

10. MECHANISM DESCRIPTION

● Features

The twin-tray system mechanism incorporated in this unit has the following two main features.

The first is that loading motor for driving the trays is the same used with the conventional single tray system, and only one motor is used. This allows for the configuration of a twin tray system CD player at a low cost. Also because almost the same control circuit for driving loading motor as used for single tray CD players can be used, this also contributes to reducing costs.

The second feature is the reduction in space provided by having the trays stacked over top of each other. Because this allows for the same parts arrangement (electrical system board on right and mechanism on left as seen from front panel) as conventional single tray CD players, our know-how of these units can be directly applied.

● Movement Range of Trays

As shown in Fig. 10-1, tray is attached to the slider by two screws ⑧. Slider moves over the groove in the slid angle. Because it is impossible to provide the distance that tray must move (from OPEN position to PLAY position) by the movement which slide angle is capable of, the operation of the linear gear ① attached to loading base, synchronous gear attached to slide angle, and the linear gear section ③ of the tray, doubles the movement distance of slide angle to allow movement of tray. The principles of operation are as follows. When slide angle moves in the horizontal direction (forward and back direction), synchronous gear rotates to move tray by the same amount that slide angle was moved.

As can be seen in Fig. 10-1, the position of tray has moved twice the distance ② that slide angle travelled, when compared with the position of tray before movement of slide angle. (The same applies to both tray 1 and tray 2.)

As shown in Fig. 10-2, slide angle U and slide angle L have shafts ① and ③ and shafts ④ and ⑥ respectively, and E-rings ⑦ and washers ⑧ are used to attach these angles to loading base.

Thus, slide angle U and slide angle L move along grooves ① and ③.

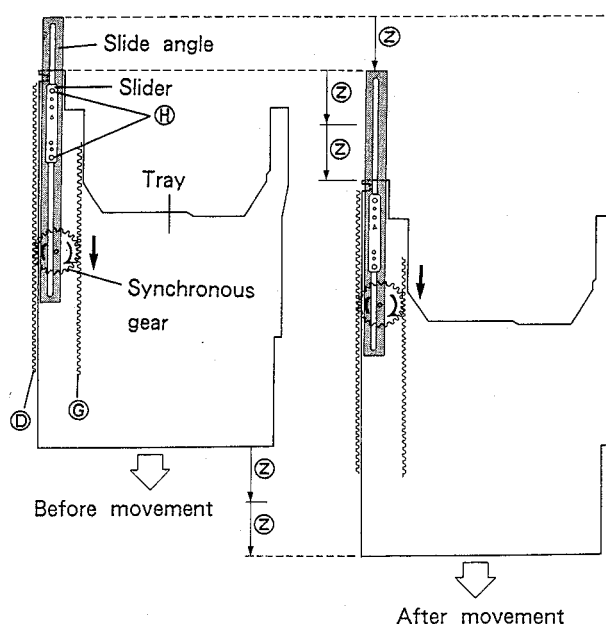


Fig. 10-1.

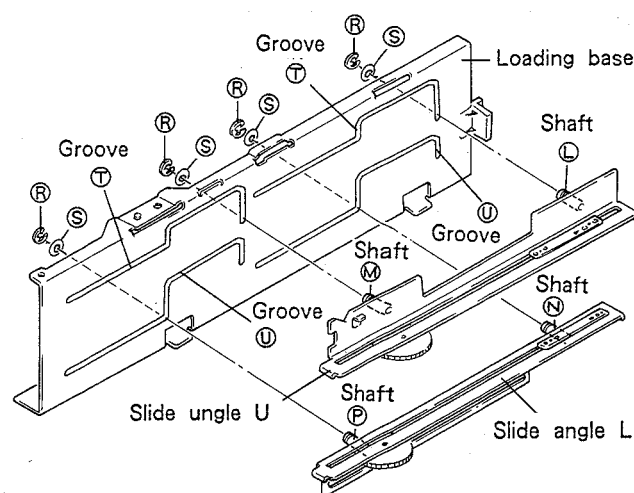


Fig. 10-2.

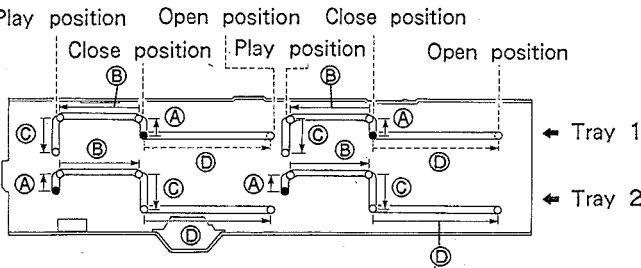
● Relationship between slide angle shaft movement range and tray movement range

In order to save space, the twin-tray system mechanism of this unit synchronizes the movement of the two trays, except when they are opened and closed independently (refer to page 72 regarding opening and closing).
Tray 1 and tray 2 stop at the play position, close position, and open position, and in either position both trays never stop at the same position at the same time.

Fig. 10-3 shows an example of tray 1 going from the close position to the play position and tray 2 from the play position to the close position (tray swapping operation).

- 1. Tray 2 rises distance ① from the play position. At this time, movement of tray 1 is synchronized to tray 2, and it rises the same distance of ① from the close position.
- 2. In order that tray 2 and tray 1 swap positions, both move a distance equivalent to twice distance ②. (This is performed by the 2× stroke mechanism formed by synchronous gear, trays, and loading base linear gear section.)
- 3. Tray 1 drops a distance of ③ from over top of the play position and tray 2 drops the same distance synchronized to it.

The above describes the tray swapping operation. When at the open position, the tray moves a distance of twice distance ④ from the close position.



*Initial position • → After replacing
Tray 1 : CLOSE Tray 1 : PLAY
Tray 2 : PLAY Tray 2 : CLOSE

*Horizontal movement range
Tray movement.....Moving range of slide angle shaft : ②×2
(④×2)

Fig. 10-3.

● Power transmission route from loading motor

The power transmission route is shown in Fig. 10-4. The rotation of the loading motor is transferred by rubber belt, gear pulley, and gear, and is transmitted to the linear gear section ③ of rack U and rack L positioned above and below the gear. Because rack U and rack L are positioned above and below gear, there is synchronized opposing movement to the left and right when the gear rotates. This movement to the left and right (front and back directions when seen from the front panel) is used to drive the two trays.

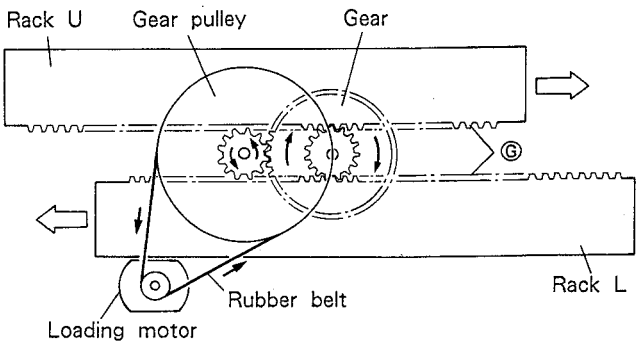


Fig. 10-4.

• Operation of rack U and rack L

Fig. 10-5 shows the racks and areas around the switch lever.

The racks change the linear movement in the right and left directions into the complex movement of the trays by grooves \textcircled{F} , \textcircled{G} , \textcircled{H} , and \textcircled{J} on the reverse side and grooves \textcircled{I} and \textcircled{U} in loading base, as shown in Fig. 10-6. Grooves \textcircled{K} , \textcircled{V} , \textcircled{W} , and \textcircled{Z} on the front side control the SW board ass'y switches (U, S, and L).

At the same time, the protruding section of switch lever S disengages the linear gear section of the rack from the gear at the play position so allow one of the trays to be opened/closed while the other tray is at the play position.

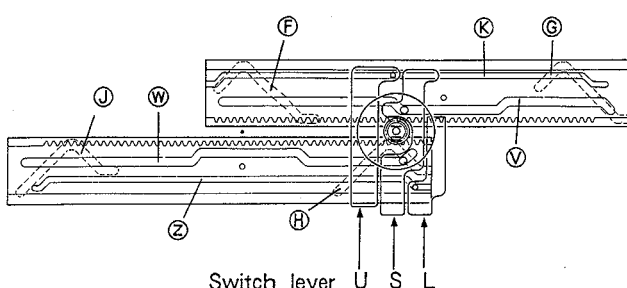


Fig. 10-5.

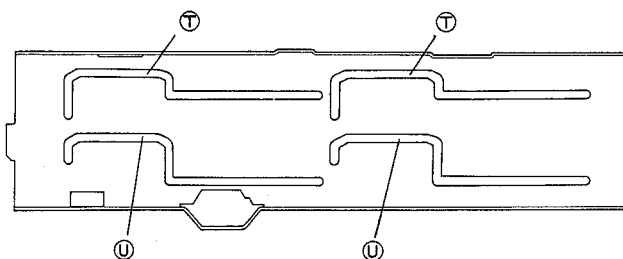


Fig. 10-6.

Fig. 10-7 through Fig. 10-10 show movement of tray 2 from the play position to the close position and tray 1 from the close position to the play position by the linear movement of rack U and rack L.

1. From the state shown in Fig. 10-7, racks U and L move in the directions of arrows $\textcircled{2}$ and $\textcircled{1}$ respectively.

This causes sections \textcircled{F} and \textcircled{G} of the racks and inclined grooves at \textcircled{H} and \textcircled{J} to push slide angle shafts \textcircled{L} , \textcircled{M} , \textcircled{N} , and \textcircled{P} .

2. When rack U and rack L move in the directions of the arrows $\textcircled{2}$ and $\textcircled{1}$ respectively, the force dispersed in the \textcircled{X} direction and the \textcircled{Y} direction shown in Fig. 10-8 acts on slide angle shafts \textcircled{L} , \textcircled{M} , \textcircled{N} , and \textcircled{P} .

However, because it is impossible to move forward in the \textcircled{X} direction, there is only movement in the \textcircled{Y} direction (upwards) and shafts \textcircled{L} , \textcircled{M} , \textcircled{N} , and \textcircled{P} rise while climbing the inclined sections of the grooves.

3. In Fig. 10-9, there is parallel movement pressing against the grooves for movement from $\textcircled{Q1}$ to $\textcircled{Q2}$, $\textcircled{R1}$ to $\textcircled{R2}$, $\textcircled{S1}$ to $\textcircled{S2}$, and $\textcircled{V1}$ to $\textcircled{V2}$.
4. When points $\textcircled{Q2}$, $\textcircled{R2}$, $\textcircled{S2}$, and $\textcircled{V2}$ are passed, the rack movement is dropping along the inclined section of the grooves as shown in Fig. 10-10.

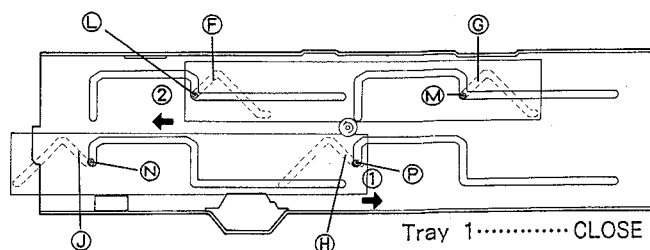


Fig. 10-7.

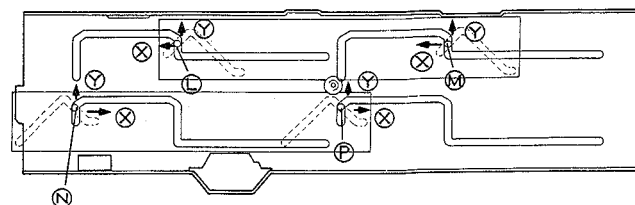


Fig. 10-8.

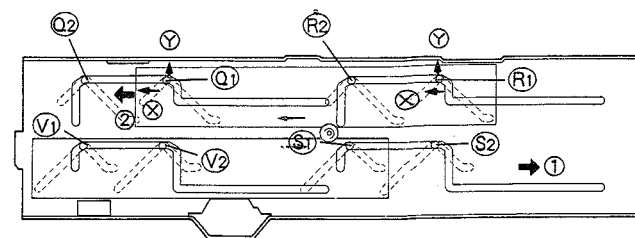


Fig. 10-9.

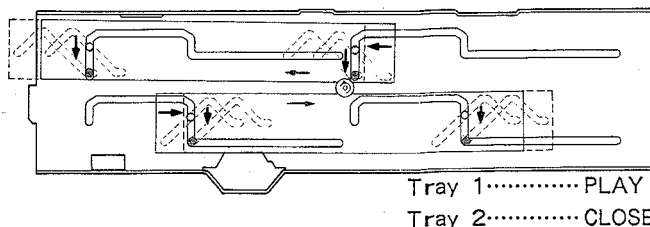


Fig. 10-10.

● Measures taken for opening/closing

As described above, rack U and rack L positioned above and below the gear have synchronized movement.

However, when one of the trays is in the play position and the other tray is opened or closed, there would be a problem with the two trays moving together.

This problem is solved by disengaging the linear gear section of the rack driving the tray at the play position from the gear.

Fig. 10-11 shows the positions of rack U and rack L and the position of switch lever S when tray 2 is in the play position and tray 1 is in the close position. There are protruding sections at ④ and ⑤ of switch lever S, and these are inserted in grooves ⑥ and ⑦ on the front side of racks U and L.

As shown in Fig. 10-12, when rack L (tray 2) is at the play position, the linear gear section of rack L is only touching the gear (section ⑧), and rack L cannot move forward under its own force.

When tray 1 is opened or closed in this state, it is necessary to completely separate the linear gear section of rack L from the gear as there is the danger of contact with the gear.

The protruding sections of rack U and switch lever S are used to separate the gear section of rack L from the gear.

When tray 1 is moved towards the open position and rack U moves in the direction ①, protruding section ④ inserted in the groove ⑥ of rack U is pushed in the direction ② while climbing the inclined section of the groove. The protruding section ⑤ inserted into the groove of the rack L is synchronized to this movement and moves up.

This causes a force pushing rack L in the direction ③ (play position direction) to act upon the inclined section of the groove of rack L, and allows for complete separation of the rack L gear section from the gear (At this time disc does not come in contact with the tray.).

When the close and play positions of rack U and rack L are swapped, ④ is pushed down and ⑤ is synchronized to it and moves down. This causes rack L to be pulled in towards the gear side. In this manner, the gear section of rack L is engaged with the gear again.

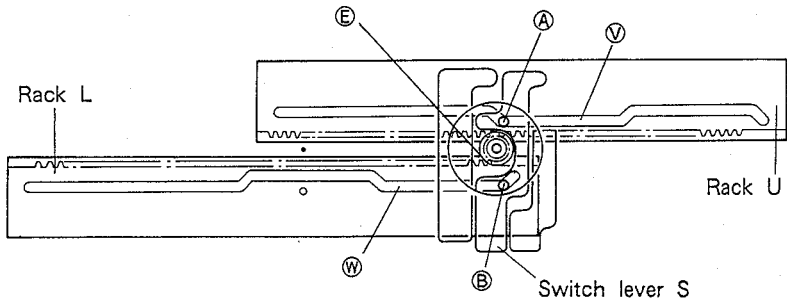


Fig. 10-11.

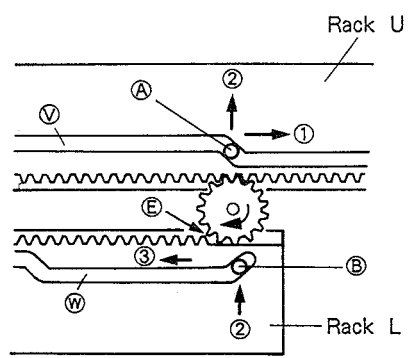


Fig. 10-12.

● Detection Method for Tray Position

The positions of tray 1 and tray 2 are detected by Pins ②④, ②⑤, and ②⑥ of the system control microcomputer IC6 (PD4184) installed in this unit. The current position of the trays is detected by the "H" and "L" combinations at these pins, and the loading motor is controlled accordingly.

Table 10-1 shows the status of the various pins and the corresponding status of tray 1 and tray 2. The positions of trays 1 and 2 are shown in Fig. 10-13. The status of Pins ②④, ②⑤, and ②⑥ of the system control microcomputer (PD4184) is created according to the ON/OFF status of the SW board ass'y switches (U, S, and L) attached to the loading base ass'y. Because Pins ②④, ②⑤, and ②⑥ are pulled up to 5V by the R146, R147, and R149 resistors, the status is "H" when the switches (U, S, and L) are OFF (lever not pressed).

These position detection switches (U, S, and L) are switched ON/OFF by the up and down movement of ㊶ (switch lever U), ㊷ (switch lever S), and ㊸ (switch lever L) shown in Fig. 10-14. The switch is ON when the switch lever is moved down. There are protruding sections ㊶, ㊷, ㊸, and ㊹ on these switch levers, and these are inserted into grooves ㊶, ㊷, ㊸, and ㊹ on the front side of rack U and rack L.

Because the grooves in these racks change height according to the positions of rack U and rack L, the height of the switch levers (U, S, and L) also changes accordingly. Fig. 10-15 through Fig. 10-17 show the state of the various sections as trays move.

As described above, switch lever S also has the function of separating the linear gear section of the rack (rack driving tray at play position) from the gear.

		TRAY1	TRAY2	TRY1 (Pin ②④)	TSEL (Pin ②⑤)	TRY2 (Pin ②⑥)	Remarks
MECHANISM POSITION	①	OPEN	PLAY	L	H	L	When tray 2 is at play position, indicates that tray 1 has arrived in open position from close position.
	②	OPEN/ CLOSE	PLAY	H	H	L	When tray 2 is at play position, indicates that tray 1 is between close position and open position.
	③	CLOSE	PLAY	H	L	L	When tray 2 is at play position, indicates that tray 1 is at close position.
	④	CHANGE	CHANGE	H	L	H	When there is transition from ④ to ⑤, indicates that there is movement in progress with tray 1 to play position and tray 2 to close position.
	⑤	CHANGE	CHANGE	H	H	H	When there is transition from ⑤ to ④, indicates that there is movement in progress with tray 1 to close position and tray 2 to play position.
	⑥	PLAY	CLOSE	L	H	H	Indicates that tray 1 is at play position and tray 2 at close position.
	⑦	PLAY	OPEN/ CLOSE	L	L	H	When tray 1 is at play position, indicates that tray 2 is between close position and open position.
	⑧	PLAY	OPEN	L	L	L	When tray 1 is at play position, indicates that tray 2 has arrived in open position.

Table 10-1.

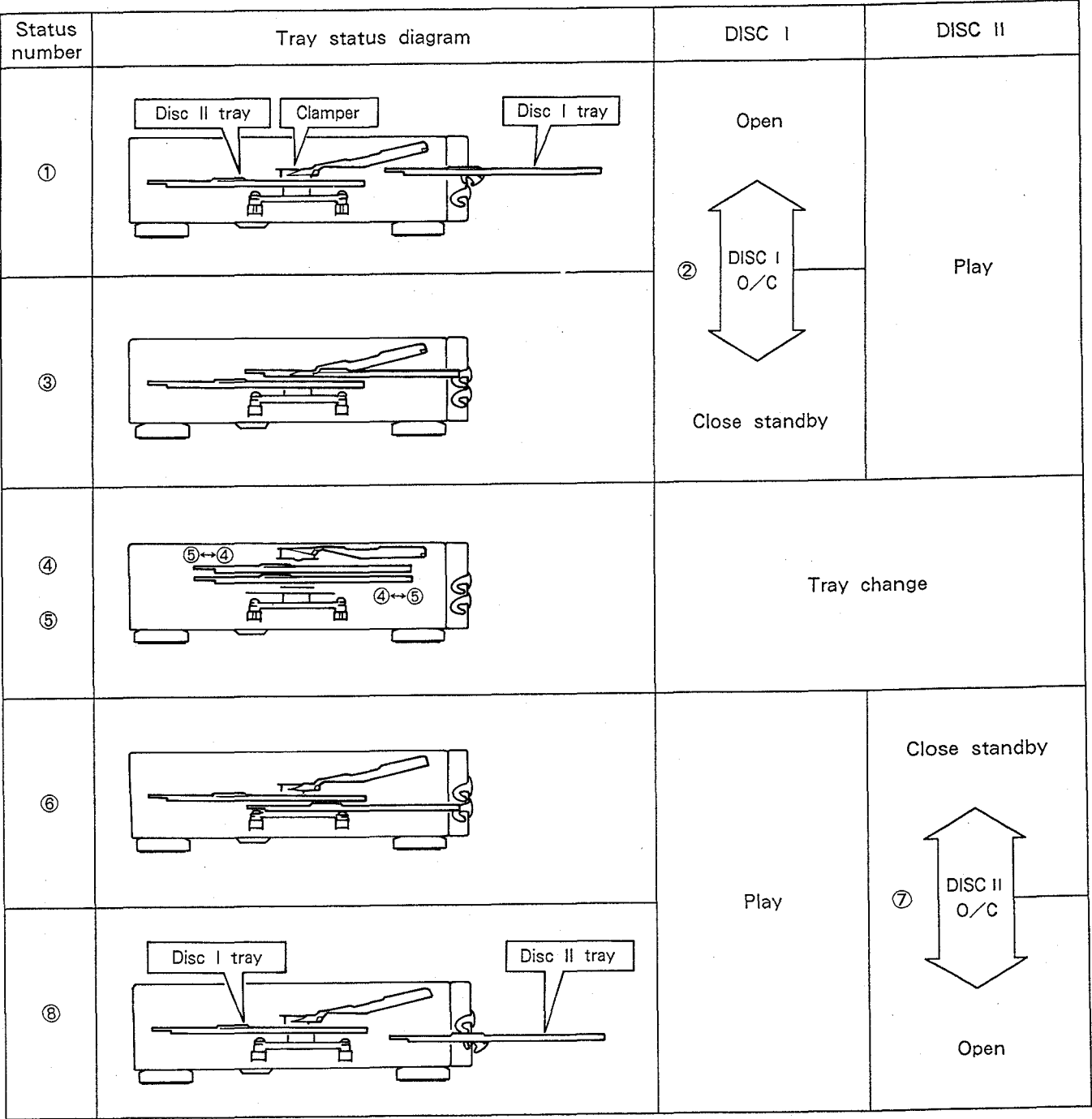


Fig. 10-13. Twin-Tray Operation Description Diagram

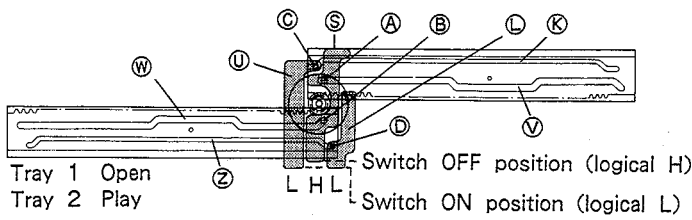


Fig. 10-14.

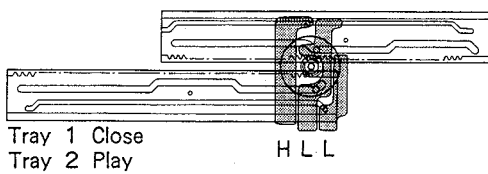


Fig. 10-15.

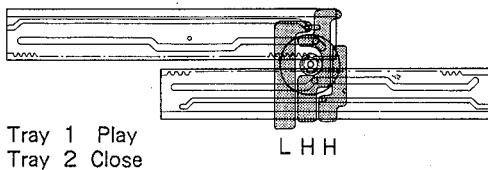


Fig. 10-16.

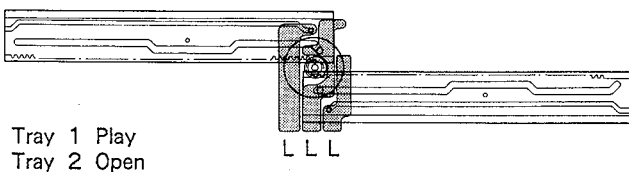


Fig. 10-17.

• Clamber holder operation

Only during clamping (tray at play position), clamber holder stops in the state that the ⑩ section of clamber holder is positioned over the upper surface section ⑪ of the gear on loading base, as shown in Fig 10-18.

This means that there is no contact with the slid angle U ① even if tray 1 is opened or closed.

• Clamber holder stopper

This unit is shipped with tray 2 at the play position and tray 1 at the close position.

A stopper to prevent up/down movement is attached at section ⑭ of the slid angle U in Fig. 10-18 to prevent clamber holder from moving up or down due to vibration during transport.

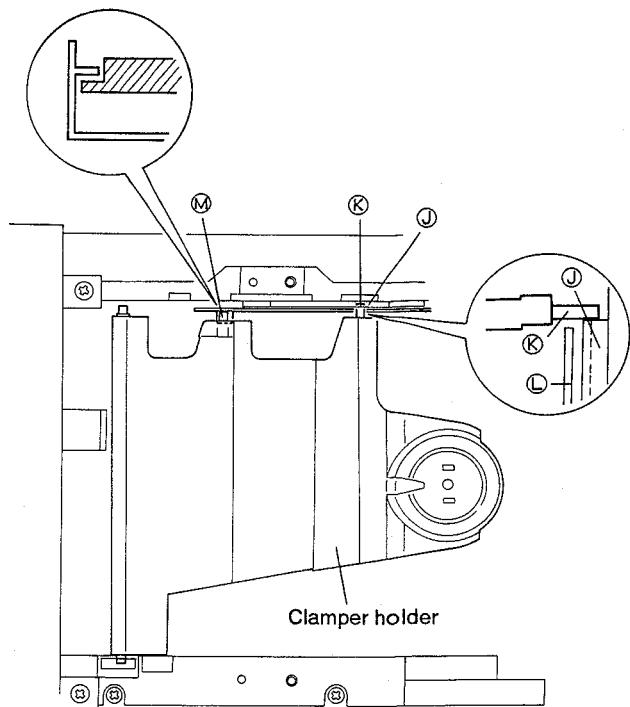


Fig. 10-18.