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(54) Device for emptying containers, in particular refuse containers, provided with a safety mechanism.

(57) A device for emptying containers, in particular refuse containers, into a collection vehicle, intended for the transportation of material, comprises lifting arms carrying a pick-up frame for picking up containers, drive means for moving the lifting arms and the pick-up frame and a control system for the drive means. The pick-up frame (1) is provided with a pick-up element (6) which can grasp a pick-up edge (5) of a container, and, near the pick-up element, with at least one sensing element (8, 9). The sensing element (8, 9) is movably supported on the pick-up frame and is adapted to interact with the bottom side of the pick-up edge (5) of a container, when grasped by the pick-up element (6), and with first switch (14) of the control system for the drive means. The pick-up frame is further provided with a locking element (15) adapted to interact with the top side of the pick-up edge (5) of a container and with detecting means for detecting the position of the locking element (15) relative to the pick-up frame. The detecting means comprise a second switch (16) of the control system for the drive means.

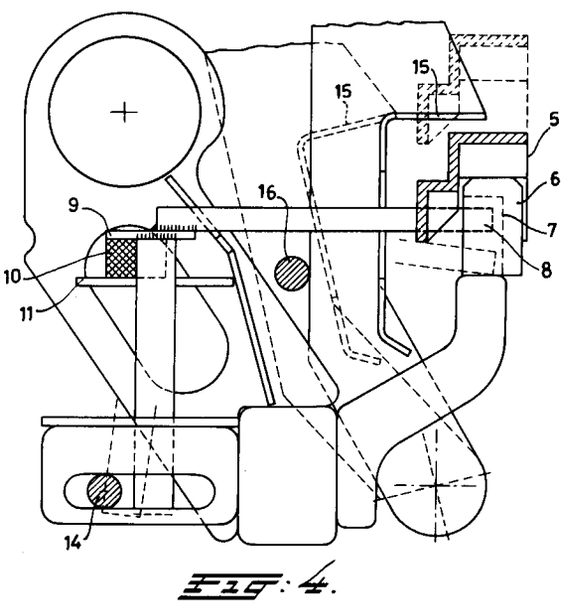

Fig. 4.

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The invention relates to a device according to the preamble of claim 1.

A device of such type is described in, for example, international patent specification WO 89/03794. In said device the sensing element and the first switch are part of a safety system for the drive means of the lifting arms and the pick-up frame. With the sensing element is checked whether the pick-up edge of the container is grasped by the pick-up element in the right way. If this is not the case the container is prevented from being lifted automatically by the lifting arms.

A disadvantage of the known device is that it has no provisions to guarantee a safe and reliable locking of the pick-up edge of the container on the pick-up frame during lifting and tipping of a container.

The object of the invention is to remove this disadvantage.

This object is attained with a device according to the preamble of claim 1 which is characterized by the features of the characterizing part of claim 1.

A device for emptying containers designed in this way comprises a safety mechanism which has two parts, a first part which becomes operative as soon as it is clear that the pick-up edge of a container has not been placed in the envisaged way over the pick-up element of the pick-up frame, and a second part which becomes operative when for one reason or another the locking of the container edge on the pick-up element has not been fully achieved or becomes ineffective.

Further features and advantages of the invention will be explained below with reference to the drawing.

Fig. 1 shows schematically in side view the pick-up frame with lifting arms of a device according to the invention.

Fig. 2 is a front view of the pick-up frame, of Fig. 1.

Fig. 3 is a view on enlarged scale of a detail of Fig. 2.

Fig. 4 is a view along the line IV-IV in Fig. 2 of the detail of Fig. 3, on the same enlarged scale.

Fig. 5 shows the various positions of the lifting arms shown in Fig. 1.

Fig. 6 shows a container placed on the pick-up frame provided with a container lock comprising a suction cup.

The device for emptying containers, in particular refuse containers, according to the invention comprises, as shown in Figs. 1 and 2, a pick-up frame 1 and lifting arms 2 which are carried by a vehicle 3. The device is provided with a safety mechanism which comprises two parts, a first part 4 which operates when a container edge 5 does not grip properly on a pick-up element in the form of a comb 6, and a second part which operates when the container edge locking mechanism is not closed properly.

The first part 4 is situated, as Fig. 2 shows, in the second tooth from the left on the comb 6, but can be fitted, depending on the type of pick-up frame and container to be handled, at any point on the comb 6. The container edge 5 with the comb 6 is also shown in Fig. 4. A slit 7, in which one end of a round pin 8 can move up and down, is made in the tooth. The other end of the pin 8 is fixed to a switch arm 9. A bearing plate 11 is welded to the frame 1. The switch arm 9 is detachably connected to the bearing plate 11 by means of a round resilient rubber element 10, having a threaded end at both sides. On the frame is also mounted a guide 12 for the switch arm 9 and a mounting plate 13, on which a limit switch 14, which is a part of the control system for the lifting arms 2 and the pick-up frame 1, is adjustably fitted. The switch arm 9 can interact with the limit swich 14.

The lifting movement can be divided into three parts A, B and C (see Fig. 5):

Part A is the part where the lifting arm 2 moves from the lowest position (storage position) to the point where the highest container is hanging on the comb 6 with the wheels just clear of the ground.

Part B is the only part where it is electrically so regulated that the safety mechanism is active. This is a short part of the lifting movement, less than one second.

Part C is the remainder of the lifting movement.

As long as the container edge 5 is not situated over the comb 6 (see the position shown by dashed lines in Fig. 4), the limit switch 14 is not activated. When the pin 8 is pressed down by the container edge 5, the switch arm 9 will start to rotate clockwise about the round resilient rubber element 10 (to the situation shown by dashed lines), thereby coming into the switch field of the limit switch 14, as a result of which the latter will switch, during part B of the lifting movement, and the lifting movement will be continued.

If the pin 8 is not pressed in by the container edge 5, the limit switch 14 will not switch into part B of the lifting movement, as a result of which the lifting movement will be interrupted and will pass into a slow lowering movement. This is done for safety.

For additional safety, the control system is designed in such a way that, if the pin 8 for some reason (e.g. jamming) remains pressed down after a container has been removed from the pick-up frame 1, the following lifting movement cannot be started. The advantage of this safety mechanism is the operating reliability and the low sensitivity to soiling.

The first part of the safety mechanism can also be used for the recognition of certain types of containers, in order to influence the control of the device for emptying containers.

The second part of the safety mechanism is, as mentioned, operative when the container edge locking mechanism is not closed properly. In the case of used containers with a deformed pick-up edge or in the case of non-standard containers, it can happen that, despite the pin 8 being pressed down, a part of the container edge 5 is still projecting above the comb 6. This means that a locking element 15 for the container edge locking which is here made up of an arm which is hingedly connected to the pick-up frame 1 and is provided with a flat part for locking the pick-up edge 5 of the container on the pick-up element 6 of the pick-up frame 1, cannot close properly. Said element 15 comes up against the container edge 5, instead of extending above the container edge.

The result of this would be that during the tipping movement the container will come away from the comb 6 and fall down.

This risk is guarded against by means of a limit switch 16, which becomes active shortly after the start (time settable) of the container edge locking. If the locking element 15 for the container edge is not fully closed after the above-mentioned setting time (see position shown by dashed lines in Fig. 4), the arm of the locking element is still situated in the switch field of the limit switch 16. This will cause the lifting movement to stop and switch over to the slow lowering movement.

The second part of the safety mechanism which includes the locking element 15 and the limit swich 16 is also effective during the last part of the lifting tipping movement, as will be explained below.

A device for emptying containers is often provided with a mechanism for locking a container to the pick-up frame during the tipping movement. Such a container locking mechanism may comprise (see Fig. 6) a vacuum operated suction cup 17 which can attach itself firmly to the side wall of a container 18. If this mechanism does not function properly, for example, due to a defect in the vacuum system connected to the suction cup 17 or a damaged suction cup of a damaged container, there is a risk that a container 18 placed on the pick-up frame 1 will start tipping relative to the pick-up frame 1 during the tipping movement of the pick-up frame, and particularly at the end thereof. This may cause the container to become loose from the comb 6 and to fall down.

However, the tipping movement of the container 18 relative to the pick-up frame 1 will cause the locking element 15 to rotate relative to the pick-up frame 1. The arm of the locking element 15 will then operate the limit swich 16. The control system for the drive means will then cause the automatic further movement of the lifting arms 2 and the pick-up frame 1 to stop. By manually operating a reset knob the pick-up frame 1 with container 18 can be tipped back and lowered at low speed.

The device for emptying containers according to invention has the following advantages:

- the correct engagement between the comb of the pick-up frame and the pick-up edge of the container is guaranteed;
- the lifting movement cannot be started if the sensing element, which checks the correct engagement between the comb of the pick-up frame and the pick-up edge of the container, remains pressed down, for example, due to a mechanical defect;
- the proper functioning of the container edge locking is checked;
- the automatic lifting and tipping movement of the pick-up frame is stopped when an unwanted continued tipping movement of a container relative to the pick-up frame occurs (for example, due to a defect in the vacuum operated suction cup system).
- the presence of a wrong container is indicated, or a specific container type is recognized.
- a false stroke of the lifting arms is prevented.

Claims

1. Device for emptying containers, in particular refuse containers, into a collection vehicle, intended for the transportation of material, said device comprising lifting arms (2) carrying a pick-up frame (1) for picking up containers, drive means for moving the lifting arms and the pick-up frame and a control system for the drive means, the pick-up frame (1) being provided with a pick-up element (6) which can grasp a pick-up edge (5) of a container, and, near the pick-up element, with at least one sensing element (8, 9), said sensing element (8, 9) being movably supported on the pick-up frame (1) and being adapted to interact with the bottom side of the pick-up edge (5) of a container, when grasped by the pick-up element (6), and with first switch (14) of the control system for the drive means, characterized in that the pick-up frame is further provided with a locking element (15) adapted to interact with the top side of the pick-up edge (5) of a container and with detecting means for detecting the position of the locking element (15) relative to the pick-up frame (1), said detecting means comprising a second switch (16) of the control system for the drive means.

2. Device according to claim 1, characterized in that the sensing element (8, 9) is formed by a

hingedly supported bell-crank lever, of which a first arm or pin (8) reaches into a slit (7) of the pick-up element (6) of the pick-up frame (1), while the second arm (9) can interact with the first switch (14) of the control system for the drive means.

3. Device according to claim 2, characterized in that the hinged support of the bell-crank lever is a rubber block (10) which is fixed on a plate (11) fitted on the pick-up frame (1).

4. Device according to claim 2, characterized in that the locking element (15) is made up of an arm which is hingedly connected to the pick-up frame (1) and is provided with a flat part for locking the pick-up edge (5) of the container on the pick-up element (6) of the pick-up frame (1), and that the arm can interact with the second switch (16) of the control system for the drive means.

6. Device according to claim 1, characterized in that the control system for the drive means comprises means for detecting, via the first switch (14), that the sensing element (8, 9) remains in operative position after a container has been removed from the pick-up frame (1) and for preventing a following lifting movement of the pick-up frame to start.

7. Device according to claim 1, characterized in that the control system for the drive means comprises means for stopping the movement of the lifting arms and pick-up frame when the second switch is operated by the locking element (15).

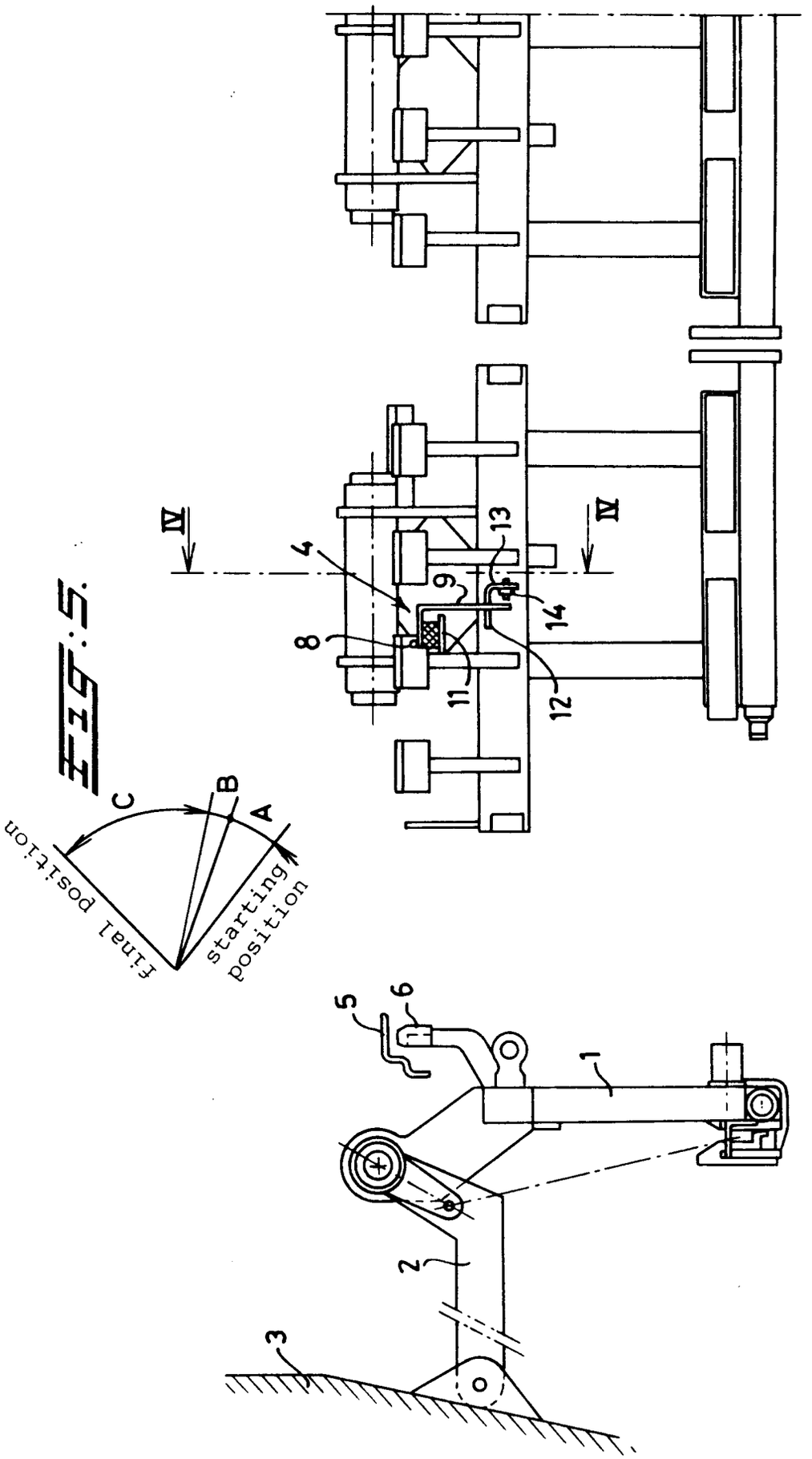

Fig. 2.

Fig. 5.

Fig. 1.

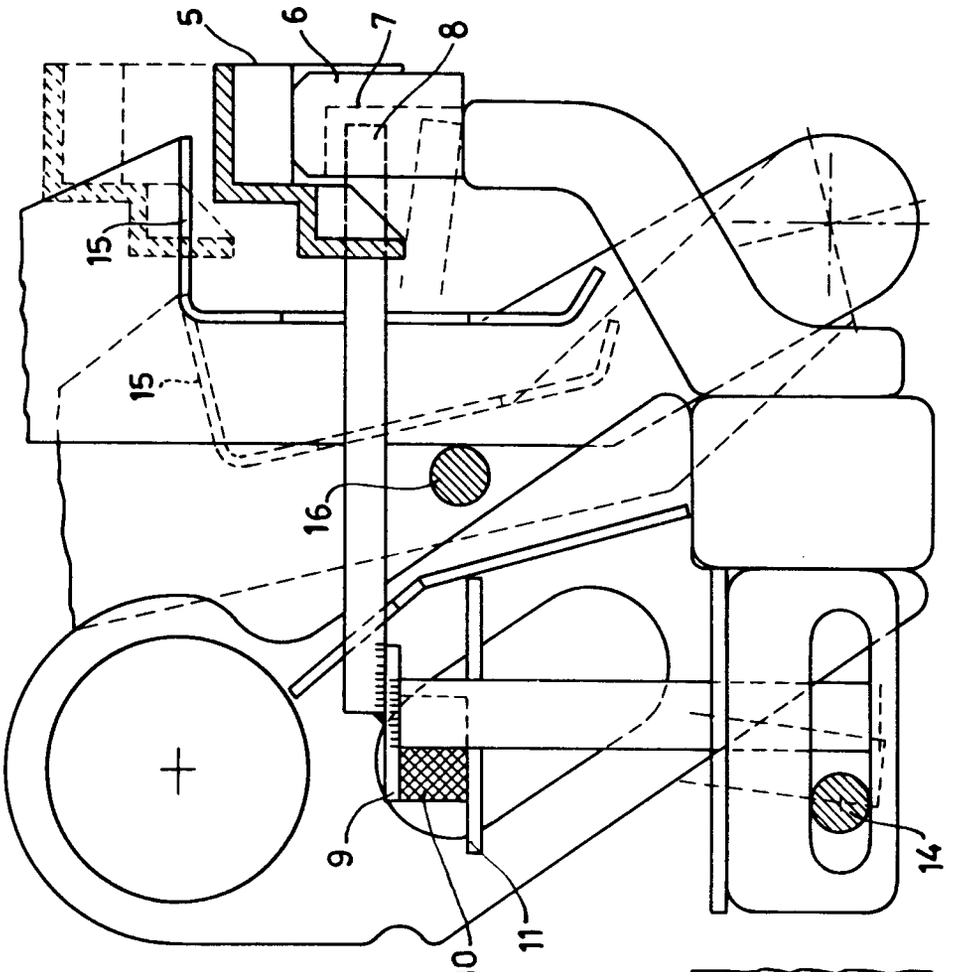

Fig. 4.

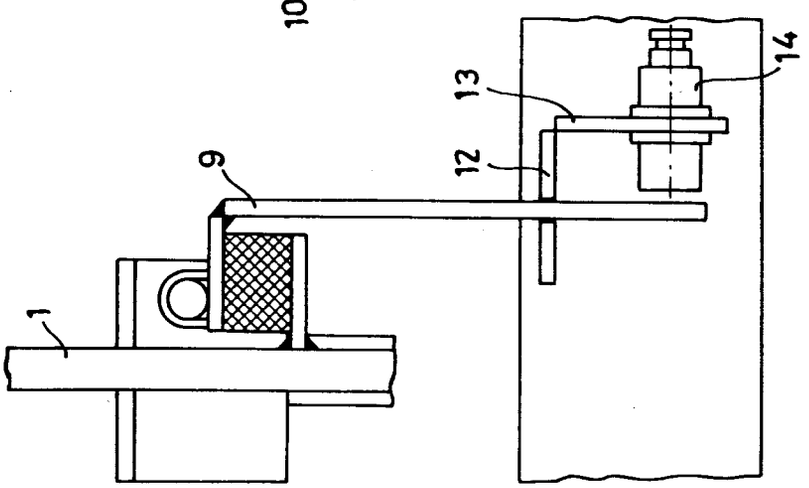

Fig. 5.

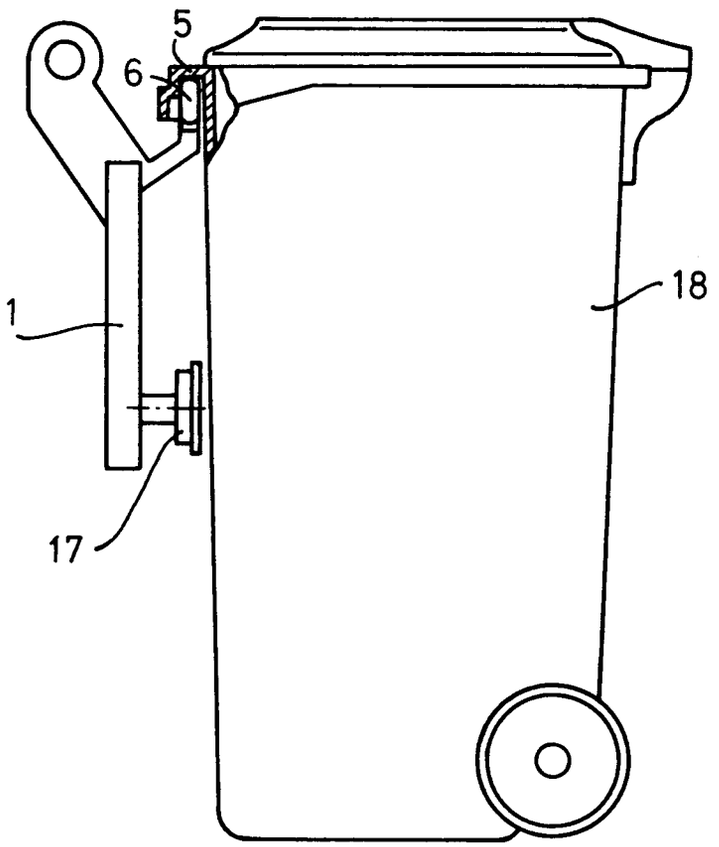

Fig. 6.

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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 2357

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	DE-U-8 906 456 (ZÖLLER-KIPPER GMBH) * page 9, paragraph 1; figures 2,3 *	1,6,7	B65F3/04
Y	DE-A-3 517 491 (G+S UMWELTTECHNIK GMBH) * page 16 - page 17; figures 5,6 *	1,6,7	
A,D	WO-A-8 903 794 (E.S.D. ENTSORGUNGS-SYSTEME FÜR DEUTSCHLAND GMBH & CO.) * page 15, line 30 - page 16, line 24; figures 2,3 *	1	
A	EP-A-0 358 046 (ZÖLLER-KIPPER GMBH) * figures 1,6,7 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07 JANUARY 1992	MARTINEZ NAVAR

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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