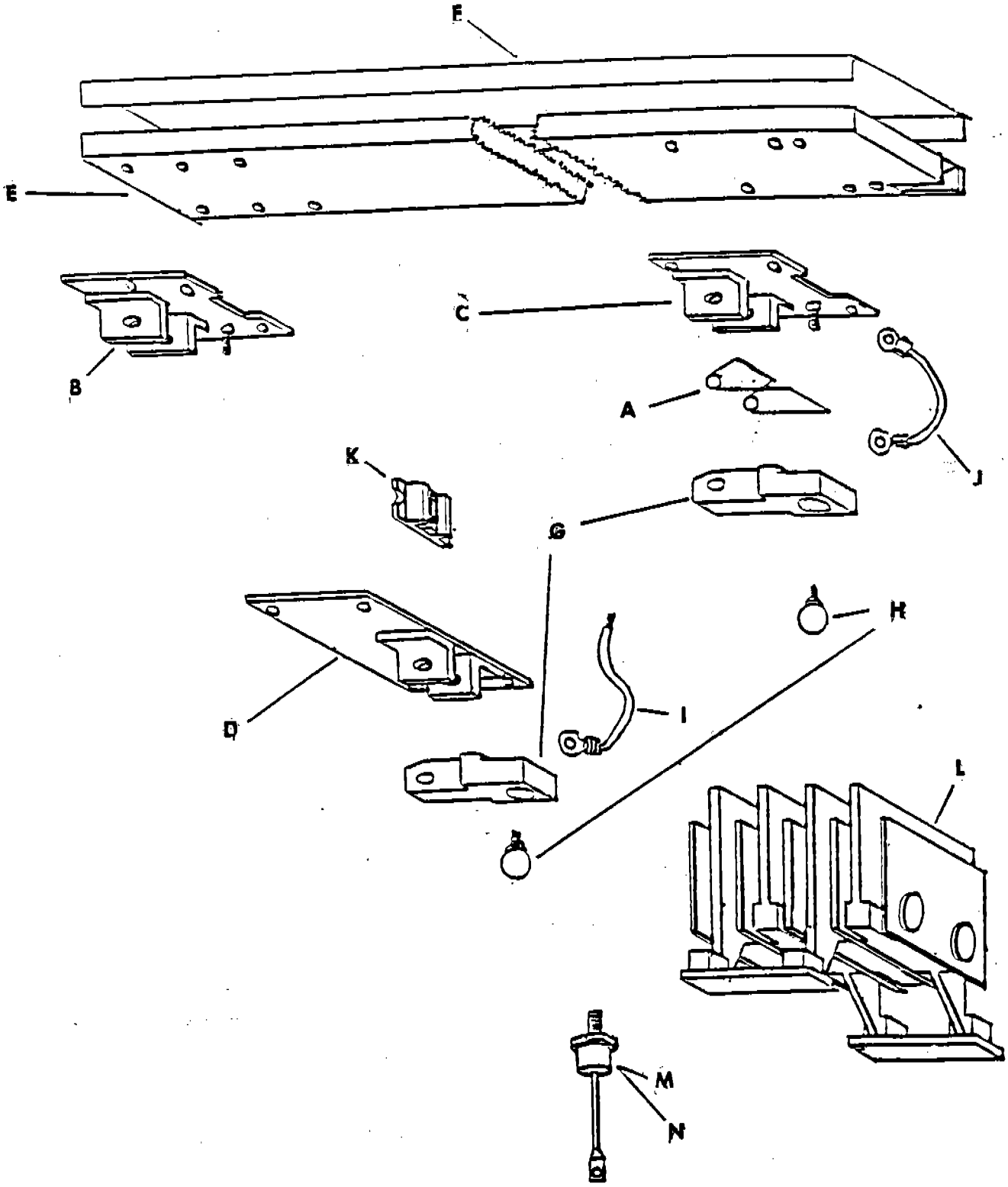

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PLATE 13
FLOOR PICK-UP PARTS

PLATE 13 - ADDITIONAL PARTS FOR FLOOR PICK-UP CARS

A	900-2775	Spring for Floor Contact Brush	4
B	916-2777	Bracket for Floor Contact Brush (Front)	1
C	916-2778	Bracket for Floor Contact Brush (Center Rear)	1
D	916-2779	Bracket for Floor Contact Brush (Rear Right and Left)	2
E	114-2778	Insulator Board	1
F		Insulator Material	1
	112-2784	Polyurethane Floor Contact Brush, Complete	4
G	112-2785	Polyurethane Floor Contact, Holder Only	4
H	112-2786	Steel Contact Ball	4
I	144-2788	Jumper Wire, 1 Terminal	2
J	144-2789	Jumper Wire, 2 Terminal	2
K	124-2792	Fuse Holder	1
	124-2793	Fuse for 2792	1
L	156-2951	Heat Sync for Rectifiers (Sold Complete Only)	1
M	174-2952	Diode - Standard	4
N	174-2953	Diode - Reverse "R"	4

RECOMMENDED LIST OF SPARE PARTS FOR 12 BUMPER CARS

5	182-0750	Pedal Rebuilding Kit
2	112-0800	Wide Wiper Blade Assembly, Complete
6	112-0802	Wide Wiper Blade
2	916-0803	Connecting Bracket
2	700-0806	Pivot Bolt
2	700-0805	Hex Bolt
14	900-0808	Trolley Spring
1	414-0830	Set Collar
2	174-0950	Diode for Duce Converter
1	930-1002	Spanner Wrench
1	930-1018	Socket Wrench
3	182-0375	Motor Brush Kit
4	702-0109	Hex Nut
2	402-0330	Bearing
5	124-0922	Fuse

RECOMMENDED LIST OF SPARE PARTS FOR 12 FLOOR PICK-UP CARS

5	182-0750	Pedal Rebuilding Kit
1	930-1018	Socket Wrench
3	182-0375	Motor Brush Kit
4	702-0109	Hex Nut
2	402-0330	Bearing
10	900-2775	Spring for floor contact
4	112-2784	Polyurethane Pick-Up, complete
10	112-2786	Steel Contact Ball
5	144-2788	Jumper wire, 1 terminal
5	144-2789	Jumper wire, 2 terminal
5	124-2793	Fuse
4	174-2952	Diode - Standard
4	174-2953	Diode - Reverse

PLATE 9
SAFETY EQUIPMENT

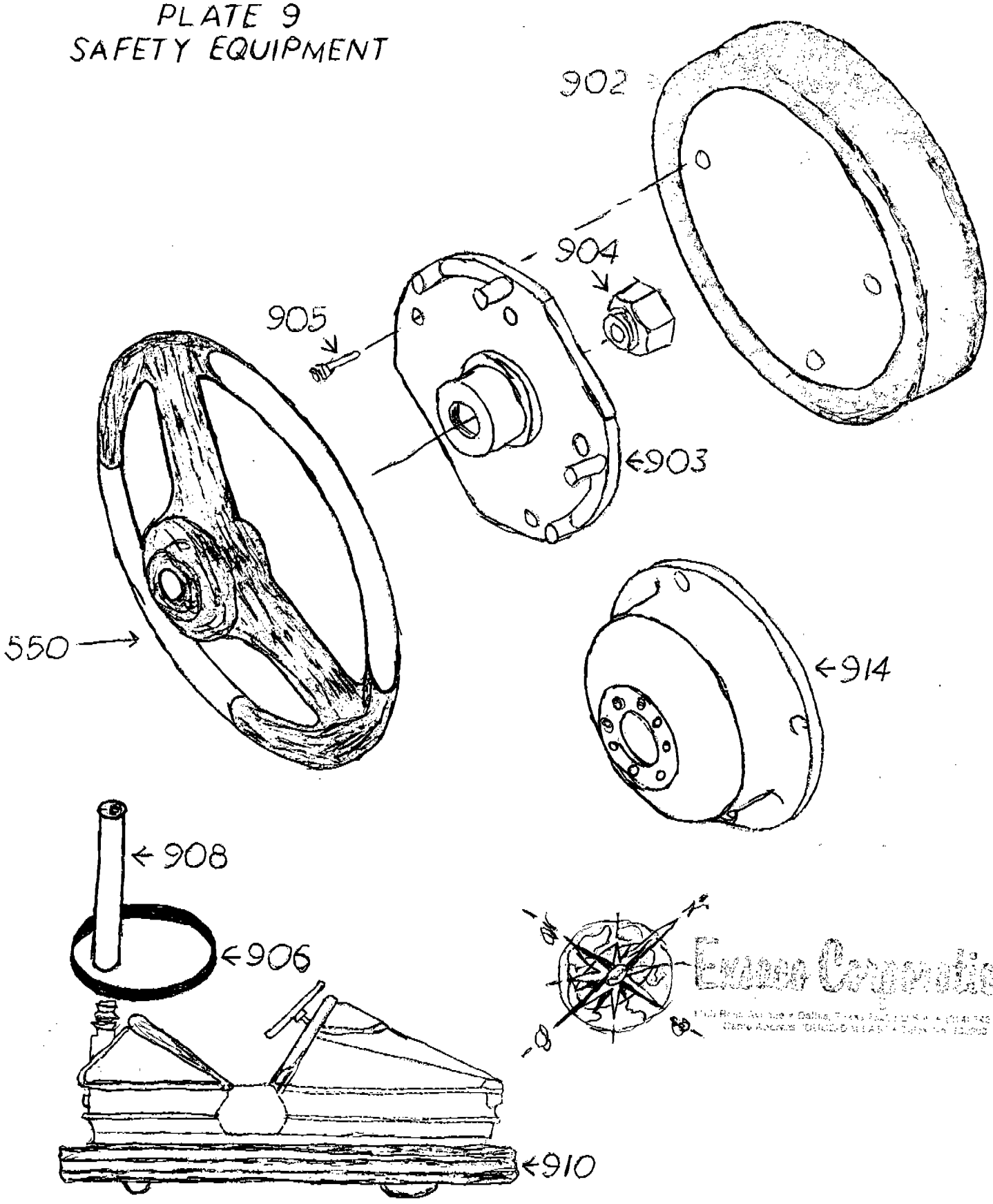


PLATE 9 - SAFETY EQUIPMENT

PART NO.	DESCRIPTION	NO. PCS. PER ASSY.
900	Safety Kit, complete (incl. 902, 903, 904, 4-905, 906, 908 (a 1018 wrench is needed per order)	1
901	Steering Wheel Cushion Kit (incl. 902, 903, 904, 4-905, (a 1018 wrench is needed per order)	1
902	Steering Wheel Pad (only)	1
903	Mounting Bracket (for steering wheel pad 902)	1
904	Nut, special (for steering wheel mounting bracket 903)	1
905	Machine Screws (for mounting 902 to 903)	4
906	Seat Belt - Mach 1, Cosmo, Comet	2
908	Pole Cushion	1
910	Bumper Tire - Mach 1, Cosmo, Comet	1
911	Bumper Tire - Dune Buggy	1
912	Bumper Tube (all types)	1
914	Mounting Bracket (fiber glass) for cushions on old-type 3-spoke steering wheel	1
550	Steering Wheel	1

[illegible] Corporation

B. Pedal assembly - This unit is purposely designed to [illegible] the switch [illegible] arcing to a minimum.

1. Copper blocks (7??) and [illegible] electrical contact points. The life of these blocks can be extended by occasionally smoothing the contact surfaces with a file. It is best to file these while out of the pedal assembly.

2. Keep bolt (713) and nut (218) and bolt (723) and nut (218) tight. A loose connection at these points puts undue strain on the fiber washer (719) causing arcing and failure. In some situations, it is advisable to use two insulators (720) if arcing occurs at this point.

C. Lights - All lights are wired in a series so that rugged 12 or 24 volt bulbs can be used; and if one burns out all fail. There is a fuse in front and under the seat on the older cars. The later cars may have an American-made "in-line" fuse. The European fuse can be obtained at any auto parts house.

5. Tire pressure should be checked regularly and kept at 16 lbs. per square inch. Low pressure allows car bodies and trim to come in contact when two cars meet. Slight nicks in the front trim are a sure sign of low tire pressure. Over-inflation may cause severe bouncing between cars and possible injuries to patrons.

6. Rear steel wheel must be kept clean to make a good electrical contact or the cars will slow down. Clean the wheel with a wire brush only.

7. As the wheels (front and rear) wear, it is possible for them to reach a point where the bumper tire drags on the floor. Letting the wheels wear to this point is false economy as the bumper tires are expensive. A temporary fix while awaiting the arrival of new wheel is to place 4 or 5 washers between parts No. 102 and 317 and 473 on each stud (320). The effect is to raise the car 1/4 to 1/2" higher from the floor.

8. Lubricate the bumper tires. We recommend the use of talc as a lubricant to be applied to the side of the tires and the inner rail surfaces of the building. Its use provides a glancing blow upon impact, giving freer and accelerated movement of the cars. Make a paste with water and apply freely. New compounds of silicone work extremely well also.

9. Blow the motor cap out with compressed air each week. This is probably the single, most important maintenance point one can have. Dust builds up causing heat and gets into moving parts -- this can cause brushes to arc to the motor housing.

10. Contact between the ceiling and the car trolley assembly - one of the most frequent trouble spots. The car not only moves in its steered direction, but during a severe bump with the rail or another car, the

pole whips in any one of several directions. [illegible] result is a possibility of the blade being forced in a new direction [illegible] to turn in the socket. Thus it is very important to have the trolley rod end [illegible] turn freely in the trolley pole (840). Keep this part lubricated with vasoline or a similar product.

On certain ceilings, it is possible for the blade (802) to be forced backwards into the joint between the ceiling plates or between the [illegible] and [illegible]. Blades can break in this type of action and become flying missiles. Keep the ceiling plates tight so no spaces appear between them.

Set collars (830) may be used to adjust the contact between the ceiling and blade (802).

Keep the fitting rail (878) tight enough so that the trolley pole does not swivel.

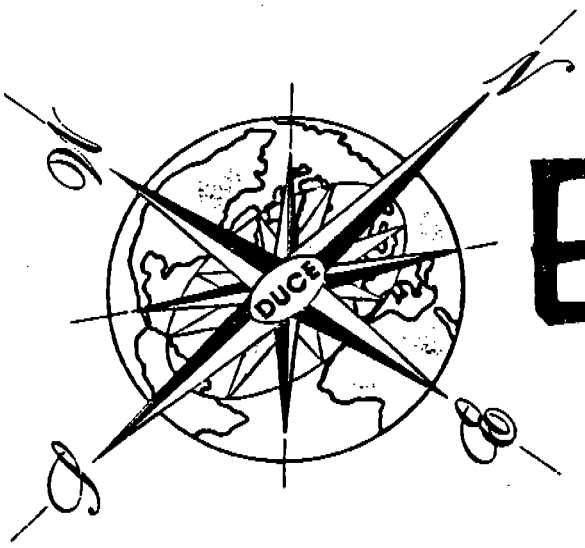
11. The in-line fuse protection for the motor in the nose of the car is located near the outer housing. This requires a 15-16 amp fuse.

12. DAILY VISUAL INSPECTION AND COMMON SENSE ARE THE MOST IMPORTANT ITEMS IN PREVENTIVE MAINTENANCE!

FLOOR PICK UP CARS

The Floor-Pickup type bumper car has basically the same type chasis and drive unit so all previous mentioned maintenance information applies.

Extra care must be taken to keep under side of car clean and dust free to help protect the rectifier. In addition, floor contact brushes should be kept lubricated and free moving.



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OPERATIONAL SPECIFICATIONS

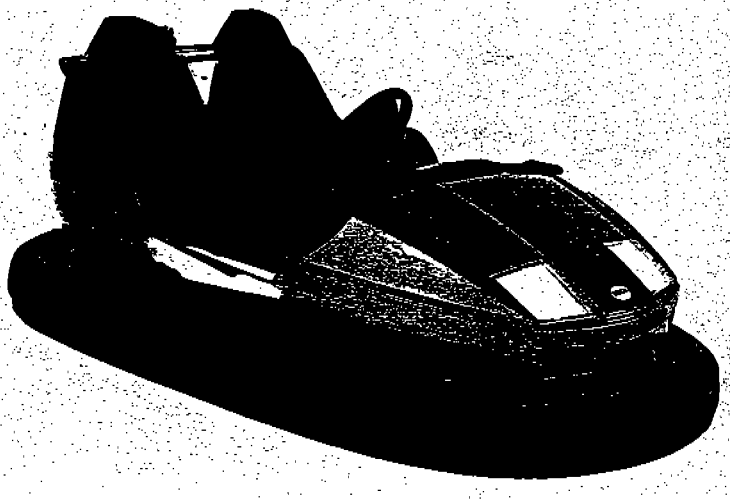
FOR EUROPEAN AMUSEMENT RIDES

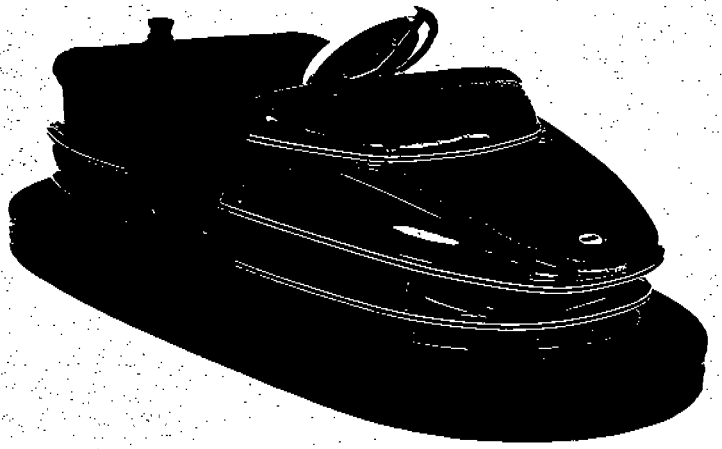
Exsaco Corporation

"The Reliable Source"

GEMINI

MACH V





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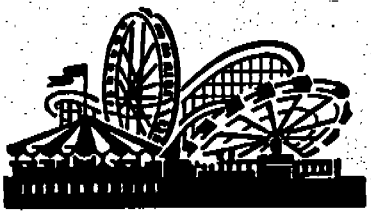

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BUMPER CAR SPECIFICATIONS

CAPACITY: 2 Passengers.

DRIVE: D.C. Motor—Rotating field with transmission and centrifugal clutch.

SPEED: 8.2 Feet per second.

LIGHTING: Rear and front lights. Comet has no lights.

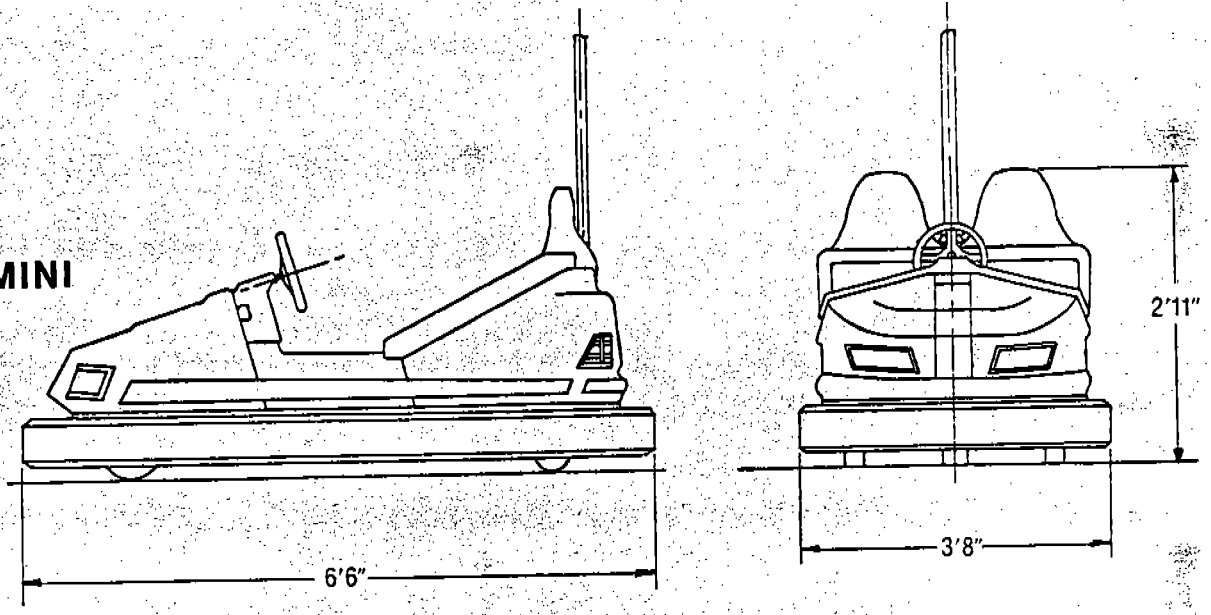
TOTAL WEIGHT: 460 lbs.

VOLTAGE REQUIREMENTS:
Standard Cars—80-110v. DC.
Floor Pickup—35-48v. DC.

CONSTRUCTION: Steel chassis, zinc plated; fiberglass body; pneumatic rubber bumper; cushioned seats.

TOTAL POWER: 1 HP (0.736 kw) per car.

GEMINI



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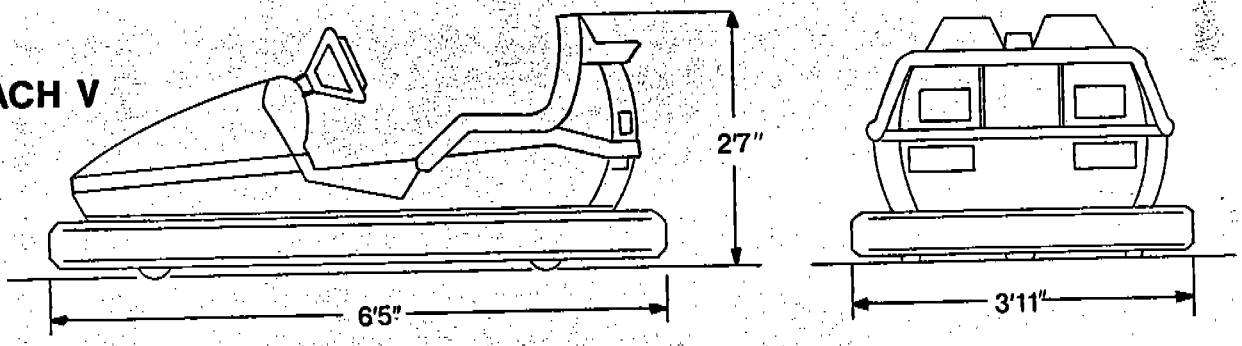

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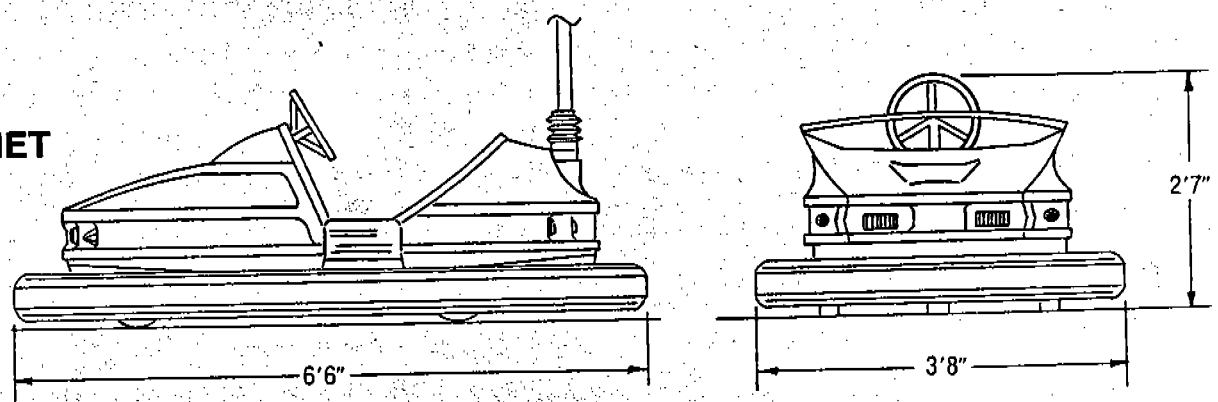

FLOOR PICKUP BUMPER CAR ELECTRICAL OPERATION

Floor pick up bumper cars operate by receiving current from (+) and (-) energized floor plates, which are arranged on the floor in rows connected to a low voltage (maximum 48 volts DC) power supply. The floor plates are spaced apart with a plastic insulator between each row.

There are four (4) pick up contacts located underneath the car which are so placed that at any one time the pick up point will be in contact with two (2) different polarity floor plates. The current is then directed via rectifier to the positive and negative supply wires of the bumper car motor. The control of the motor is accomplished through a mechanical foot switch, which, when closed, allows the current to travel to the motor therefore allowing the car to operate.

STANDARD BUMPER CAR ELECTRICAL OPERATION:

Standard Bumper Cars operate by receiving current (80-110 DC) from energized ceiling panels usually mounted 8'-9' above a steel on aluminum floor. The current is picked up through a wiper assembly mounted on an insulated pole. This pole is then electrically connected to a mechanical foot switch which when pressed by rider it allows current to be supplied to motor which allows the car to operate.

RECOMMENDED OPERATION OF BUMPER CARS

I. **Number of Operators**

Bumper cars are normally operated with one (1) person who has access to controls, entrance gates, and exit gates at all times. It may become necessary in certain instances to add extra personnel to assist with the operation of the ride during times of high usage in order to safely control traffic flow.

II. **Safety Equipment**

1. Safety Shoulder Straps - Each bumper car is supplied with two (2) shoulder straps. It is mandatory that a shoulder strap be worn by each rider during the duration of the ride. The shoulder straps are worn by inserting one arm through loop and allowing the strap to rest on the patron's shoulder. Failure to comply with these instructions could cause possible injury to the riders.
2. Cushioned Steering Wheel - This cushion, which is located in the center of the steering wheel, is mandatory. No bumper car should be allowed

to operate without one.

3. Cushioned Trolley Pole - (Standard model cars only). - This cushion is required on all standard model bumper cars with trolley poles. This cushion is designed to absorb shock in the event that a rider's head comes in contact with the trolley pole.

4. Headrest Cushion (Certain models) - Provides protection for rider's head and neck areas.

5. Dash Pad - This cushion is required along the front edge of the bumper cars seating compartment in order to provide protection for legs and knees.

6. Padded Seats - The padded seat is provided for passengers comfort. **It is not recommended** to replace this seat with a hard surface material (fiberglass, plastic, etc.).

III. Rider Instructions

The following instructions should be mounted in a place that is easily readable by all potential riders. These instructions must be strictly enforced.

1. No food or drinks allowed on ride.
2. Shoes must be worn at all times.
3. No riders under 42 inches permitted.
4. Children under the age of 7 years must be accompanied by an adult.
5. No head-on bumping allowed.
6. All riders must wear shoulder straps at all times.
7. Limit 2 riders per car.
8. No running on floor at any time.
9. Remove all loose articles before entering ride.
10. No pregnant women
11. No rider with history of neck or back injury.

IV. Large Floors

When floors exceed 40 feet in continuous length, it is recommended that signs be posted to indicate the riders should operate the cars in one circular direction around the floor. This is to discourage excessive speed and long run intentional head-on bumping.

OPERATION OF RIDE

(Also refer to Rider Instructions)

I. Before operating any ride cycle, operator must be aware of the following:

1. All riders are seated.
2. All riders have shoulder straps in place.
3. No patrons standing on floor.
4. Both entrance and exit gates must be closed with patrons behind gates.

II. Adjust timer for desired length of ride.

III. Start ride.

IV. Monitoring of ride

During operation of ride, observe riders. If anyone is acting in an unsafe manner, stop the ride, warn rider. Restart ride. If problem persists, stop ride and request patron to leave ride.

If a situation arises, such as patron leaves car during operation, a spectator climbs over the fence, loose articles are found on the floor, etc., **STOP RIDE IMMEDIATELY**. Do not start ride again until situation has been corrected.

In the instance of a "jam up", stop ride, manually push cars free, then restart ride.

V. End of Ride

When ride time elapses and cars stop moving, allow the riders to exit the floor completely and close exit gates before allowing new riders to enter the ride.

DAILY OPERATOR MAINTENANCE AND INSPECTIONS

The inspections and maintenance points listed below are to be completed daily by the person(s) responsible for the operation of the ride with patrons. It should be understood that these inspections should be done in conjunction with those outlined in the maintenance manual.

I. Inspections

1. * Check floor for any large objects that could cause damage to the cars or injury to patrons.

2. * Check all cars and make certain all safety equipment is installed and in proper working condition.
3. * Check floor plating for any screws that are loose or missing.
4. Check operation of controls and emergency stop.
5. Check condition of entrance and exit gates.
6. * Report any problems or questions to proper personnel.

* To be monitored continually during the operating day.

II. Daily Operational Maintenance

1. Sweep floor at least two (2) times per day with a dust mop or equivalent (more if necessary).
2. Paint talc on bumper tires, as described in Operation Manual, every two (2) days.
3. Clean walkway, entrance way, and operation area.
4. Operator should report any problems or questions to proper personnel.
5. Clean cars and seats.

RIDE MAINTENANCE AND INSPECTIONS

The inspections and maintenance points listed below are to be completed daily by the person(s) responsible for maintenance of the ride.

I. Daily Maintenance and Inspections

1. Check operation of each car.
2. Check all bolts, wires, motor, etc, for security.
3. Check all safety equipment on cars.
4. Inspect floor, bump rail, electrical service for any damage or abnormal conditions.
5. Check operation of entire system.
6. Inspect fiberglass body and repair if necessary.

II. Weekly Inspections and Maintenance

1. Lubricate switch pedal with silicon base lubricant.
2. Check wear on contact points (pick up style only). Replace contact when worn down flush with holder.
3. Check condition of contact spring.
4. Check condition of rubber wheel(s) 1/4" rim thickness of rubber.
5. Check seats, fiberglass, body, bumper tube, frame for unusual conditions or damage.

6. Check operation of foot pedal. Inspect insulators and copper blocks. If blocks are pitted, file to smooth finish.
7. Remove wiper blade assembly and lubricate rod with light coating of moly type lubricant (standard models only).

III. Yearly Inspection and Maintenance

1. Remove Motor
   a. Inspect clutch, replace if necessary.
   b. Replace armature carbon brush.
   c. Check condition of external commutator and brush.
   d. Check armature bearings. If condition is rough, replace.
2. Inspect and replace worn wheels.
3. Check steel frame for any cracks or unusual damage.
4. Check condition of pneumatic rubber bumper tire.
5. Check all bearings in wheels, inner/outer housings, and motor. Replace if necessary. (All bearings are sealed -do not require lubrication.)
6. Replace any damaged or worn safety equipment.

BUMPER CAR SPECIFICATIONS

	FLOOR PICK-UP	STANDARD
Motor Type	Direct Current	
Voltage Min/Max	35 - 48 Volts DC	80 - 110 Volts DC
Wattage	0.672 Watts	0.736 kw
Amperage	25 Amp Max	14 Amps Max
	14 Amp Operating	7 Amps Operating
Horsepower	.92 HP	1 HP
RPM	261 Max	261 Max
Speed	10.5 FPS Max	10.2 FPS Max
Capacity (Persons)	2 Adults	2 Adults
	350 Lbs	350 Lbs
Vehicle Weight	475 Lbs	475 Lbs
Maximum Load Per Wheel	286 Lbs	286 Lbs
Ride Duration (Suggested)	2 Minutes	2 Minutes
Passenger Restrictions	42 Inches	42 Inches
	Under 7 yrs of age accompanied by adult	Under 7 yrs of age - accompanied by adult

DIMENSIONS

Narrow Body (Cosmo, Comet, Gemini)
6'6" Length
3'8" Width
2'7" to 2'11" Height

Wide Body (Mack I, Mach V)
6'5" Length
3'11" Width
2'7" to 2'11" Height

Manufacturers:

S.D.C., srl
Via E. Lazzaretti 2/A
42100 Reggio Emilia, Italy
522-42346

Barbieri. srl
Via Cocchi 11
42100 Reggio Emilia, Italy
522-511503

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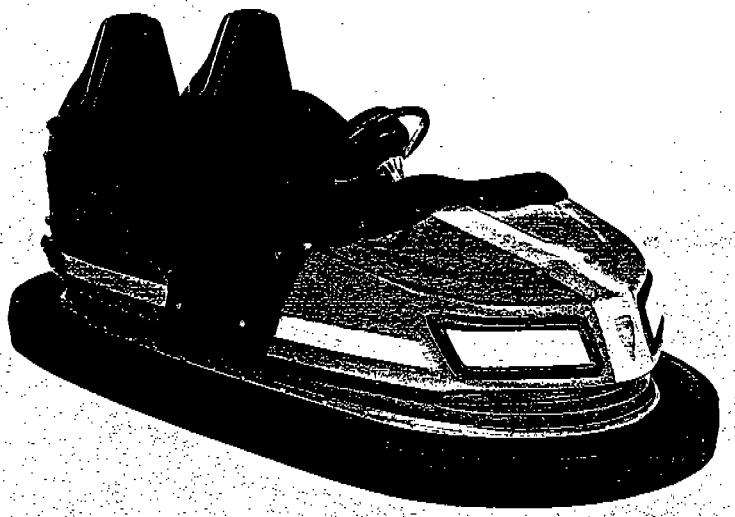
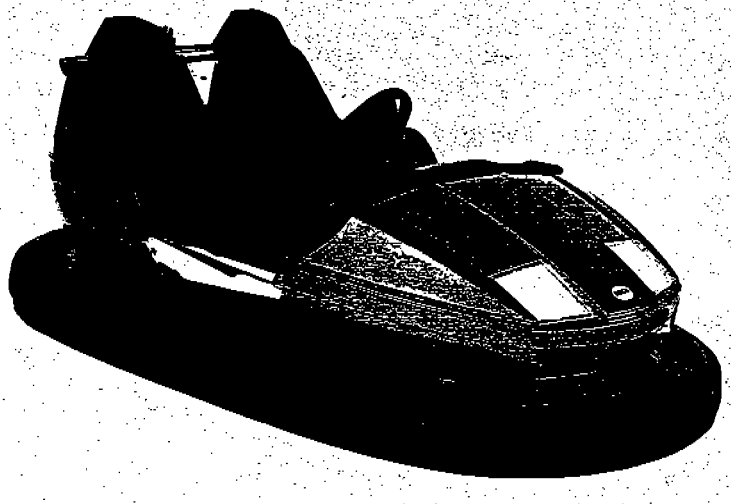
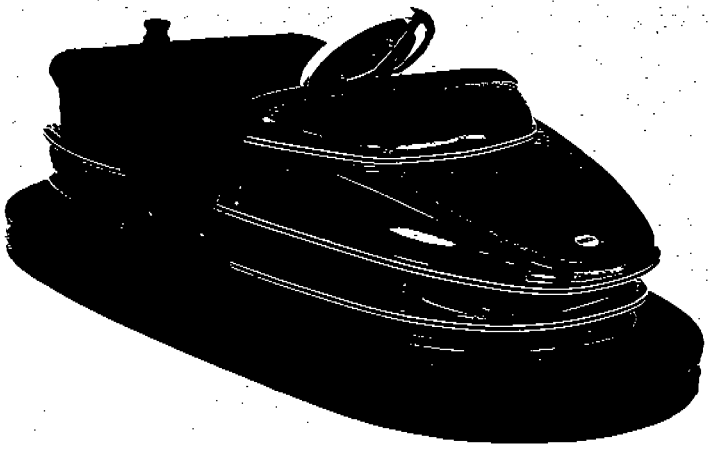


MACH V





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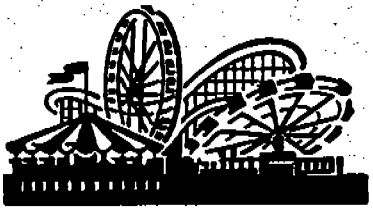

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BUMPER CAR SPECIFICATIONS

CAPACITY: 2 Passengers.

DRIVE: D.C. Motor—Rotating field with transmission and centrifugal clutch.

SPEED: 8.2 Feet per second.

LIGHTING: Rear and front lights. Comet has no lights.

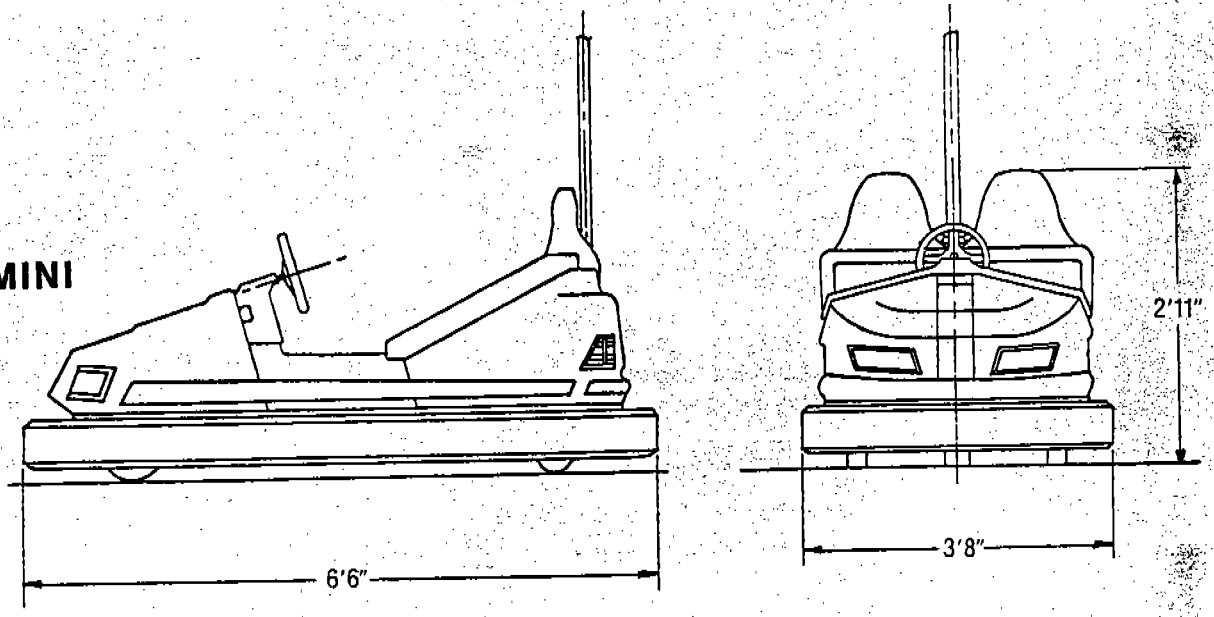
TOTAL WEIGHT: 460 lbs.

VOLTAGE REQUIREMENTS:
Standard Cars—80-110v. DC.
Floor Pickup—35-48v. DC.

CONSTRUCTION: Steel chassis, zinc plated; fiberglass body; pneumatic rubber bumper; cushioned seats.

TOTAL POWER: 1 HP (0.736 kw) per car.

GEMINI



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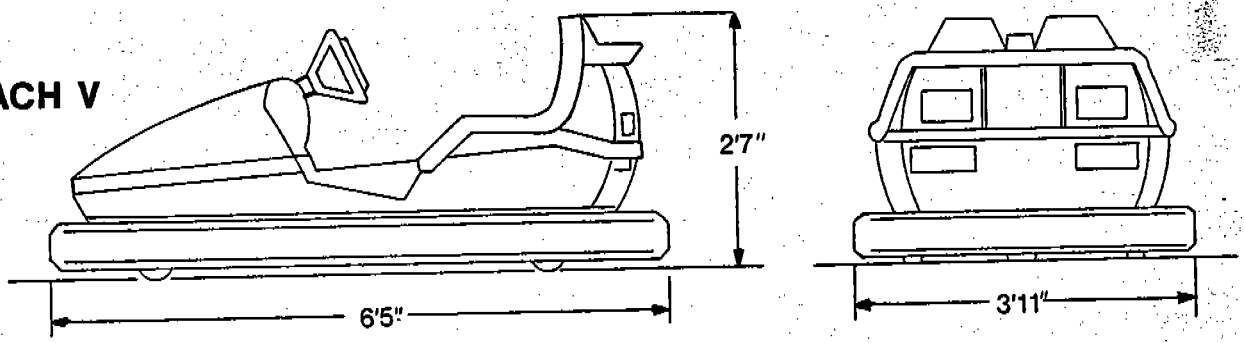

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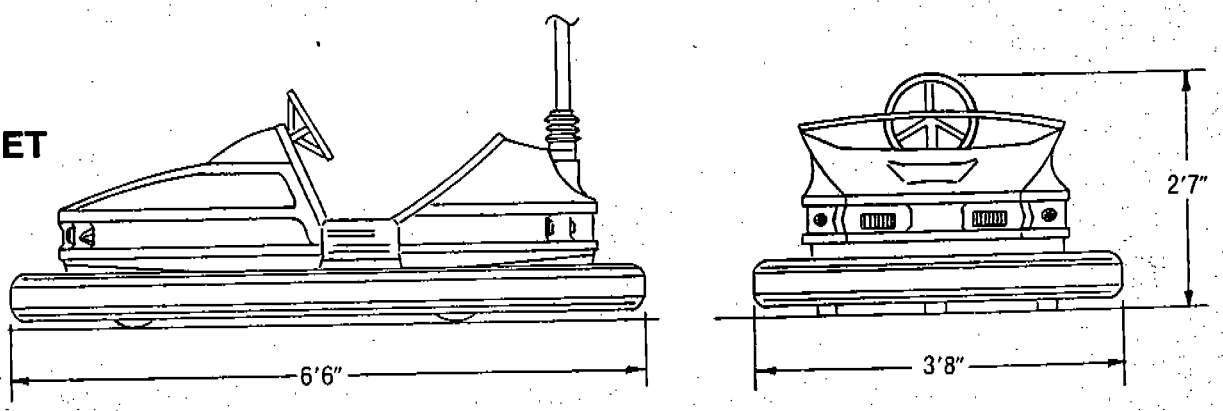


FLOOR PICKUP BUMPER CAR ELECTRICAL OPERATION

Floor pick up bumper cars operate by receiving current from (+) and (-) energized floor plates, which are arranged on the floor in rows connected to a low voltage (maximum 48 volts DC) power supply. The floor plates are spaced apart with a plastic insulator between each row.

There are four (4) pick up contacts located underneath the car which are so placed that at any one time the pick up point will be in contact with two (2) different polarity floor plates. The current is then directed via rectifier to the positive and negative supply wires of the bumper car motor. The control of the motor is accomplished through a mechanical foot switch, which, when closed, allows the current to travel to the motor therefore allowing the car to operate.

STANDARD BUMPER CAR ELECTRICAL OPERATION:

Standard Bumper Cars operate by receiving current (80-110 DC) from energized ceiling panels usually mounted 8'-9' above a steel on aluminum floor. The current is picked up through a wiper assembly mounted on an insulated pole. This pole is then electrically connected to a mechanical foot switch which when pressed by rider it allows current to be supplied to motor which allows the car to operate.

RECOMMENDED OPERATION OF BUMPER CARS

I. <u>Number of Operators</u>

Bumper cars are normally operated with one (1) person who has access to controls, entrance gates, and exit gates at all times. It may become necessary in certain instances to add extra personnel to assist with the operation of the ride during times of high usage in order to safely control traffic flow.

II. <u>Safety Equipment</u>

1. <u>Safety Shoulder Straps</u> - Each bumper car is supplied with two (2) shoulder straps. It is mandatory that a shoulder strap be worn by each rider during the duration of the ride. The shoulder straps are worn by inserting one arm through loop and allowing the strap to rest on the patron's shoulder. Failure to comply with these instructions could cause possible injury to the riders.
2. <u>Cushioned Steering Wheel</u> - This cushion, which is located in the center of the steering wheel, is mandatory. No bumper car should be allowed

to operate without one.

3. Cushioned Trolley Pole - (Standard model cars only). - This cushion is required on all standard model bumper cars with trolley poles. This cushion is designed to absorb shock in the event that a rider's head comes in contact with the trolley pole.

4. Headrest Cushion (Certain models) - Provides protection for rider's head and neck areas.

5. Dash Pad - This cushion is required along the front edge of the bumper cars seating compartment in order to provide protection for legs and knees.

6. Padded Seats - The padded seat is provided for passengers comfort. **It is not recommended** to replace this seat with a hard surface material (fiberglass, plastic, etc.).

III. Rider Instructions

The following instructions should be mounted in a place that is easily readable by all potential riders. These instructions must be strictly enforced.

1. No food or drinks allowed on ride.
2. Shoes must be worn at all times.
3. No riders under 42 inches permitted.
4. Children under the age of 7 years must be accompanied by an adult.
5. No head-on bumping allowed.
6. All riders must wear shoulder straps at all times.
7. Limit 2 riders per car.
8. No running on floor at any time.
9. Remove all loose articles before entering ride.
10. No pregnant women
11. No rider with history of neck or back injury.

IV. Large Floors

When floors exceed 40 feet in continuous length, it is recommended that signs be posted to indicate the riders should operate the cars in one circular direction around the floor. This is to discourage excessive speed and long run intentional head-on bumping.

OPERATION OF RIDE

(Also refer to Rider Instructions)

I. Before operating any ride cycle, operator must be aware of the following:

1. All riders are seated.
2. All riders have shoulder straps in place.
3. No patrons standing on floor.
4. Both entrance and exit gates must be closed with patrons behind gates.

II. Adjust timer for desired length of ride.

III. Start ride.

IV. Monitoring of ride

During operation of ride, observe riders. If anyone is acting in an unsafe manner, stop the ride, warn rider. Restart ride. If problem persists, stop ride and request patron to leave ride.

If a situation arises, such as patron leaves car during operation, a spectator climbs over the fence, loose articles are found on the floor, etc., **STOP RIDE IMMEDIATELY**. Do not start ride again until situation has been corrected.

In the instance of a "jam up", stop ride, manually push cars free, then restart ride.

V. End of Ride

When ride time elapses and cars stop moving, allow the riders to exit the floor completely and close exit gates before allowing new riders to enter the ride.

DAILY OPERATOR MAINTENANCE AND INSPECTIONS

The inspections and maintenance points listed below are to be completed daily by the person(s) responsible for the operation of the ride with patrons. It should be understood that these inspections should be done in conjunction with those outlined in the maintenance manual.

I. Inspections

1. * Check floor for any large objects that could cause damage to the cars or injury to patrons.

2. * Check all cars and make certain all safety equipment is installed and in proper working condition.
3. * Check floor plating for any screws that are loose or missing.
4. Check operation of controls and emergency stop.
5. Check condition of entrance and exit gates.
6. * Report any problems or questions to proper personnel.

* To be monitored continually during the operating day.

II. Daily Operational Maintenance

1. Sweep floor at least two (2) times per day with a dust mop or equivalent (more if necessary).
2. Paint talc on bumper tires, as described in Operation Manual, every two (2) days.
3. Clean walkway, entrance way, and operation area.
4. Operator should report any problems or questions to proper personnel.
5. Clean cars and seats.

RIDE MAINTENANCE AND INSPECTIONS

The inspections and maintenance points listed below are to be completed daily by the person(s) responsible for maintenance of the ride.

I. Daily Maintenance and Inspections

1. Check operation of each car.
2. Check all bolts, wires, motor, etc, for security.
3. Check all safety equipment on cars.
4. Inspect floor, bump rail, electrical service for any damage or abnormal conditions.
5. Check operation of entire system.
6. Inspect fiberglass body and repair if necessary.

II. Weekly Inspections and Maintenance

1. Lubricate switch pedal with silicon base lubricant.
2. Check wear on contact points (pick up style only). Replace contact when worn down flush with holder.
3. Check condition of contact spring.
4. Check condition of rubber wheel(s) 1/4" rim thickness of rubber.
5. Check seats, fiberglass, body, bumper tube, frame for unusual conditions or damage.

6. Check operation of foot pedal. Inspect insulators and copper blocks. If blocks are pitted, file to smooth finish.
7. Remove wiper blade assembly and lubricate rod with light coating of moly type lubricant (standard models only).

III. Yearly Inspection and Maintenance

1. Remove Motor
   a. Inspect clutch, replace if necessary.
   b. Replace armature carbon brush.
   c. Check condition of external commutator and brush.
   d. Check armature bearings. If condition is rough, replace.
2. Inspect and replace worn wheels.
3. Check steel frame for any cracks or unusual damage.
4. Check condition of pneumatic rubber bumper tire.
5. Check all bearings in wheels, inner/outer housings, and motor. Replace if necessary. (All bearings are sealed -do not require lubrication.)
6. Replace any damaged or worn safety equipment.

BUMPER CAR SPECIFICATIONS

	FLOOR PICK-UP	STANDARD
Motor Type	Direct Current	
Voltage Min/Max	35 - 48 Volts DC	80 - 110 Volts DC
Wattage	0.672 Watts	0.736 kw
Amperage	25 Amp Max	14 Amps Max
	14 Amp Operating	7 Amps Operating
Horsepower	.92 HP	1 HP
RPM	261 Max	261 Max
Speed	10.5 FPS Max	10.2 FPS Max
Capacity (Persons)	2 Adults	2 Adults
	350 Lbs	350 Lbs
Vehicle Weight	475 Lbs	475 Lbs
Maximum Load Per Wheel	286 Lbs	286 Lbs
Ride Duration (Suggested)	2 Minutes	2 Minutes
Passenger Restrictions	42 Inches	42 Inches
	Under 7 yrs of age accompanied by adult	Under 7 yrs of age - accompanied by adult

DIMENSIONS

Narrow Body (Cosmo, Comet, Gemini)	6'6" Length 3'8" Width 2'7" to 2'11" Height
Wide Body (Mack I, Mach V)	6'5" Length 3'11" Width 2'7" to 2'11" Height

Manufacturers:

S.D.C., srl
Via E. Lazzaretti 2/A
42100 Reggio Emilia, Italy
522-42346

Barbieri. srl
Via Cocchi 11
42100 Reggio Emilia, Italy
522-511503

U.S.A. Representative:

Exsaco Corporation
One North Santa Fe Street
P.O. Drawer 328
Alvarado, Texas 76009
817-783-2265

OPERATION, MAINTENANCE AND TROUBLE SHOOTING HINTS

1. After initial few days of operation, tighten all electrical connections. An application of heavy-duty "loc-tite" is recommended at this point.

2. Lubrication:

   A. All bearings inside the drive unit are sealed and require no additional lubrication.

   B. Wheel bearings should be inspected and packed between 20,000 and 30,000 rides per car. Any good grade wheel bearing grease will do.

   C. Once every week apply a small amount of grease to the ends of the hinge 706 and the switch hinge 709.

   D. The bearings 104 between the inner housing 102 and outer housing 101 should be lubricated once a year or sooner if there is evidence of hard steering.

   E. The transmission is filled and sealed at the factory. Unless there is evidence of loss of grease through the transmission seals, only yearly lubrication is required. At this time, open the inspection bolt and with a grease gun, shoot one or two shots of multi-purpose grease into the opening. CAUTION: OVERFILLING WILL DESTROY SEALS. THIS UNIT REQUIRES ONLY 1/2 CUP WHEN FILLED FROM EMPTY.

3. Clutch - The clutch is a simple centrifugal unit that has only four moving parts, resulting in a long trouble-free life. Clutch linings have a life expectancy of 20,000 or more rides. A high pitch metal screeching sound, similar to worn auto brakes, is an indication that new clutch lining is needed at once.

4. Electrical - The motor is a 90V DC, series wound unit; it is speed controlled by varying the voltage. As a result of this design, voltage fluctuations are not harmful.

   A. There are two sets of brushes in the motor.

      1. The double brush holders, 312, have a long life as they contact the slow rotating, smooth slip ring no. 324.

      2. The single brush holders (2) no. 203 and brushes 204 operate against the grooved commutator at a relatively high speed and wear at moderate rate. The brushes should be replaced when they no longer project above the brush holder. At this point, they may stick and arc against the armature.

3. The field winding 302 can be replaced by removing bolts bolts 304 and laminated block 303. Use caution in re-assembling so as not to cut through insulation.

B. Pedal assembly - This unit is purposely simple in design. The switch is an "over center" unit that snaps on or off and cuts arcing to a minimum.

1. Copper blocks 721 and 724 serve as electrical contact points. The life of these blocks can be extended by ocasionally smoothing the contact surfaces with a file. It is best to file these while out of the pedal assembly.

2. Keep bolt 718 and nut 710 and bolt 723 and nut 710 tight. A loose connection at these points puts undue strain on fiber washer 719 causing arcing and failure. In some situations it si advisable to use 2 720 insulators if arcing occurs at this point.

C. Lights - All lights are wired in a series so that rugged 12 or 24 volt bulbs can be used; if one bruns out all fail. There is a fuse in front and under the seat on the older cars. The later cars may have an American-made "in-line" fuse. The European fuse can be obtained at any auto parts house.

5. Tire pressure should be checked regularly and kept at 16 lbs. per square inch. Low pressure allows car bodies and trim to come in contact when two cars meet. Slight nicks in the front trim are a sure sign of low tire pressure. Over inflation may cause severe bouncing between cars and possible injuries to patrons.

6. Rear steel wheel must be kept clean to make a good electrical contact or the cars will slow down. Clean the wheel with a wire brush only.

7. As the wheels (front & rear) wera, it is possible for them to reach a point where the bumper tire drags on the floor letting the wheels wear to this point is falsa economy as the bumper tires are expensive. A temporary fix while awaiting the arrival of new wheel is to place 4 or 5 washers between parts no. 102 and 317 and 423 on eash stud 220. The effect is to raise the car 1/4 to 1/2 higher from the floor.

8. Lubricate the bumper tires. We recommend the use of talc as a lubricant to be applied to the side of the tires and the inner rail surfaces of the building. Its use provides a glancing blow upon impact, giving freer and accelerated movement of the cars. Make a paste, with water and apply freely. New compounds of silicone work extremely well also.

9. Blow the motor cap out with compressed air each week. This is probably the single, most important maintenance point one can have. Dust builds up causing heat and gets into moving parts, this can cause brushes to arc to the motor housing.

10. Contact between the ceiling and the car trolley assembly - one of the most frequent troulble spots. The car not only moves in its steered direction, but during a severe bump with the rail or another car, the pole whips in any one of several directions. The result is a possibility of the blade being forced in a new direction without time to turn in the socket. Thus it is important to have the trolley rod end 801 turn freely in the trolley pole 840. Keep this part lubricated with vasoline or a similar product.

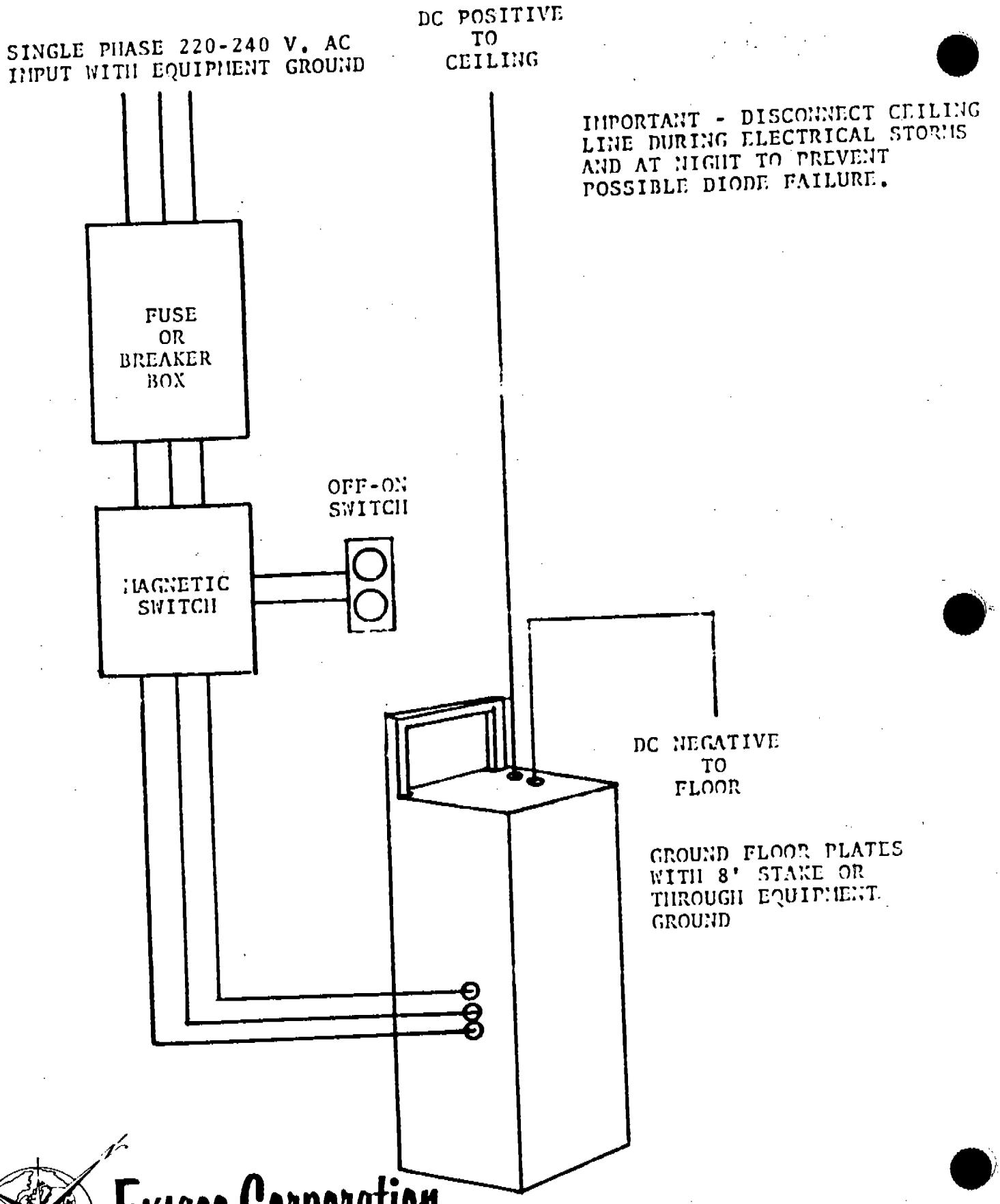
    On certain ceilings, it si possible for the blade 802 to be forced backwards into the joint between ceiling plates or between the plate and support. Blades can break in this type of action and become flying missles. Keep the ceiling plates tight so no spaces appear between them.

    Set collars 830 may be used to adjust the contact between the ceiling and blade 802.

    Keep the rail fitting 878 tight enough so that the trolley pole does not swivel.

11. The inline fuse protection for the motor in the nose of the car is located near the outer housing. This requires a 15-16 amp. fuse.

12. DAILY VISUAL INSPECTION AND COMMON SENSE ARE THE MOST IMPORTANT ITEMS IN PREVANTATIVE MAINTENANCE



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