

Reach-In Refrigerating Food Case for Convenience Store

Daisuke Sugimoto

1. Introduction

If walking in a city or driving through the suburbs, one will soon encounter convenience stores. In fact, the total number of convenience stores in Japan has remarkably increased over the last several years and even today high growth continues owing to the convenience of these 24 hour stores and the diverse line of goods they carry to meet the needs of present-day society.

Such high growth has led to serious competition among stores, not only with regard to the display of goods, product line and sales methods, but also to reduce total costs including equipment and installation costs.

Responding to such market needs, Fuji Electric has developed and introduced to the market a new series with 10 models of reach-in refrigerating food case for convenience stores that are being accepted popularly.

A summary is presented in the following paragraphs. (See Fig. 1)

Fig. 1 External view of a FG-series reach-in refrigerating food case



2. Overview of the Reach-In Refrigerating Food Case

The FG-series of reach-in refrigerating food case were developed with the goal of providing “reliable technology that is easy to use”.

Consideration was given to the appropriate size, function and design to effectively utilize the small spaces in convenience stores, with emphasis on easy installation and maintenance to cope with the 24 hour operation of these stores.

2.1 Classification of the reach-in refrigerating food case

The FG-series of the reach-in refrigerating food case are classified according to their usage and model type as follows.

2.1.1 Usage

- (1) Freezing :
frozen foods, ice cream; -18°C or lower
- (2) Refrigeration :
raw meat, raw fish; -2 to $+2^{\circ}\text{C}$
daily delivered goods, dairy goods; 0 to 10°C

2.1.2 Model types

- (a) Thick freezer case with 2 or 3 doors
- (b) Thin freezer case with 2 or 3 doors
- (c) Thick refrigerator case with 2 or 3 doors
- (d) Thin refrigerator case with 2 or 3 doors
- (e) Sliding backdoor refrigerator case with 2 or 3 doors

There are a total of 10 model types.

2.1.3 Specifications and construction

The main specifications are shown in Table 1 and schematic diagrams are shown in Fig. 2.

3. Features of the Reach-In Refrigerating Food Case

3.1 Standard features for the entire FG-series

- (1) A substitute for chloro-fluorocarbon is used in all 10 models.
- (2) A large sized glass heater is used on the wide opening doors so that the goods inside the case are clearly visible and attractively displayed through the unblurred doors.

Table 1 Specifications of the FG-series reach-in refrigerating food case

Type Usage		FG75AN -2CRC	FG75AN -3CRC	FG60AN -2CRC	FG60AN -3CRC	FG75MN -2CRC	FG75MN -3CRC	FG60MN -2CRC	FG60MN -3CRC	FG75MS -2CRC	FG75MS -3CRC
		Frozen foods/ice cream		Frozen foods/ice cream		Meat/fish		Meat/fish		Dairy products	
Operating temperature (°C)		- 18 or less		- 18 or less		- 2 to 2		- 2 to 2		0 to 10	
Effective capacity (L)		1,074	1,610	763	1,143	1,093	1,638	773	1,158	1,093	1,638
Displaying area (5 shelves) (m ²)		4.4	6.6	3.1	4.6	4.4	6.6	3.1	4.6	4.4	6.6
Load (kg)		285	420	230	345	265	400	230	345	290	430
Drainage diameter		30A		30A		30A		30A		30A	
External size	Overall height (mm)	1,900		1,900		1,900		1,900		1,900	
	Overall width (mm)	1,430	2,145	1,430	2,145	1,430	2,145	1,430	2,145	1,430	2,145
	Length (mm)	755		605		755		605		807	
	Number of doors	2	3	2	3	2	3	2	3	2	3
	Door size (mm)	700×1,600		700×1,600		700×1,600		700×1,600		700×1,600	
Electrical system	Lighting (W) (A)	60×3 2.0	60×4 2.7	60×3 2.0	60×4 2.7	65×3 3.9	65×4 5.2	65×3 3.9	65×4 5.2	65×3 3.9	65×4 5.2
	Fan motor (W) (A)	68 0.7	102 1.0	68 0.7	102 1.0	68 0.7	68 0.7	68 0.7	68 0.7	68 0.7	102 1.0
	Dew protection heater (W) (A)	727 7.3	1,091 10.9	722 7.3	1,088 10.8	448 4.5	672 6.7	448 4.5	672 6.7	514 5.1	772 7.7
	Drain-pan heater (W) (A)	150 1.5	225 2.3	150 1.5	225 2.3	—	—	—	—	—	—
	1φ 100V total (W) (A)	1,125 11.9	1,658 16.9	1,120 11.5	1,655 16.8	711 9.1	1,000 12.6	711 9.1	1,000 12.6	777 10.1	1,134 13.9
	3φ 200V defrost heater (W) (A)	300×3 2.5	450×3 3.9	300×3 2.5	450×3 3.9	—	—	—	—	—	—
Freezing capacity	Required freezing capacity (kcal/h)	900	1,200	900	1,200	450	650	450	650	650	970
	Evaporation temperature (°C)	- 40		- 40		- 10		- 10		- 10	
	Coolant	R-22		R-22		R-22		R-22		R-22	
	PipingLiquid pipe	φ9.53		φ9.53		φ9.53		φ9.53		φ9.53	
	Suction pipe	φ15.88		φ15.88		φ12.7		φ12.7		φ12.7	
	Defrosting methods	Electric heater		Electric heater		Off-cycle		Off-cycle		Off-cycle	

- (3) The large inner capacity and variable pitches of the shelves make it possible to display many kinds of goods in various ways.
- (4) Utilizing a long-size fluorescent light with a special stabilizer, the inner space is illuminated brightly and evenly.
- (5) Because the case is closed it is influenced little from the external air and is economical owing to the high cooling efficiency.
- (6) All 10 models share a refined design and can form a unified lineup to satisfy the various arrangements in each store. Further, the construction having 2 separate and adjustable kickplates eliminates the space between the cases and the floor, integrating the showcases into the store's interior design.
- (7) The cold air inlet is constructed with a detachable return grill which allows easy cleaning.
- (8) The reversible construction of the glass doors makes changing the door hinges to either the left

or right side easy, as possibly required by changes in the store lay out. The horizontal door line can also be adjusted easily by means of the attached door height adjuster.

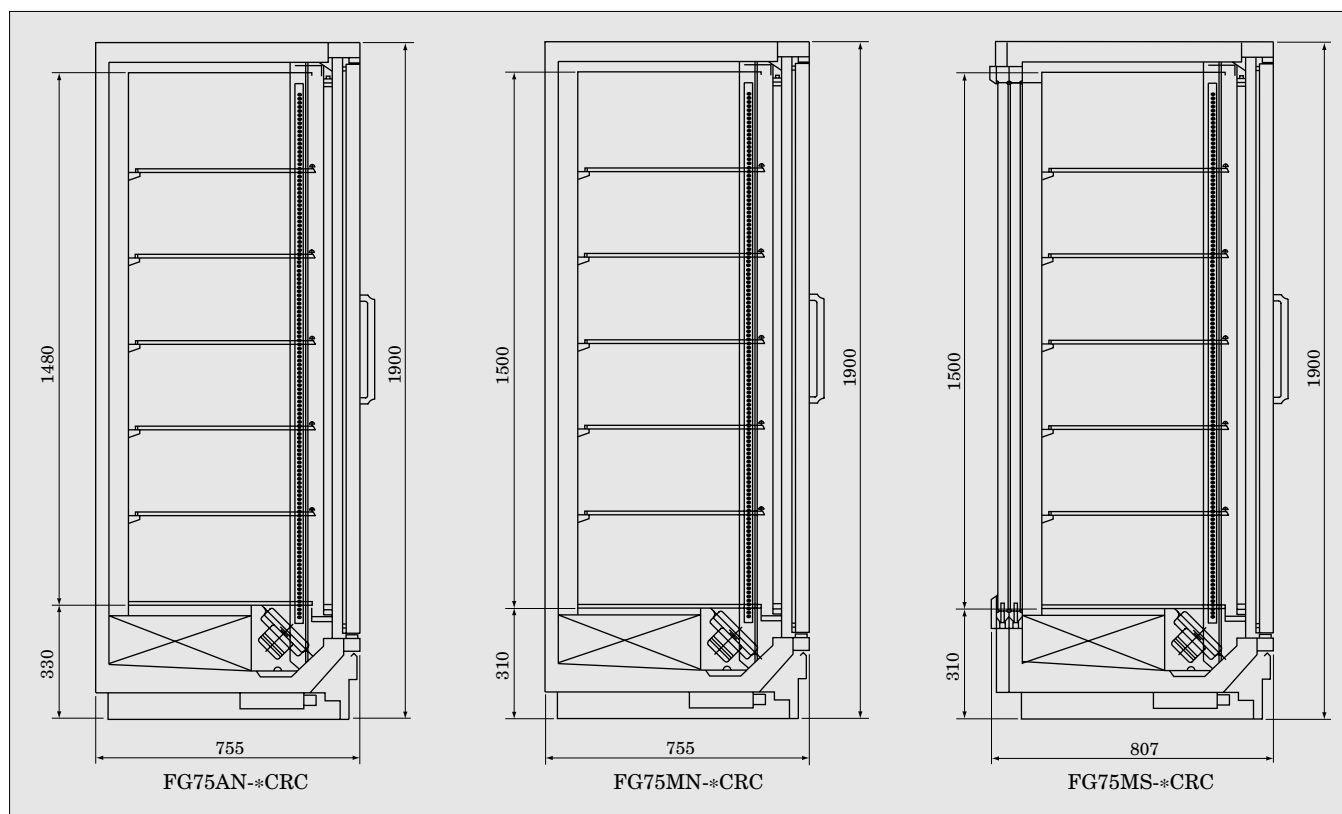
- (9) The concentration of electrical equipment at the front on the case bottom keeps the case top flat and makes installation easier. Also, this makes part replacement of the electrical equipment easier from the front side and improves the serviceability.

3.1.1 Features of the freezing case

(1) Freezing performance

Environmental conditions in the convenience stores are severe because the entrance and exit doors are opened and closed very often, and in addition food processors are installed in the stores where fast-foods are also sold. Even under such conditions the cooling performance of the refrigerating food cases is secured by means of a high efficiency evaporator and a reinforced air curtain with doubled louvers at the cold

Fig. 2 Schematic diagrams of the FG-series reach-in refrigerating food case



air nozzle outlet.

(2) Defrosting performance

Temperature rise of the goods during defrosting must be kept small to prevent softening of the high grade ice cream. These refrigerating food cases prevent softening of the high grade ice cream by means of a drastically shortened defrosting time which reduces the pull-down time after defrosting.

(3) Prevention of frosting in the case

Air that enters during opening and closing of the doors and steam generated during defrosting cause frost to form on the goods, on the inside ceiling and on the back wall. Frost that is repeatedly formed, melted and then frozen not only interferes with the display of goods, but also possibly damages the goods. In these cases the causes of frost formation are suppressed as much as possible by means of a high efficiency evaporator and a shortened defrosting time as mentioned above. Additionally, these refrigerating food cases are equipped with a function for removing already formed frost.

3.1.2 Features of the cases with a sliding back door

(1) Single backdoor construction

Cases with a sliding back door through which goods can be refilled from the store's backyard conventionally had double doors that served as thermal insulation and also as a cold air duct. The back doors were therefore heavy and difficult to open and close.

In the new showcases, cold air ducts are formed by stack-shaped pillars located at the center, and left and right corners of the back wall. This arrangement has a single back door construction. The door can be opened and closed smoothly and also the inner capacity is enlarged.

(2) Refrigeration performance

Cold air nozzles are arranged at the top and bottom ducts on the back wall to secure refrigeration performance by preventing cold air from escaping and external air from entering even during frequent opening and closing of the back door.

4. Conclusion

We have presented an overview of the FG-series of reach-in refrigerating food case for convenience stores. Although these refrigerating food cases exactly correspond with the needs of the rapidly growing convenience store market and are accepted popularly, the requirements are becoming severer for total-cost reduction as a result of decreasing profit margins and the cost destruction and calls for diversification to distinguishing one store from its competitors.

Fuji Electric will continue to meet these requirements of the convenience stores and to develop unique products.



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