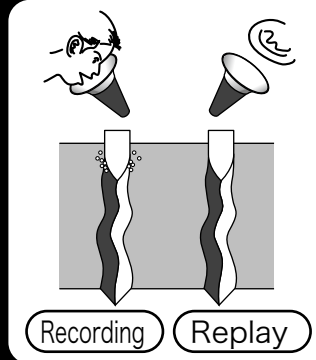
New Edison-style Cup Phonograph Kit

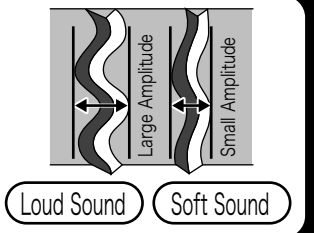
Why can we record and replay voices?

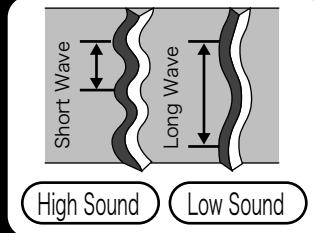


●Your voice vibrates the air minutely when it gets into the horn. Then the vibration is conducted to the needle and is translated into a wavy movement of the needle and carves a groove on the cup.

●When replaying, the other way round, the waves of the groove vibrate the needle and the vibration is conducted to the horn and the sound is produced from the horn.

The difference in the tones reflects the difference in the shapes of the waves.

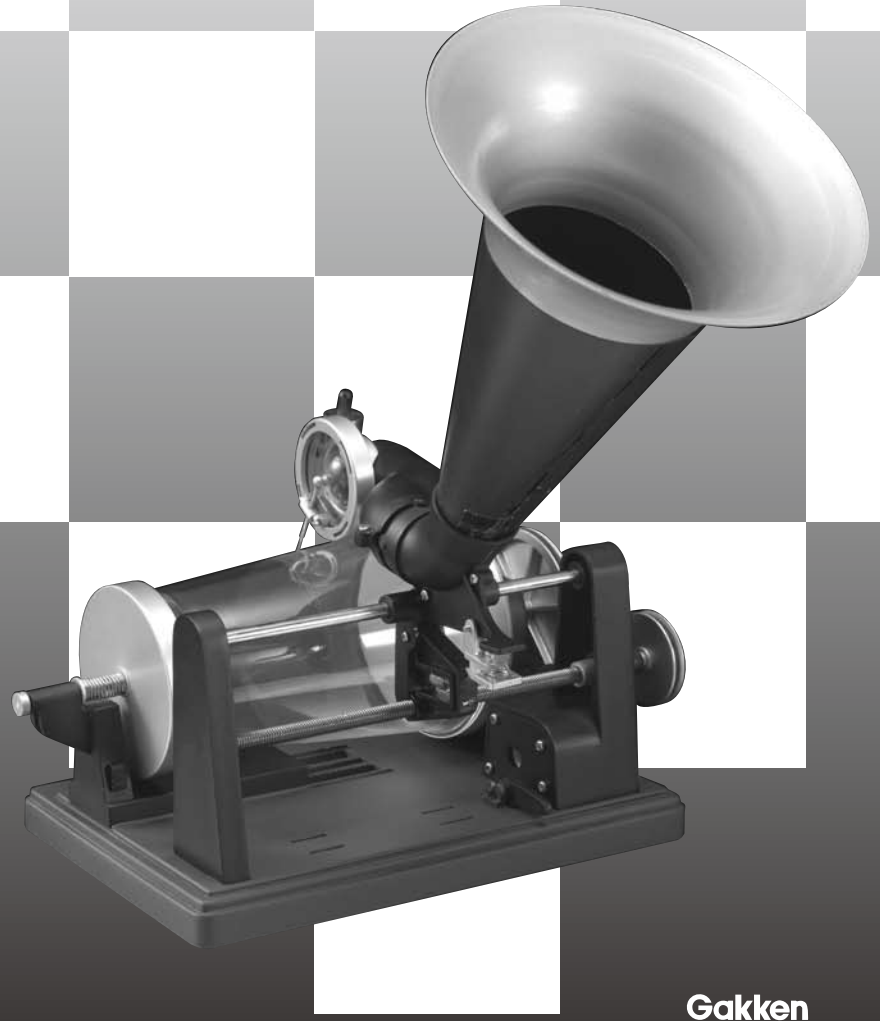




大人の科学® Otona no Kagaku

The Sophisticated Science Kit for Adults

New Edison-style Cup Phonograph Kit

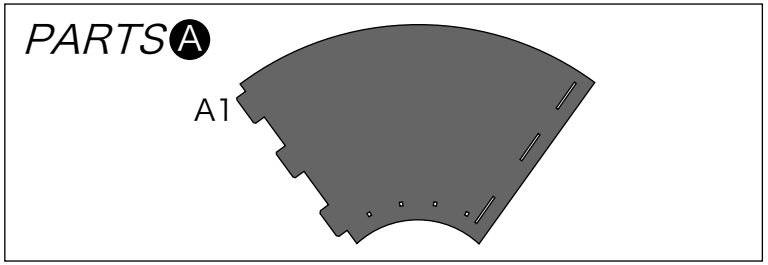


Gakken

Parts List New Edison-style Cup Phonograph Kit

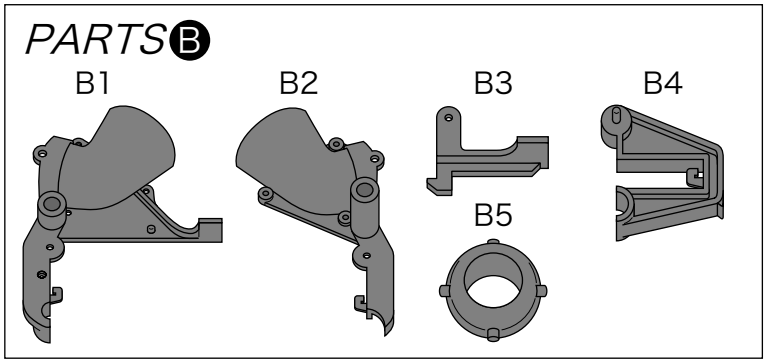
PARTS A

A1 / cone



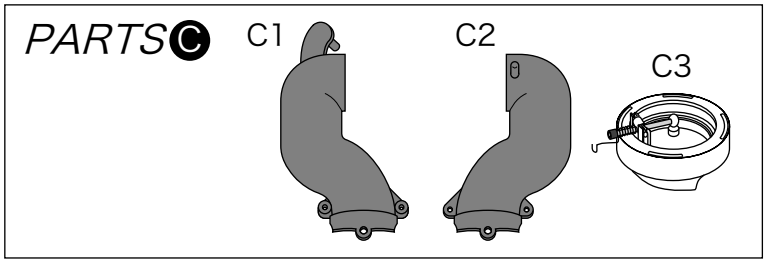
PARTS B

B1 / elbow
B2 / elbow
B3 / guide stopper
B4 / guide part
B5 / ball joint



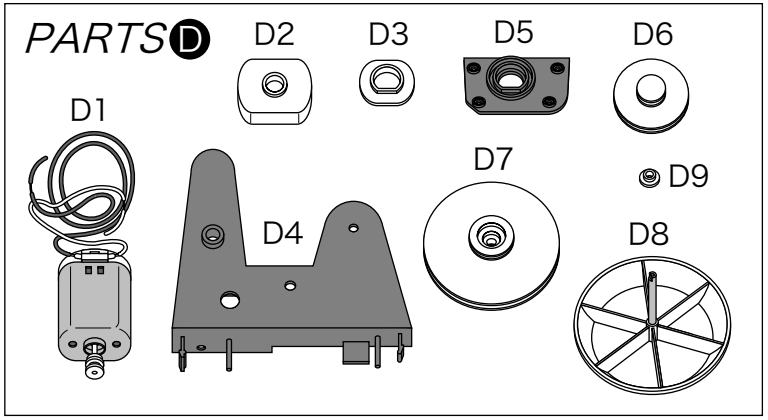
PARTS C

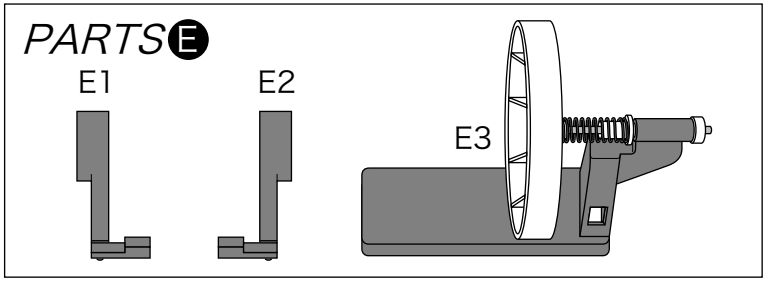
C1 / arm
C2 / arm
C3 / pickup



PARTS D

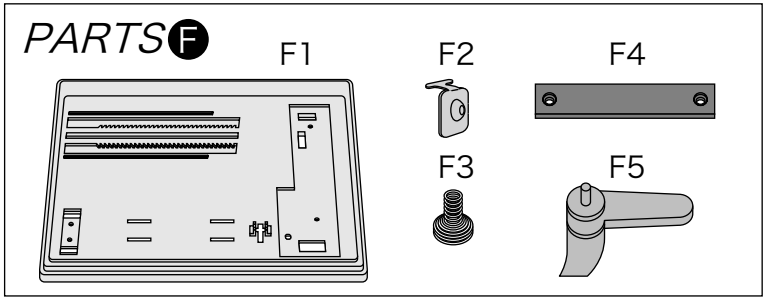
D1 / motor
D2 / rubber absorber
D3 / rubber absorber
D4 / motor box
D5 / cover
D6 / pulley
D7 / pulley
D8 / cup holder
D9 / bearing





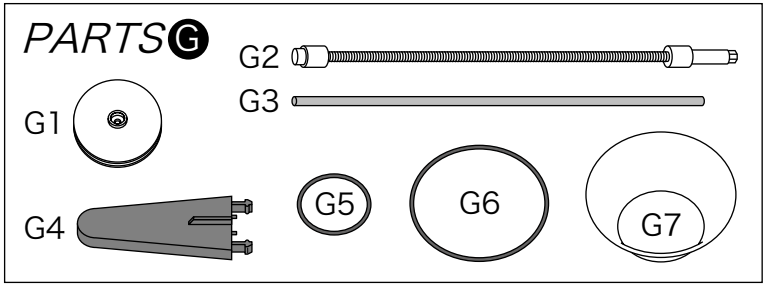
PARTS E

E1 / right slide stopper
E2 / left slide stopper
E3 / cup holder



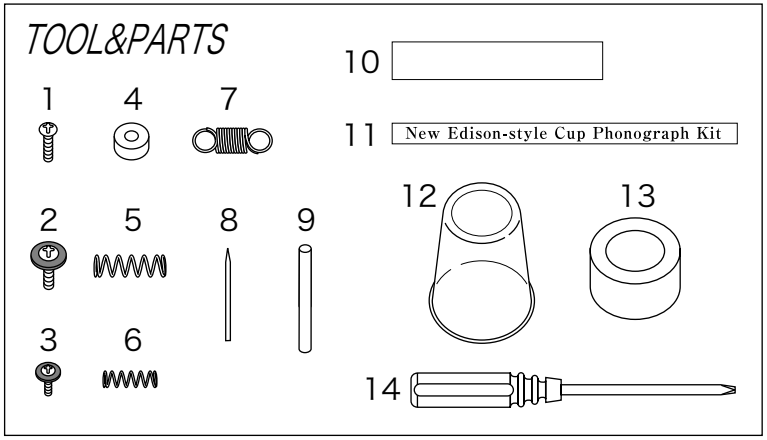
PARTS F

F1 / base panel
F2 / positive terminal
F3 / negative terminal with spring
F4 / slide base
F5 / switch



PARTS G

G1 / pulley
G2 / screw shaft
G3 / shaft
G4 / shaft holder
G5 / small belt
G6 / large belt(2)
G7 / funnel



TOOL&PARTS

1 / screw(6mm)
2 / large screw with collar
3 / small screw with collar
4 / weight(3)
5 / large spring
6 / small spring
7 / spring
8 / needle
9 / sewing needle adapter
10 / both side adhesive tape
11 / sticker
12 / cup
13 / styrene foam
14 / screwdriver (cross-headed tip)

⚠ CAUTION ★ Please read the following instructions before using this kit.

●Use caution when handling a needle. Improper use may cause injury.
●Use caution when handling some metallic parts that are made thin and sharp functionally. Improper use may cause injury.
●To avoid the risk of suffocation, use caution not to swallow small parts.
●Remove batteries after using the kit and keep away from babies and children.

Two size AA batteries are required. Improper use of the batteries may cause the generation of heat, explosions or leaks. The following precautions should be taken:
●Do not use rechargeable batteries, such as nickel cadmium batteries.
●Ensure that the positive and negative terminals on the batteries are facing the right way.
●If liquid leaked from batteries gets in an eye, rinse it well in a lot of water immediately and consult a doctor. When liquid stick to skin or clothes, wash it up with water immediately.
●Remove batteries after an experiment.

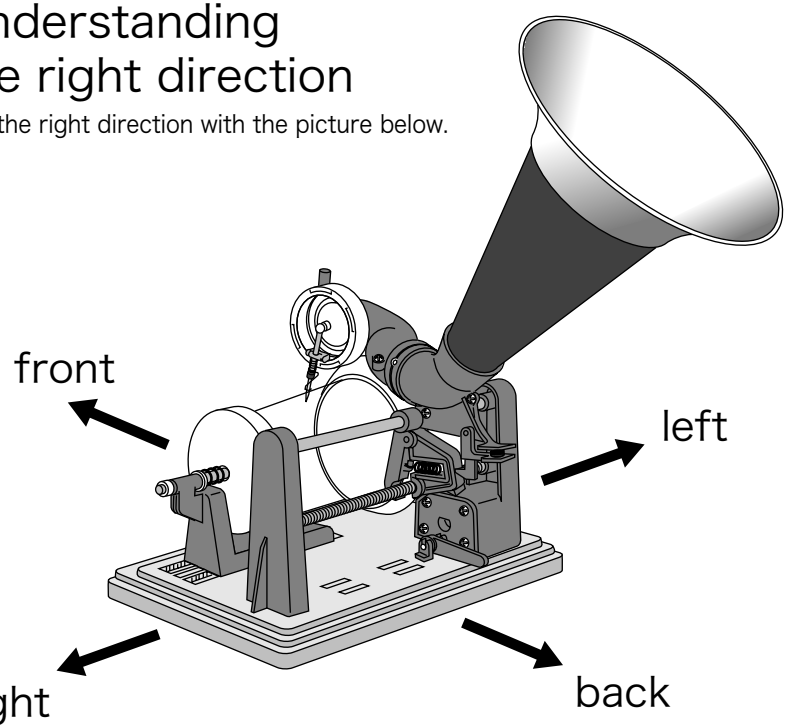
★Please read the assembly instructions and cautions carefully before using the kit.
★Instructions and cautions in this booklet should always be followed for safety. Do not use any materials that have become damaged or deformed while in use.
★Keep this kit away from babies and children.

●The plastic materials used in this kit●
body (black)/ horn (gold)/: ABS bearing (white): POM
small bags (transparent): polyethylene cup (transparent): polyethylene terephthalate
※Vinyl chloride resin is used for the covers of the lead wires.
※When disposing of the kit, please follow the recycling regulations in your area.

Before Assembling the Kit

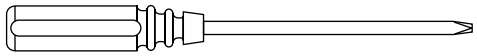
1. Understanding the right direction

Check the right direction with the picture below.

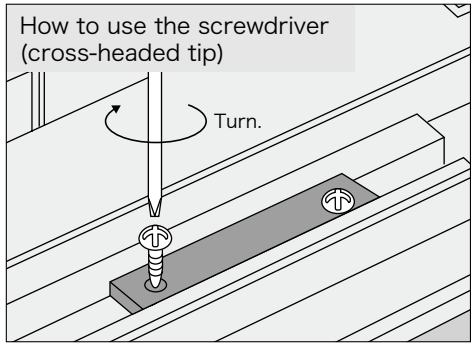


2.How to Use Supplied Tools

●screwdriver
(cross-headed tip)



The screwdriver can be used to tighten a screw.
※The screws are self-tapping screws that create helix when driven in.



3.Things you will need

Two AA alkaline batteries , Scotch tape , scissors

※Please note that shapes and length of materials may appear slightly different from pictures and illustrations in this booklet.

1 Assembling the Horn

Parts to be used *PARTS* Ⓐ

A1 cone

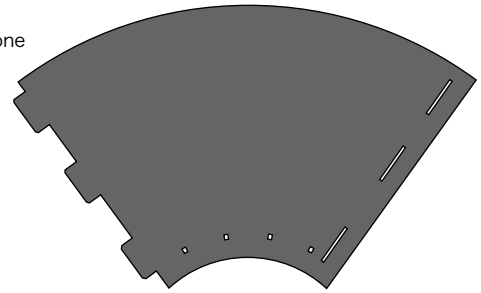
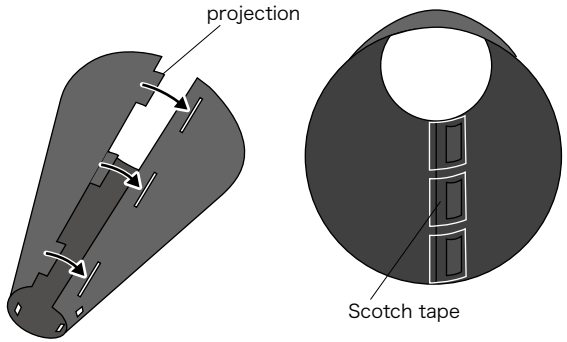


Figure — ❶
Roll up the A1 cone and put three projections into three holes to make into horn like shape. Fasten with Scotch tape on the inside.

❶ Form the A1 cone into horn like shape.

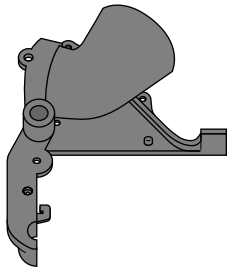


Fasten joints with Scotch tape on the inside.

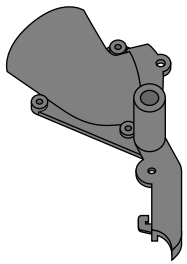
2 Assembling the guide part

Parts to be used *PARTS* Ⓑ ※There may be more screws than actually used for spare.

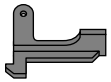
B1 elbow



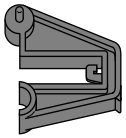
B2 elbow



B3 guide stopper



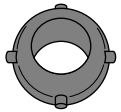
B4 guide part



spring

large spring

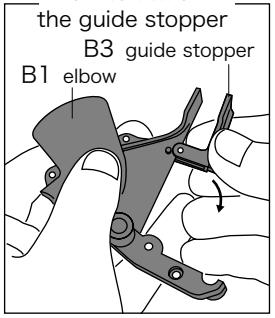
B5 ball joint



Four 6mm screws

Figure — ❷
Attach the B3 guide stopper to the B1 elbow.

How to attach the guide stopper

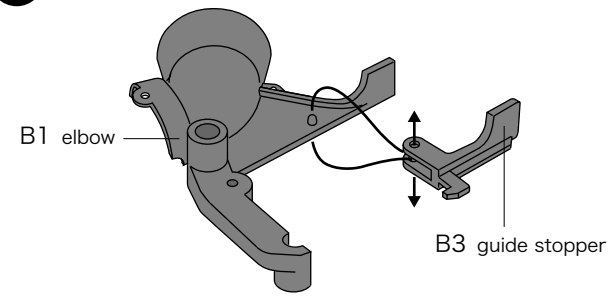


To attach the B3 guide stopper, push it down as the arrow shows in the figure above.

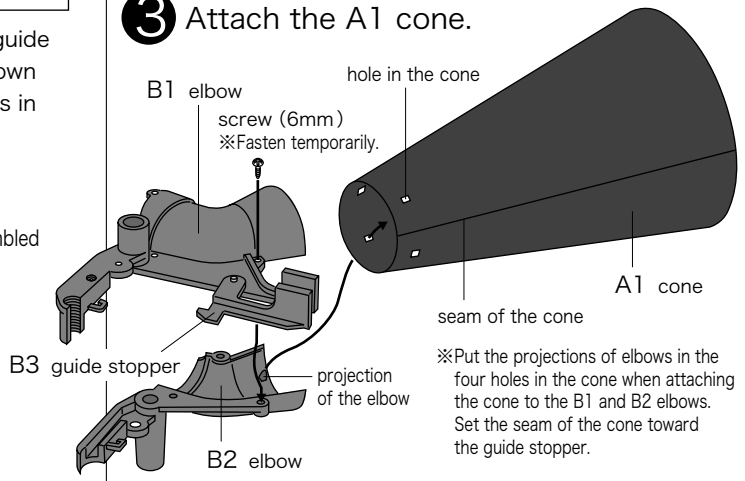
Figure — ❸
Put the A1 cone assembled in the Figure — ❶ between the B1 elbow and the B2 elbow and fasten temporarily with a 6mm screw.

Figure — ❹
Make space between the B1 and the B2 elbows that are temporarily fastened and thrust the B4 guide part and fasten with a 6mm screw temporarily.

❷ Attach the B3 guide stopper.



❸ Attach the A1 cone.



※Put the projections of elbows in the four holes in the cone when attaching the cone to the B1 and B2 elbows. Set the seam of the cone toward the guide stopper.

❹ Attach the B4 guide part.

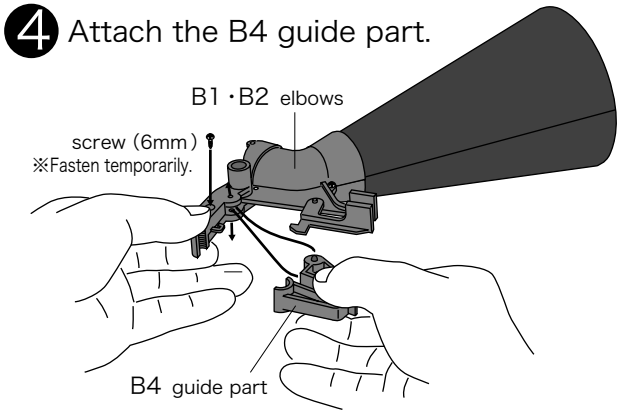


Figure —❺
Stretch and set the spring between B1 B2 elbows and B4 guide part assembled in Figure —❹.

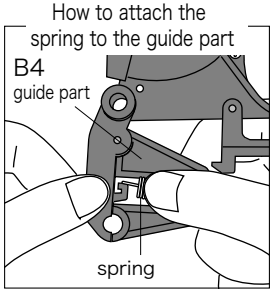
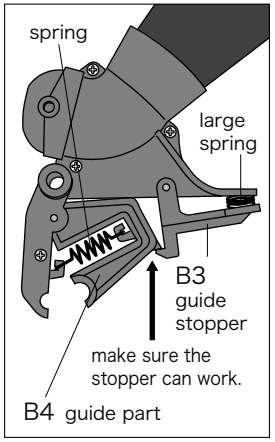
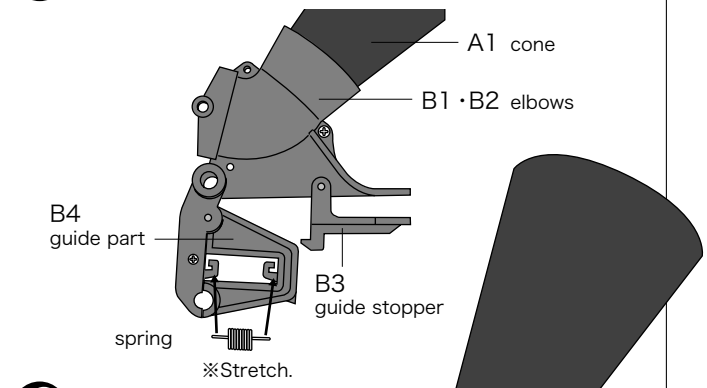


Figure —❻
Open between the B1 and the B2 elbows a little and put the ball joint in. Then fasten with two 6mm screws. Tighten the screws fastened temporarily in Figure —❸ and ❹.

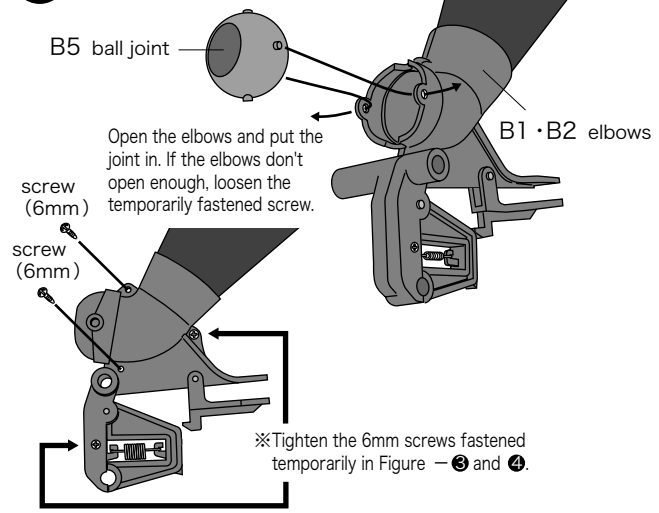
Figure —❼
Put the large spring in between B1, B2 elbows and the B3 guide stopper and see if the B3 guide stopper can catch the B4 guide part.



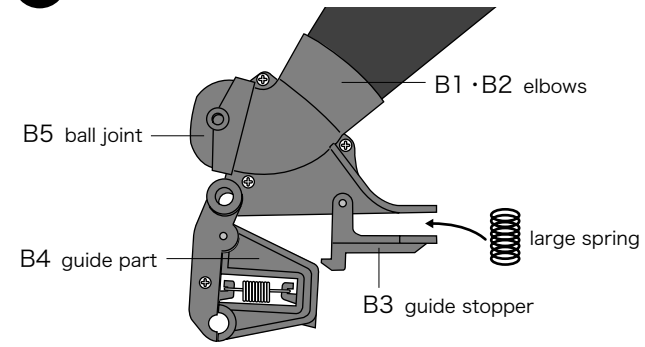
❺ Attach the spring to the B4 guide part.



❻ Attach the B5 ball joint.



❼ Attach the large spring to the B3 guide stopper.



❸ Assembling the arm parts

Parts to be used *PARTS* Ⓒ ※There may be more screws than actually used for spare.

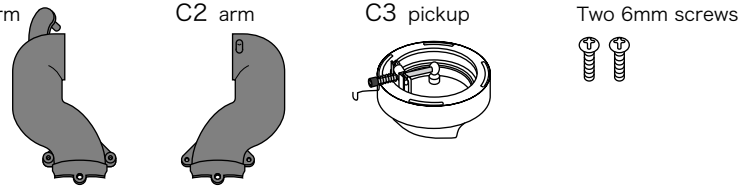


Figure —❽
Put the ball joint part assembled in Figure —❼ between the C1 and the C2 arms and fasten with 6mm screws.

How to assemble the pickup part

In case the pickup comes apart, assemble in this order.

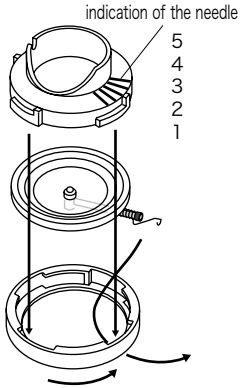
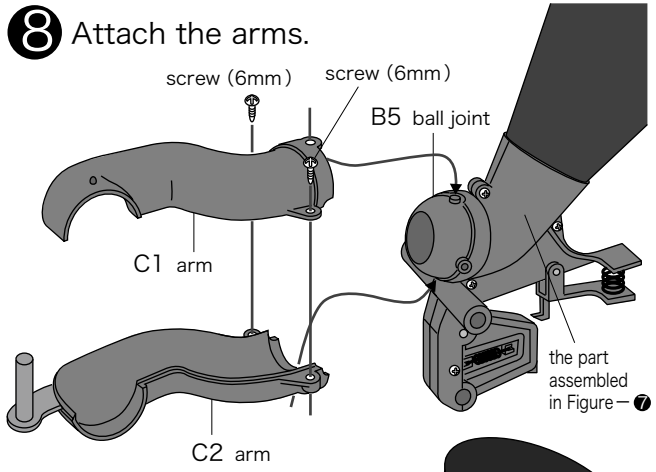
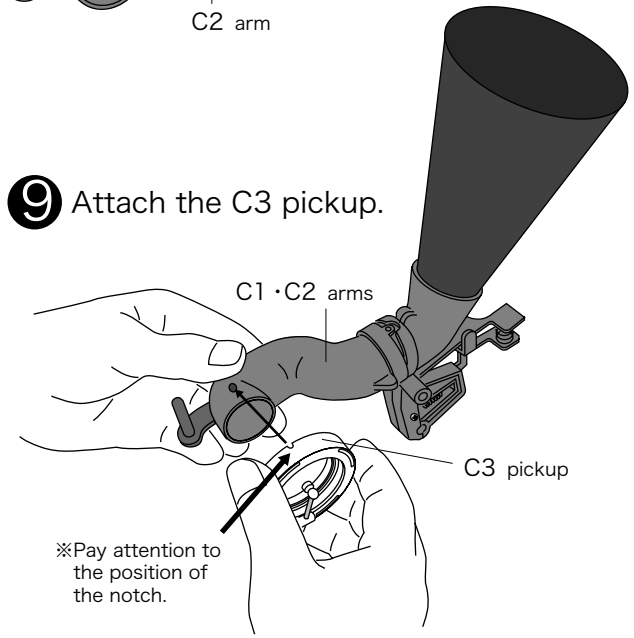


Figure —❾
Attach the C3 pickup to the parts assembled in Figure —❽.
Pay attention to the position of the notch and push the pickup in. (It may be hard to push. Insert completely.)

❽ Attach the arms.



❾ Attach the C3 pickup.



4 Assembling the motor box

Parts to be used *PARTS* D ※There may be more screws than actually used for spare.

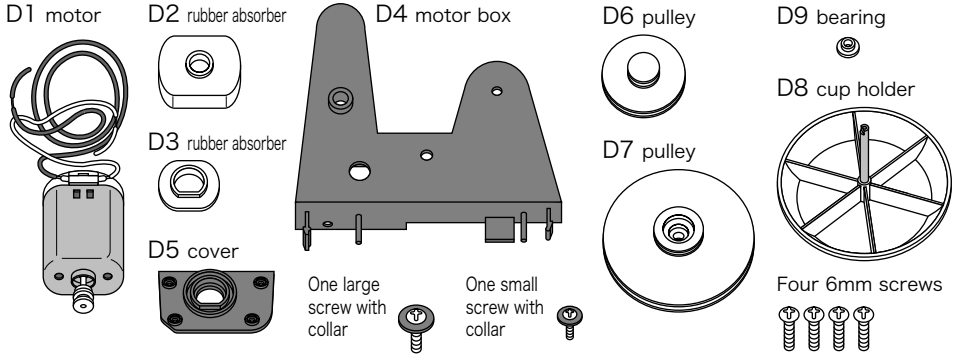
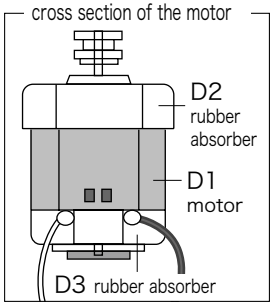
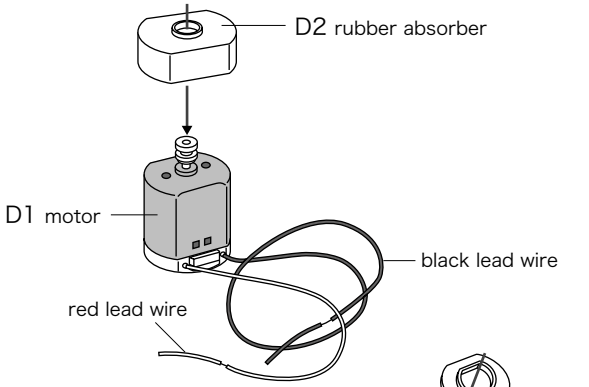


Figure — ⑩
Put the D2 rubber absorber on the D1 motor.

Figure — ⑪
Set the D1 motor in the D4 motor box and put the D3 rubber absorber on.



⑩ Assemble the motor.



⑪ Set the motor into the D4 motor box.

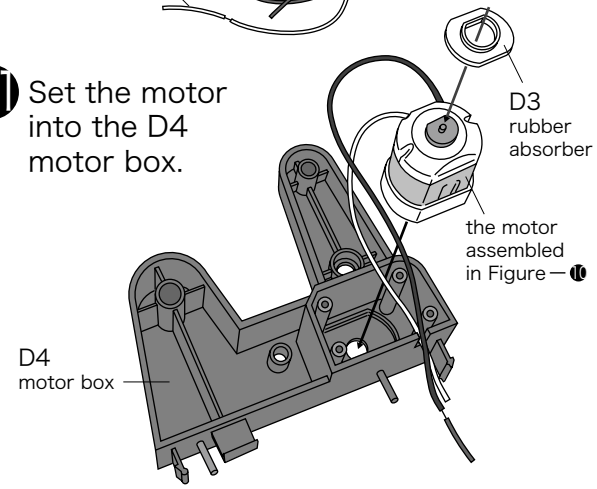
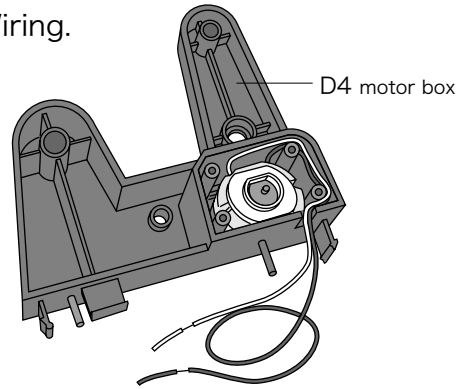


Figure — ⑫
Wire the red and the black lead wires coming from the motor as shown in the right figure.

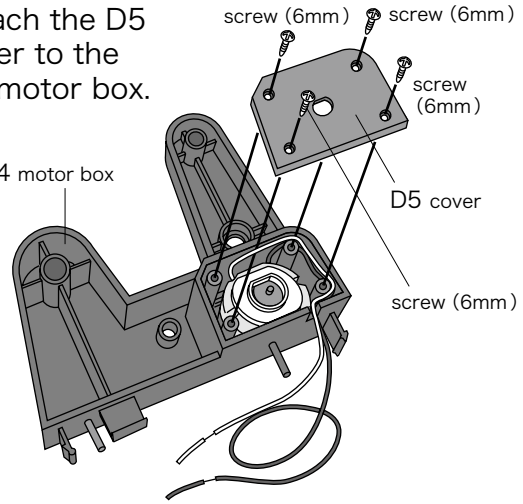
Figure — ⑬
Attach the D5 cover to the assembled D4 motor box with four 6mm screws.

Figure — ⑭
Attach the D6 pulley to the D4 motor box with the large screw with collar.

⑫ Wiring.



⑬ Attach the D5 cover to the D4 motor box.



⑭ Attach the D6 pulley.

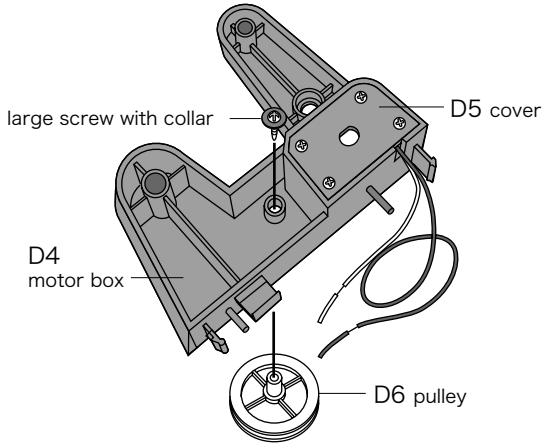
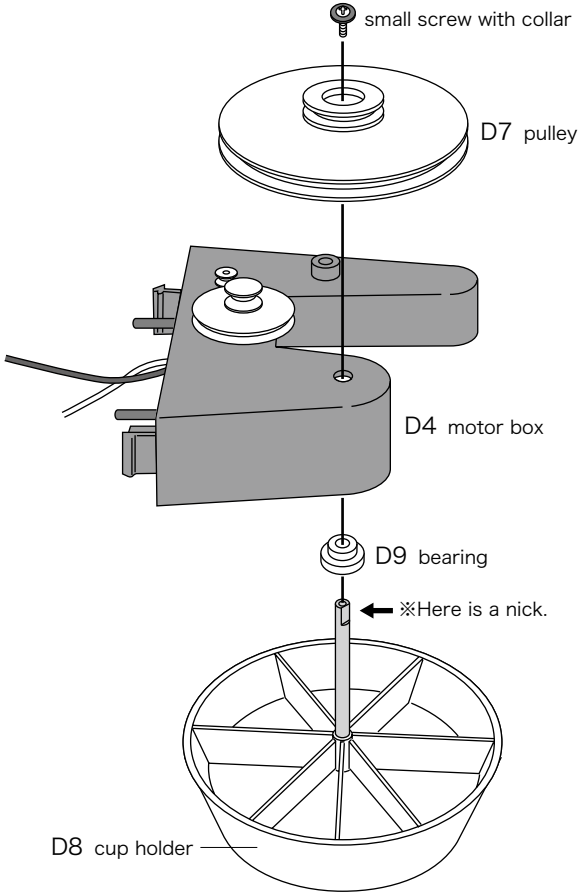


Figure — ⓯
Attach the D9 bearing to the D8 cup holder and then insert them into the D4 motor box deeply.
Put the D7 pulley on these and fasten with the small screw with collar.

Pay attention to the position of the nick of the D8 cup holder so that it fits in the D7 pulley when inserting.

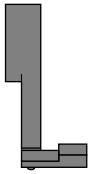
⓯ Attach the D7 pulley and the D8 cup holder.



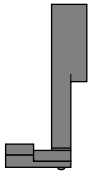
5 Assembling the cup holder

Parts to be used *PARTS* Ⓔ

E1
right slide stopper



E2
left slide stopper



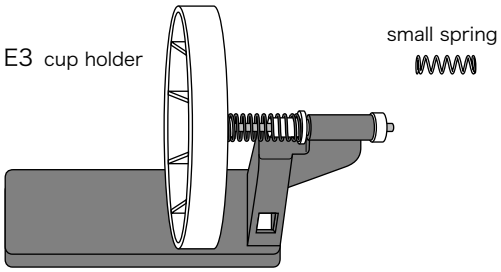


Figure — ⓰
Attach the E1 right and the E2 left slide stoppers to the E3 cup holder.

⓰ Attach the E1 right and the E2 left slide stoppers.

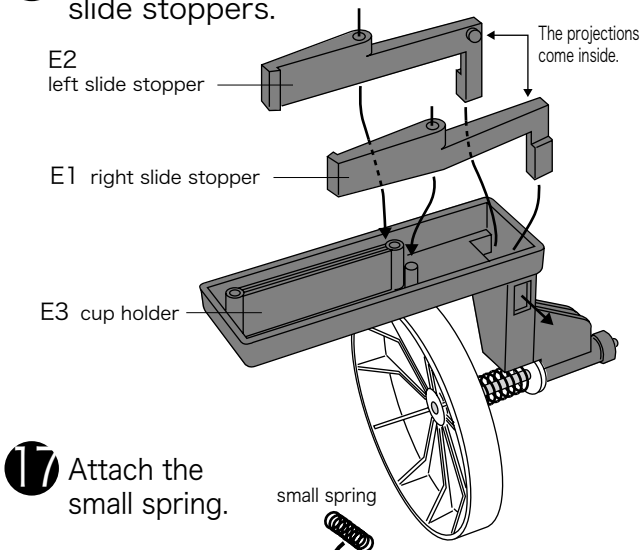
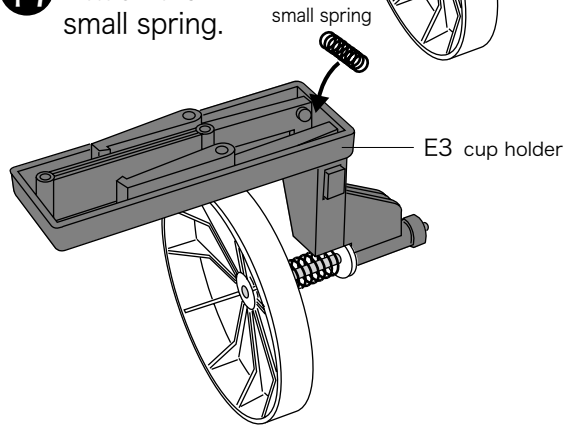


Figure — ⓱
Put the small spring in between the E1 right and the E2 left slide stoppers.

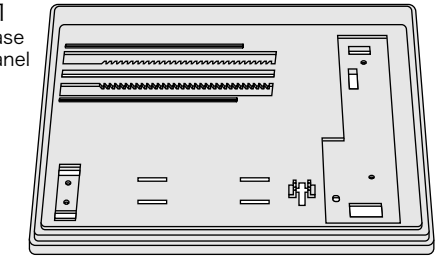
⓱ Attach the small spring.



6 Attaching parts to the base panel

Parts to be used *PARTS* Ⓕ ※There may be more screws than actually used for spare.

F1
base panel

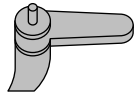


F2
positive terminal

F3
negative terminal with spring

F4 slide base

F5 switch



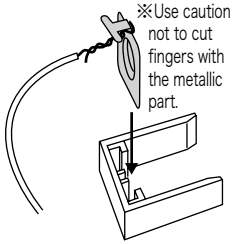
Two 6mm screws

Figure — ⓲
Set the motor box assembled in Figure — ⓯ on the F1 base panel.

Figure — ⓳
Turn the base panel over. Attach the F3 negative terminal with spring to the black lead wire and the F2 positive terminal to the red lead wire, and then attach them to the base panel.

How to attach the terminals and lead wires

●positive terminal



●negative terminal

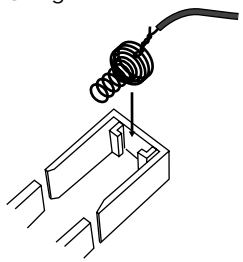
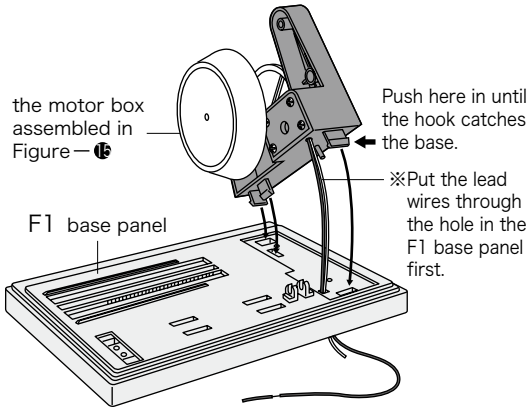
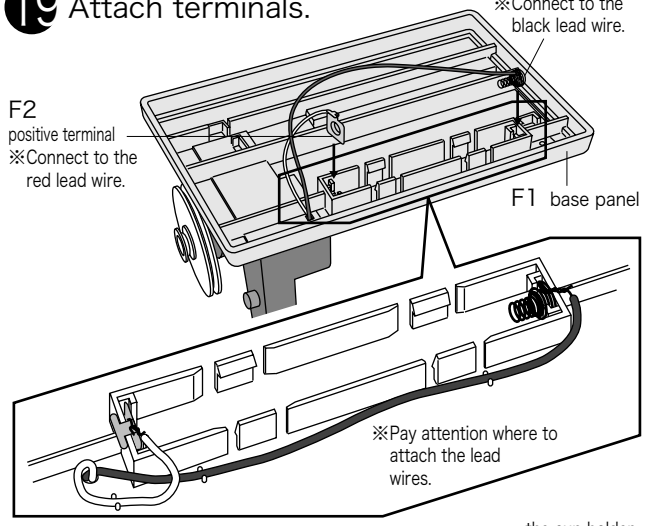


Figure — ⓴
Set the cup holder assembled in Figure — ⓱ on the F1 base panel. (Push it in pressing down the slide buttons on both sides.)

⓲ Set the motor box.



⓳ Attach terminals.



⓴ Set the cup holder.

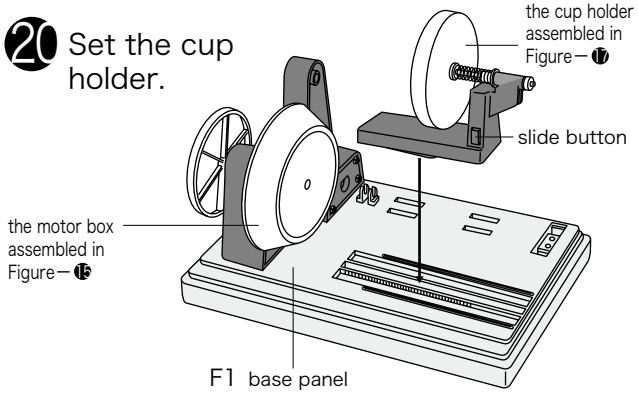


Figure — ㉑
Turn the F1 base panel over again and attach the F4 slide base with two 6mm screws.

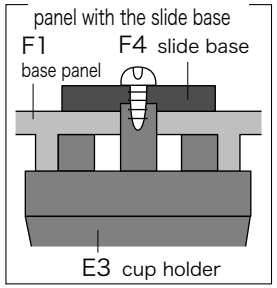
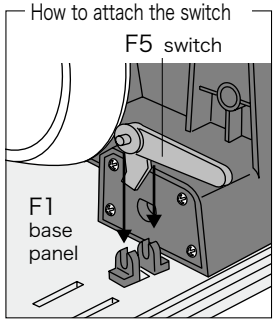
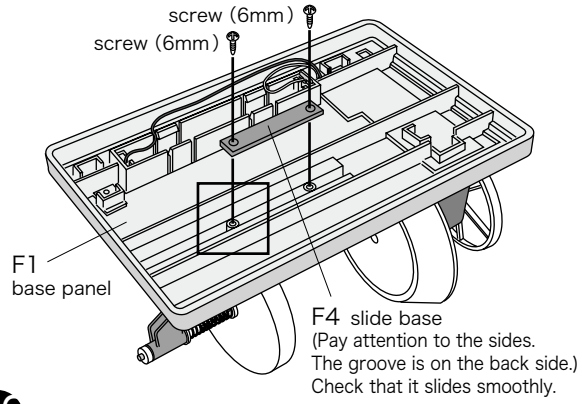


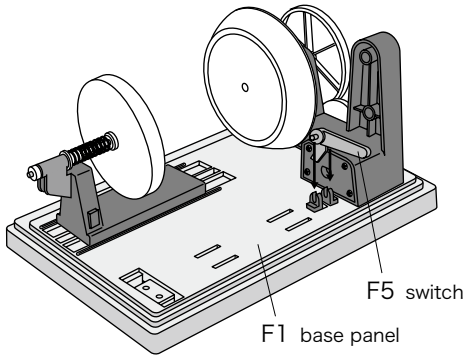
Figure — ㉒
Attach the F5 switch to the F1 base panel. (Press down until it clicks in.)



㉑ Fasten the cup holder with the F4 slide base. (Don't screw too tight.)



㉒ Attach the F5 switch.



7 Attaching Shafts to the F1 Base Panel

Parts to be used *PARTS* G ※There may be more screws than actually used for spare.

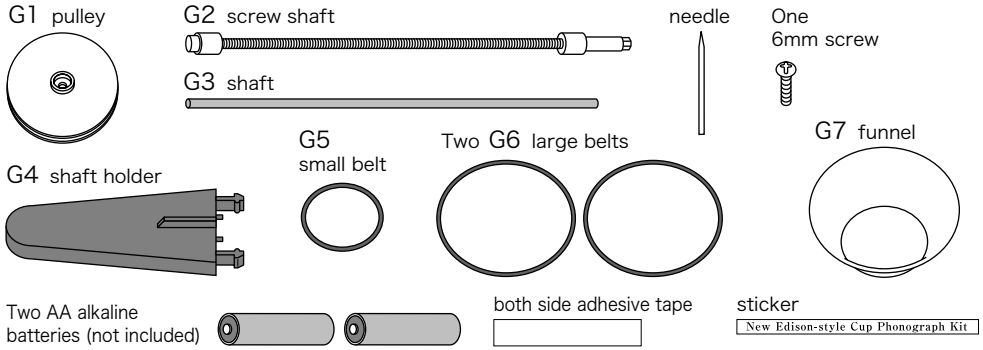
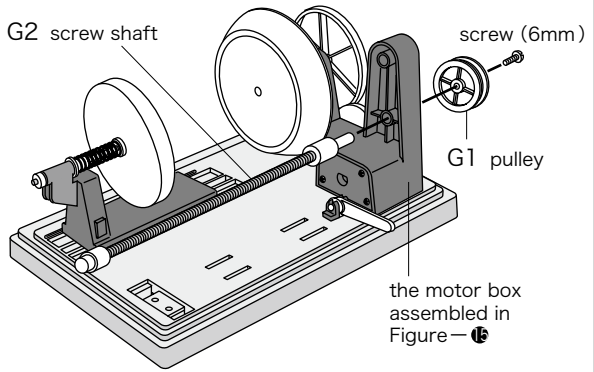


Figure — ㉓
Attach the G1 pulley and the G2 screw shaft to the motor box assembled in Figure — ⑮ with a 6mm screw.
Hold the G1 pulley not to turn when screwing.

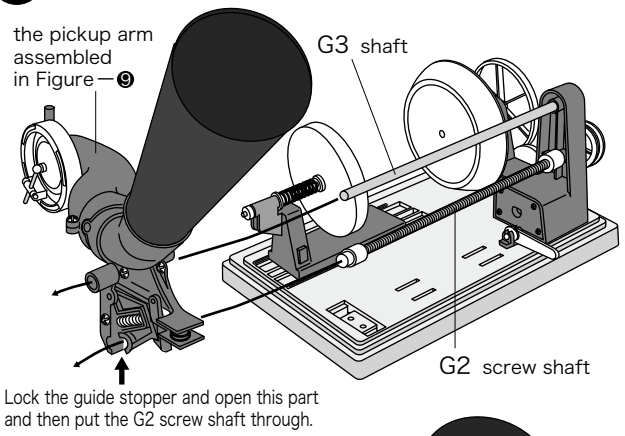
Figure — ㉔
Attach the G3 shaft to the motor box assembled in Figure — ⑮.
Then put the G3 shaft and the G2 screw shaft through the pickup arm assembled in Figure — ⑨ in the guide stopper locked condition.

Figure — ㉕
After the pickup arm was attached, fasten the shafts with the G4 shaft holder to the F3 base panel.

㉓ Attach G2 screw shaft.



㉔ Attach the pickup arm.



㉕ Fasten shafts with the G4 shaft holder.

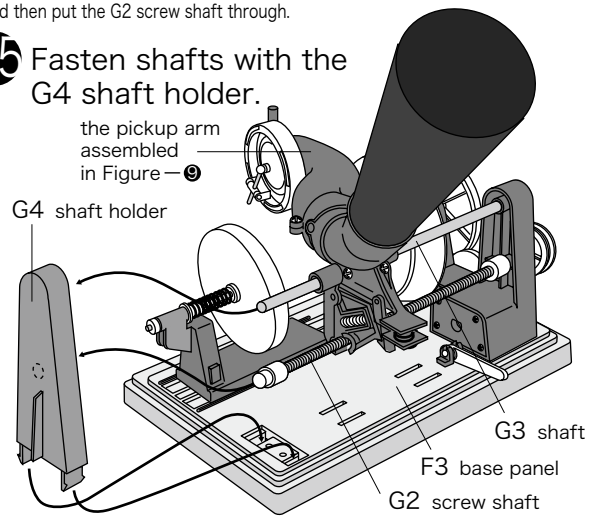


Figure — ㉖
Set the belts as shown in the right figure.
① G5 small belt
the motor and the D6 pulley
② G6 large belt
the D6 pulley and the D7 pulley
③ G6 large belt
the D7 pulley and the G1 pulley

㉖ Set the belts.

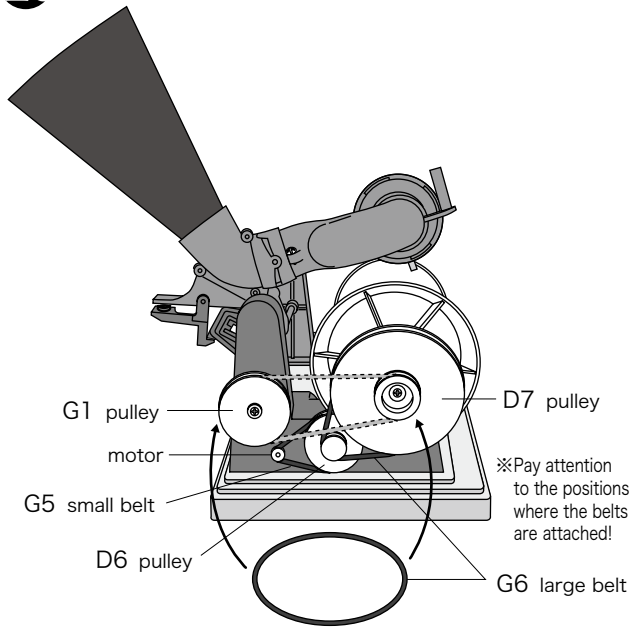


Figure — ㉗
Put new batteries in and check the motion of the motor.

㉗ Put the batteries in the right way.

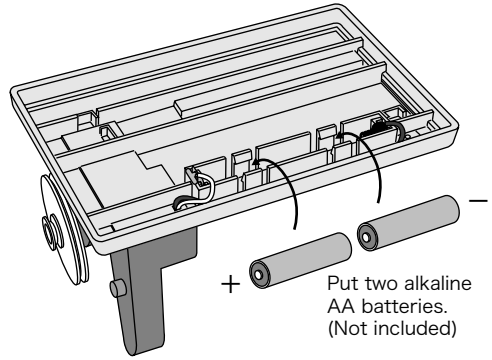


Figure — ㉘
Cut the both side adhesive tape in four pieces and stick to the four places of the G7 funnel.

㉘ Stick both side adhesive tapes to the G7 funnel.

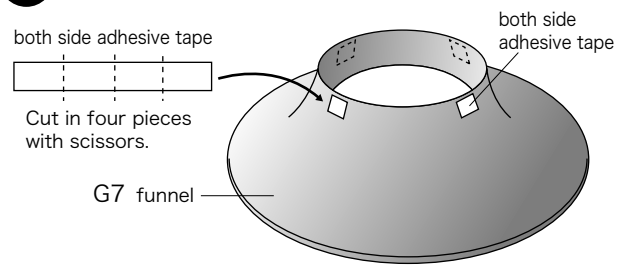
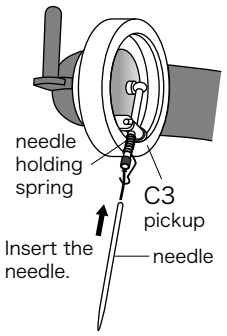


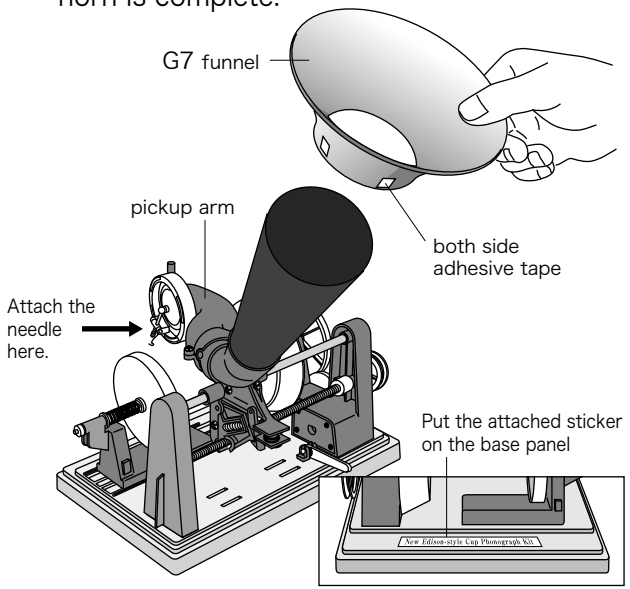
Figure — 29
Peel off the separating sheets of the both side adhesive tapes and attach the G7 funnel to the cone. Attach the needle and then put the sticker on the base panel.

How to attach the needle



Insert the needle deeply in the needle hole of the pickup hanging the needle holding spring.

29 Attach the funnel to the cone and the horn is complete.

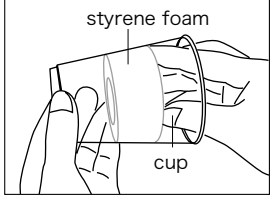


8 Recording

Figure — 30
When setting a cup, push the slide button to move the holder as shown in the figure.

In case of using a cup not in this kit

If the cup is very soft, put the styrene foam in to increase the stability.



30 How to adjust when setting the cup.

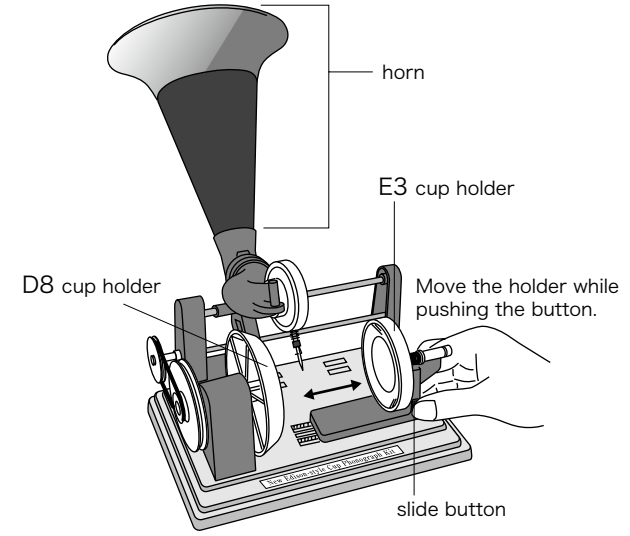


Figure — 31
Slide the E3 cup holder to fix a cup.
First, press the holder against the cup and then pull back by two cogs of the gear.

How tight a cup should be fixed

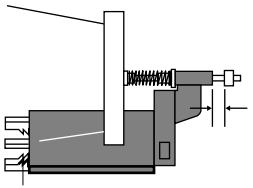
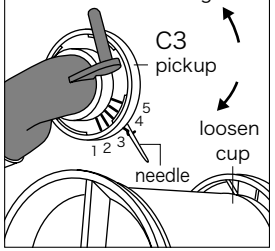
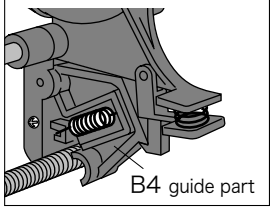


Figure — 32
Adjust the angle of the needle as shown in the figure below.
Loosen the outer ring of the C3 pickup and change the angle of the needle.
First, set it at "3".

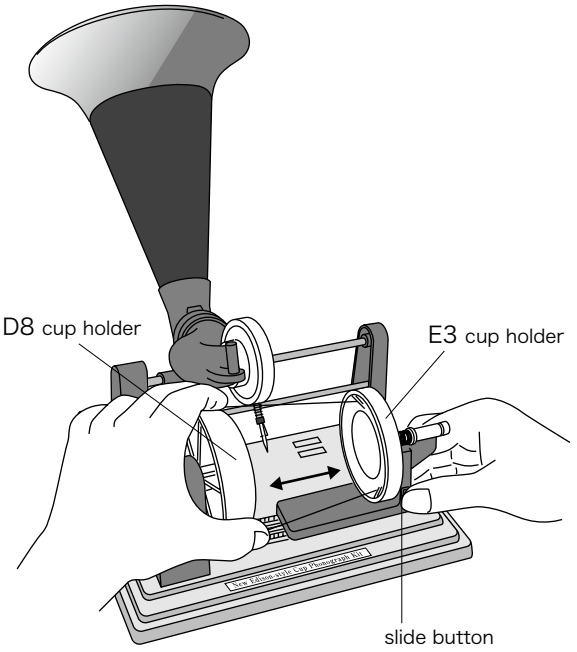
How to adjust the angle of the needle



When the stopper is on



31 Set a cup.



32 Adjust the angle of the needle.

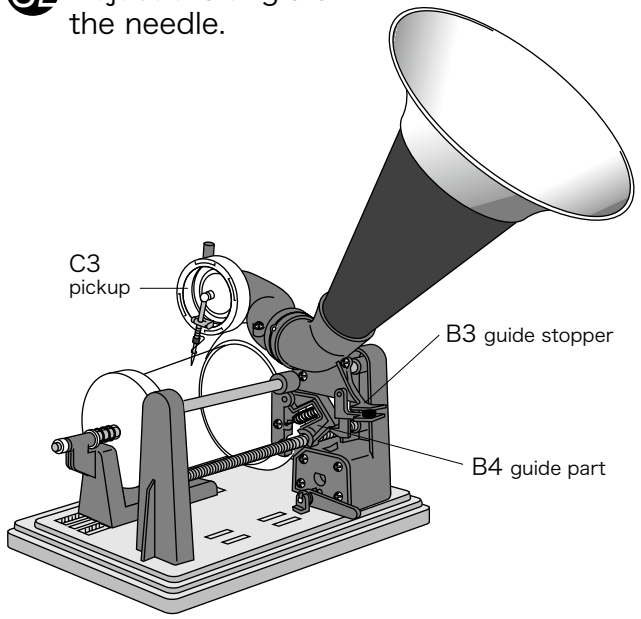


Figure — 33
Push up the B3 guide stopper lightly. Slide the pickup arm toward the motor box holding the elbow part.

33 Slide the pickup arm toward the motor box.

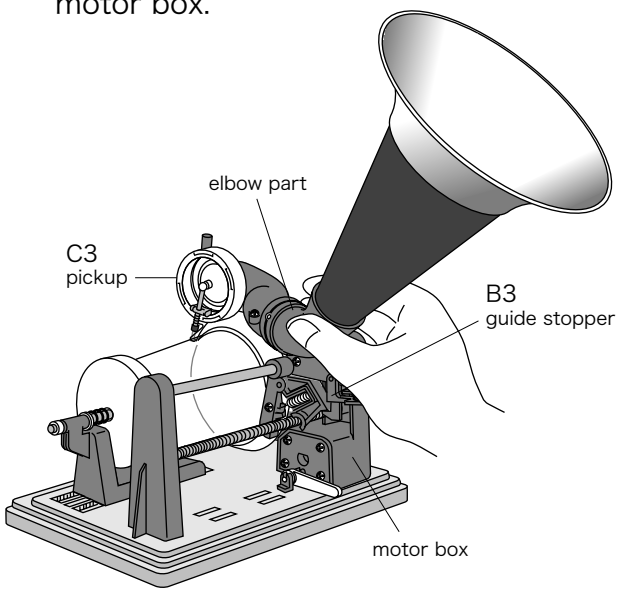
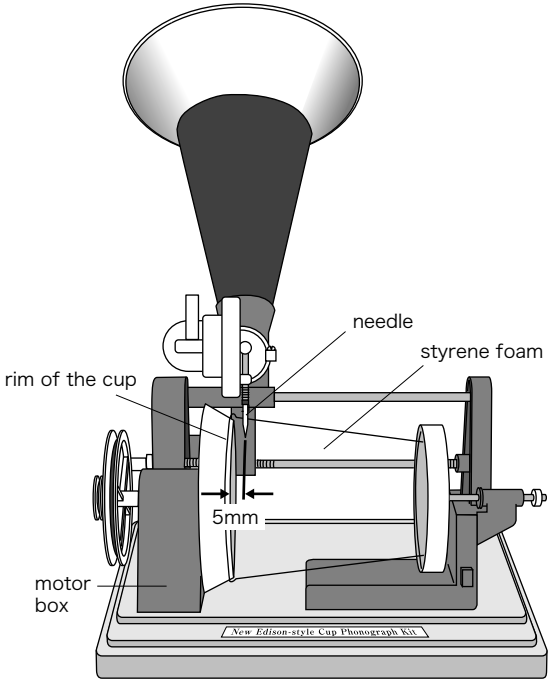


Figure — 34
Check if the needle comes to the position 5mm apart from the rim of the cup when it is placed as shown in the figure.

34 Check the point where the needle tip is placed.



In case of using a cup not in this kit

Use the part without grooves.

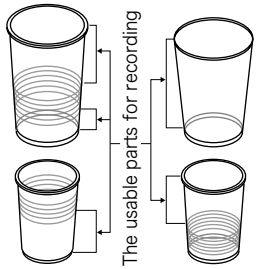


Figure — 35
Attach three weights to the pickup arm.

35 Attach three weights.

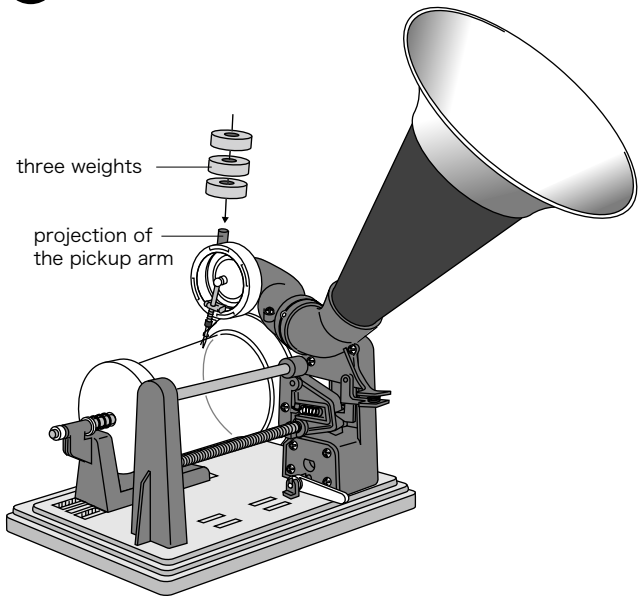
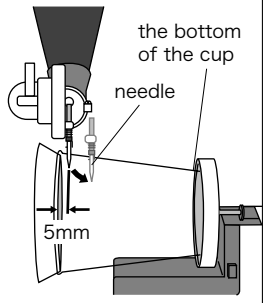


Figure — 36
Turn on the switch and start turning the cup. Pinch the B3 guide stopper to undo the stopper holding the B4 guide part and place the needle quietly. (The B4 guide part touches to the G2 screw shaft.)

How the needle moves



When putting down the needle, it starts moving flowingly toward the bottom of the cup.

36 Turn on the switch. Pinch the B3 stopper to undo the stopper holding the B4 guide part and put down the needle.

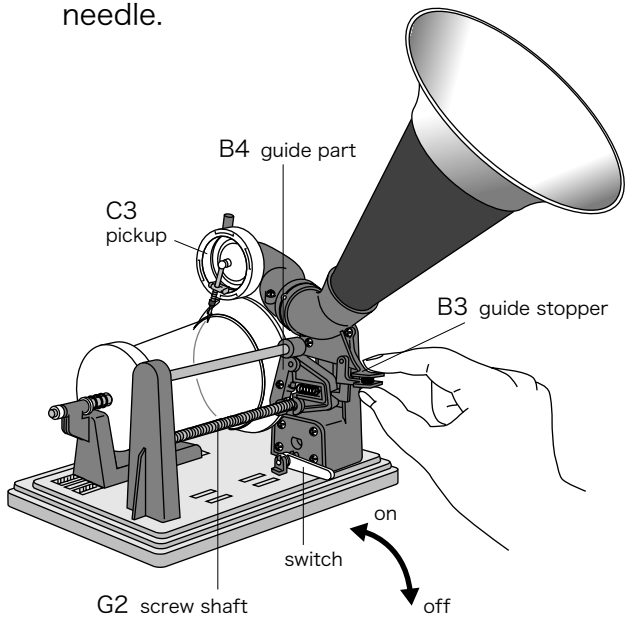


Figure — 37

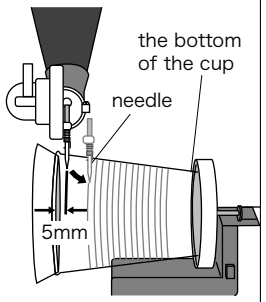
Bring your mouth as close as possible to the horn (till it almost touches the horn.) Record a message or a song in as clear voice as possible. The recording capacity of the cup in the kit is about 50 seconds.

※Do not turn off the switch during the recording. (If you once turn off the switch and start recording again, the needle may make two grooves and replay may not go successfully.)

Figure — 38

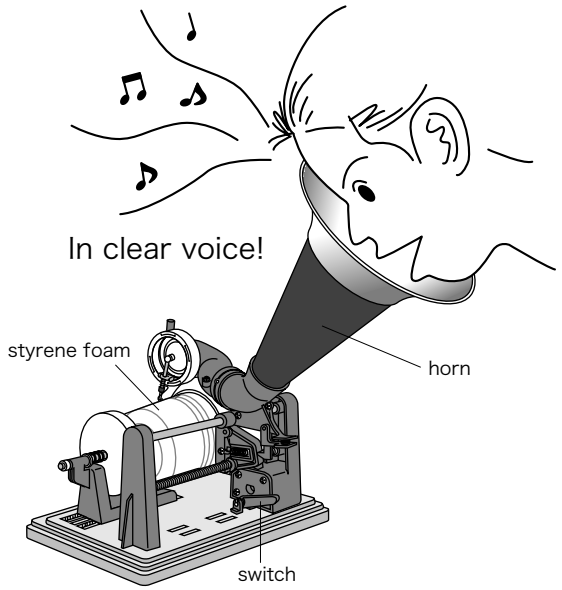
Remove two weights before replay and leave one weight only. Set the guide stopper and slide the horn toward the motor box (to the position shown in the figure).
Turn on the switch.
Release the stopper and place the needle quietly on the point recorded groove on the cup starts.

How the needle moves



When putting down the needle, it starts moving flowingly toward the bottom of the cup.

37 Recording.



38 Replay.

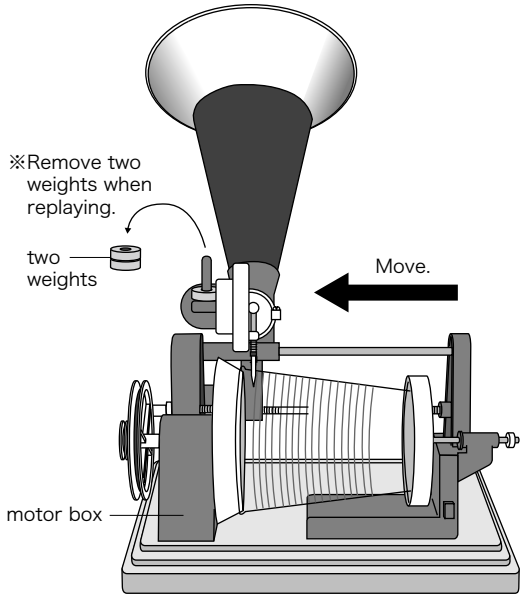


Figure — 39

When it isn't possible to record or replay, or when noise is too loud, change the angle of the needle. (Level 3 is the normal angle.) When you make the angle bigger, the groove becomes deeper and the smaller, the shallower. (Level 1 is the biggest angle and level 5 is the smallest angle.)

Figure — 40

A sewing needle can be used as a needle for this phonograph. In case you need to change a needle, insert a sewing needle after attaching the sewing needle adapter as shown in the figure.

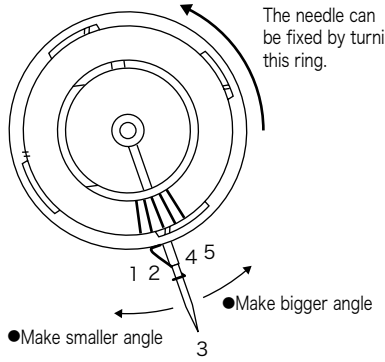
※The size of a replacement needle must be 0.84mm in diameter and 45.5mm in length.

※A needle can be used for recording normally more than thirty times, but the change of the needle is necessary in case sound quality deteriorates or the needle skips.

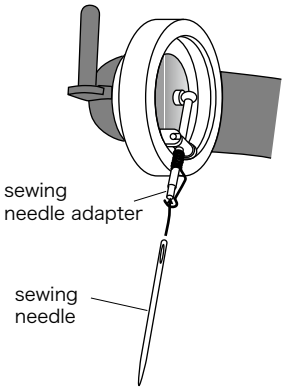
39 How to adjust the angle of the needle.

Make a bigger angle in such cases as follows:
●The sound is too small. (Or it isn't possible to replay.)
●The cup is soft. (In case using a cup not in the kit)

Make a smaller angle in such cases as follows:
●The noise is too loud.
●To improve the sound quality
●The cup is hard. (In case using a cup not in the kit)



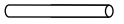
40 How to use a sewing needle.



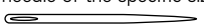
Regarding a replacement needle for use

The size of the needle must be 0.84mm in diameter and 45.5mm in length

sewing needle adapter



needle of the specific size



Trouble Shooting New Edison-style Cup Phonograph Kit

Q1:The needle doesn't start carving a groove when turning on the switch.
A1:Wait for a while. After a moment, the needle will start moving. Make sure the needle starts moving, and then record. (If it just will not start, check the direction of batteries.)
Q2:When recording, the cup doesn't turn though the D8 cup holder turns.
A2:See Figure—31 in p.19 and adjust the E3 cup holder.
Q3:The needle doesn't trace a groove when replaying.
A3:The groove might be too shallow. See Figure—39 in p.23 and adjust the angle of the needle. Then, see Figure—35 in p.21 and Figure—37 in p.22 for recording minding the number of the weights and the volume of voice.