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CAUTION! Please read the following instructions before using this kit.

Be careful of handling thin and pointed metal bars contained in this kit. Improper use may cause injury to persons.

Be careful of handling some metallic parts that are made thin and sharp functionally. Improper use may cause injury to persons.

Be careful not to swallow small parts to avoid suffocation.

Be careful not to point your hands and eyes with the screwdriver in this kit to avoid injury.

Be careful that your fingers are not caught in a machine while operation.

Do not operate the doll on a road to avoid the risk of traffic accidents.

Do not break up the mainspring. An inner spring may cause injury to persons.

Please read the assembly instructions and cautions in this booklet carefully before use. Do not use the parts that are broken or deformed.

Please handle the doll with good care. The doll may be broken if it is treated roughly. For example, do not shake it with its head down.

Be careful not to be scalded when the doll serves hot drinks.

The colors may fade out of Kimonos when it is exposed to the sun. Keep the doll with care. Do not wash the Kimonos with whites. The colors may be washed off and stain whites.

The plastic materials used in this kit

head (white):styrene body, tray, tweezers and other brown parts:styrene arms, feet and other white parts: polyacetal

guards (transparent) : polyethylene terephthalate handle of the screwdriver : polystyrene small bags (transparent) : polyethylene

 $\,{}^{\star}$ When you dispose the kit, follow the regulations of each local government. 2

The World of Karakuri Mechanical Dolls

The history of Karakuri ("Karakuri" means the mechanism that drives a machine.) automatic dolls in Japan began in the early Edo period(1603~1867). The tea-serving doll is the most typical one and it appears in the book written by Ihara Saikaku, a very popular novelist in the Edo period. This Karakuri doll kit is produced according to the "Karakuri Zui", the only existing manual of Karakuri mechanical dolls written in 1796 by

Hosokawa Hanzo, popularly known as Karakuri Hanzo who was an engineer of Tosa domain. Karakuri dolls can be said to be one of the original foams of modern robots. Please enjoy the beauty of Japanese craftsmanship of those days by assembling this kit.













Attach four screw F's to the bottom parts of the escapement.



Now the left body is completed!

You've finished installing the escapement to the left body. Look at the figure to make sure that the escapement is correctly attached.



The roll of the escapement

The main components of the escapement are two cylindrical parts with pallets attached on the upper part of the shaft. The escapement controls the speed of the rotation by hanging the pallets on the wheels. The heavier are the sheet weights around the bottom parts of the shaft, the more slowly the wheel rotates, and the lighter, the faster.













5

Put the mainspring shaft through the rotary plate first, then though the large wheel in the direction as shown in the figure.



Put the rubber band into the mainspring shaft to the end so that the parts don't come apart.













Make Fine Adjustments to each part

Before your performance in front of guests, test a couple of times and grasp how each part works, how long the doll moves and how it turns. Then make fine adjustments to each action as follows if necessary.



Check the Move of the Doll

If the doll moves as follows, you've made good adjustments. Check it now!



Make the Final Adjustment Before your Performance

When you finish the adjustments on p.22, make the final adjustment before you show the doll to your guest.(This adjustment is possible after the doll is dressed. In that case, pull the hakama

up.) Adjust the distance between the starting point and where the doll bows in front of your guest.



When you wind up the mainspring, the adjuster at the rotary plate comes to 2 the position shown in the figure below. Turn the rotary plate clockwise and change the position to suite the distance between you and the guest. (The more you turn, the less the distance becomes. Take a look at the figure

below and adjust the distance.)

Be sure to turn the rotary plate always clockwise.

When the mainspring is wound, the adjuster comes to this position. The doll goes straight about 90 cm (the longest) if you set the doll in motion in this condition.

When the adjuster is at this position, the doll goes straight about 45 cm.

Note: Keep the screw of the adjuster as it is. (Do not loosen it and change the position of the adjuster itself.)

If the doll doesn't move successfully after all adjustments, check the following points.

The doll starts right after you wind up the mainspring without putting the teacup on the tray. The tension spring (middle) might not be working well. Knot the string twice and make the loop smaller or change the tension spring (middle) with a spare.

The doll doesn't go straight after the turn. The tension spring (small) might not be working well. Knot the string twice and make the loop smaller or change the tension spring (small) with a spare.

The doll bows from the beginning. The tension spring (large) might not be working well. Knot the string twice and make the loop smaller or change the tension spring (large) with a spare.

The doll doesn't make a bow at all. If the doll is dressed already and if it is too tight around the neck, the doll can't bow. In this case, loosen the Kimono a little so that the doll can move the neck.

How to Dress the Doll

Before you start dressing

Put on guards (upper and lower) beforehand so that the dress is not caught in wheels.

guard (upper) guard (lower) Pay attention to the direction

Dress the kimono tops.

1. Cut a both side adhesive tape into 10cm. Put it on the inside of the back margin of the kimono top 1 (the left side when you face it).

2. Put each arm through sleeves of the kimono top 1 and the 2. Peel the thin paper from the adhesive tape and paste the both sides of kimono tops together at the back. Align the collars of



2 Dress the hakama skirt.

1. Unfold the hakama skirt and put through the doll from the bottom. Bring the front laces back and tie them at the back.(Tie the laces at the height as shown: in the figure below. Adjust the skirt so that the insteps come out a little bit.)



3 Dress the chanchanko vest.

Take off the head. Turn the vest upside down and put the both arms through sleeve holes as shown in the figure. Dress the vest as it covers the neck. Tie the laces. (If the front knot comes out forward. fasten with an adhesive tape.) and dress the Put the head on again. Now chanchanko vest. you've finished!

2. Bring the back laces to the front and tie them at the front. (Cover the back knot with the hakama skirt Make the back part higher and the front part lower.) Check the collar, the nape, the neckline and the position of the hakama skirt. If they are all right, cut the rest of the adhesive tape and fasten the front with it.



Tie the

front laces.

Take off the head

Note: If the front is crossed too tight, the doll can't bow. Check if the neck can move back and forth before you fasten the front with a tape.

Finished!

Attach the tray. Be careful that the front laces do not touch the tray. 25

Mechanisms of the Karakuri Mechanical Doll

What mechanisms make this doll move?

This karakuri doll is basically modeled after the mechanisms described in the "Karakuri Zui". The very best technologies of the Edo period(1603~1867) are applied to the mechanisms of the doll.

No.1 wheel

The mechanism of a start and a stop What takes on the switching system for a start and a stop is the auto-adjustment pin connected with the arms. (The ⓐ in the figure of the "Karakuri Zui") When you put the teacup on the tray, the arms go down and the pin goes up. This pin plays the role of the stopper for the cogwheel. When the pin goes up, the stopper becomes off and the cogwheel starts turning. When you take the teacup, the arms go up and the stopper works and the cogwheel stops.



No.2 wheel

The mechanism of going straight

When the mainspring loosens, it generates power. This power first effects on the No.1 wheel. This wheel has 80 cogs. The power is transmitted to the No.2 wheel, and it has 12 cogs. Based on the calculation, the No.2 wheel turns about 7 times while No.1 wheel turns once. After 5 turns, however, the projection at the rotary plate begins to push the front wheel. The doll moves about 18 cm while the No.2 wheel turns once, so it goes straight about 90 cm long before the projection catches the front wheel (and the doll begins to turn). For the mainspring, the "Karakuri Zui" specifies that a whale fin should be used.

The mechanism of a turn

What takes on a turn is the little wheel at the bottom. The angle of the wheel decides the course of the doll just like the front wheel of a tricycle determines its route. The angle of the wheel changes by being pushed by the rotary plate. The doll continues to turn right while the wheel is pushed. When the front wheel connector gets off the projection, the wheel goes back to the former position and the doll goes straight. You can control the angle of the turn by adjusting the projection. The mechanism of a bow

This doll makes a bow politely when it brings a cup of tea to the guest. What a charming action it is! The part that controls this action is the rotary plate. When the projection catches the part extended from the neck, the front of the neck is pulled and the head goes down. When the projection gets out of the place, the neck is released and the head goes back to the former position. Since the rotary plate also controls the front wheel, the doll always makes a bow before it makes a turn coordinately.





The mechanism of adjusting the speed

What controls the speed is a cogwheel at the back part called "gyojirin". (See the picture.) Being caught in the cogwheel, the two stoppers at the escapement controls the rotation. The technology used for the escapement of a Japanese clock is applied to this mechanism. The sheet weights around the speed control bar have made the finer speed control possible.

The mechanism of the shuffle walk

While the doll is moving, its feet move back and forth. It looks as if the doll conforms to the manners of the tea ceremony and shuffles forward. This unique walk style is realized by the crank movement made by the pivots controlling the move of each foot, since their shafts are not aligned with the center of the driving wheels. The "Karakuri Zui" instructs that the left pivot should be attached forward and right pivot backward.

