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(54) MACHINE AND METHOD FOR SEALING THE MOUTH OF A BOTTLE

(57) Method for sealing the mouth of at least one bottle (2) by creating a capsule of sealing material around at least the neck (20) of the bottle (2), comprising the following steps:
a) rotation or rototranslation of the bottle (2) around a horizontal axis (R) from an initial position to an immersion position, in which immersion position the bottle (2) has the neck (20) facing downwards and immersed at least partially in a bath of said sealing material in a molten state;
b) rototranslation of the bottle (2) up to a first dripping position, in which first dripping position the bottle (2) is completely extracted from the sealing material bath and has the neck (20) facing downwards and has its longitudinal axis inclined compared to a vertical plane;
c) rotation or rototranslation of the bottle (2) in a second dripping position, in which second dripping position the bottle (2) is completely extracted from the bath of sealing material and has the neck (20) facing downwards and has its longitudinal axis inclined with respect to said vertical plane in opposite direction with respect to said first dripping position;
d) rotation or rototranslation of the bottle (2) to a final position.

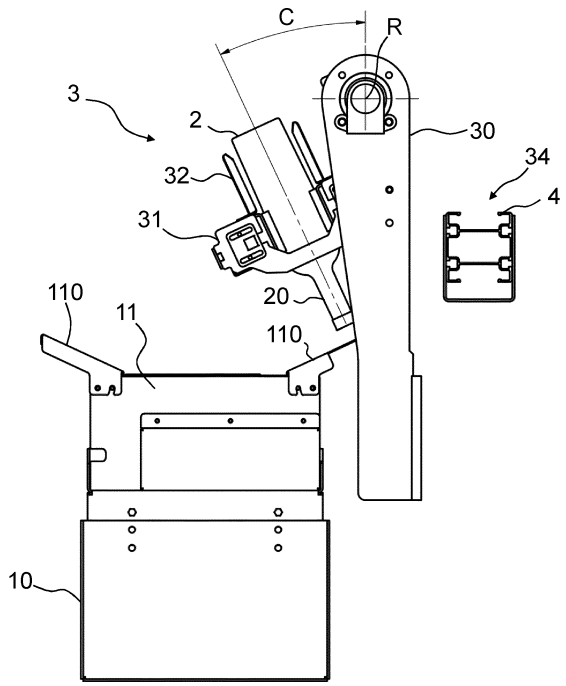

Fig. 6

EP 3 733 587 A1

Description

[0001] The present invention relates to a machine and a method for sealing the mouth of at least one bottle by creating a capsule of sealing material around the neck of the bottle.

[0002] In the bottling sector, in particular in the case of wines or spirits, it is known sealing the mouth of the bottle with a sealing material, for example sealing wax or shellac, so as to ensure the final buyer on the integrity of the package.

[0003] As is known, after bottling or packaging in bottles or containers of loose products such as wines and spirits, a closure cap of the bottles or containers is first applied, and then the bottles or containers are sealed at the top with a sealing material such as sealing wax or shellac. The application of this sealing material has the function not so much of ensuring the seal between cap and bottle or container, which is usually guaranteed by the cap, but rather of providing an element of inviolability, that is, to guarantee that the content has not been affected and somewhat altered.

[0004] The application of the seal can be performed manually immersing the terminal part the bottle neck in a sealing wax or shellac bath in a special tank. The tank is preferably equipped with heating means to maintain the sealing wax or shellac in a liquid or semi-liquid state. The neck of the bottle is therefore kept immersed for long enough to ensure the adhesion of the sealing wax or shellac to the neck and the bottle is therefore removed from the tank.

[0005] Machines for the automatic sealing of bottles are currently known, which are provided with a mobile support in which one or more bottles or containers to be sealed can be stored. The mobile support can immerse the terminal part of the neck of the bottles or containers in a tank containing wax or shellac in a molten, liquid or semi-liquid state, placed under the mobile support, rotate each bottle or container around its own longitudinal axis, keep the neck immersed and in rotation for long enough to ensure the application of the wax and, interrupting the rotation of each bottle, to extract the bottles or containers from the tank.

[0006] With these procedures, both manual and automated, a layer of sealing wax or shellac remains adhered to the top of the bottle, and, in contact with the air at room temperature, it hardens thus forming a capsule consisting of a compact sealing layer in the manner of well-fitting cap.

[0007] In the existing processes and machines it is also known to consider a dripping step in which the bottle, after being extracted from the tank, remains inclined with the neck facing down for a predetermined time, allowing the fall by gravity of the sealing material in the molten state in excess with respect to the amount needed to create the capsule. If this phase were omitted and the bottle was immediately brought back to an upright condition, an unsightly drop of excess material not yet solidified would form.

[0008] In currently known machines and processes, however, the dripping step may not be sufficient to obtain a capsule with a high homogeneity, such that even at a possible subsequent stamping of the head surface the said drop of material excess not yet solidified is not generated. This is because in the inverted and inclined position in which the bottle is kept during the dripping phase, the molten material tends to flow from the entire capsule towards the drop formation zone, in proximity of a point on the peripheral edge of the capsule head surface. In the passage from this inverted position to the final position in which the bottle is brought back to an upright position, an accumulation of material remains in the drop formation area, which can then run down the neck forming the said drop of excess material which has not yet solidified.

[0009] This process is described in detail in document FR 3 001 951 A1 which relates to a linear machine, in which bottles placed in rows are immersed with the neck in a shellac bath and are then extracted and kept inclined to drip away the material in excess. When the bottles are brought back to their upright position, they have an excess of material in the dripping zone, which can lead to the formation of a drop along the neck.

[0010] US 2.081.478 A describes a rotary machine in which the bottles are first immersed in a shellac bath by means of a cam, then they are lifted and then placed again to drip in an arched drip tray, while rotating around the column of the machine. Also in this case, when each bottle is brought back from the dripping position to the final position, an accumulation of material remains in the drop formation area, which can lead to the formation of a drop along the neck.

[0011] Therefore, at present there is an unmet need for a method and a machinery that allows the production of an aesthetically perfect capsule on the bottles with simple precautions, without drops that can flow laterally along the neck of the bottles, even in the event of any stamping performed on the head surface of the capsule.

[0012] The present invention aims at solving this technical problem by means of a method as described at the beginning, which further comprises the following steps:

a) rotation or rototranslation of the bottle around a horizontal axis from an initial position to an immersion position, in which immersion position the bottle has the neck facing downwards and immersed at least partially in a bath of said sealing material at molten state;

b) rotation or rototranslation of the bottle up to a first dripping position, in which first dripping position the bottle is completely extracted from the sealing material bath and has the neck facing downwards and has its own longitudinal axis inclined with respect to a vertical plane;

c) rotation or rototranslation of the bottle in a second dripping position, in which second dripping position

the bottle is completely extracted from the bath of sealing material and has the neck facing downwards and has its own longitudinal axis inclined with respect to said vertical plane in the opposite direction with respect to said first dripping position;

d) rotation or rototranslation of the bottle to a final position.

[0013] In one embodiment the said vertical plane passes through the axis of rotation or rototranslation of the bottle.

[0014] In a further embodiment, the first dripping position and the second dripping position alternatively identify two diametrically opposite points of the end edge of the bottle neck as the lower extreme point of the bottle.

[0015] In this way dripping is performed in two consecutive phases in which the bottle is inclined in opposite directions with respect to a vertical plane. In the first dripping position the sealing material tends to accumulate in a first drop formation point on the peripheral edge of the head surface, while when the bottle is brought to the second dripping position this accumulation takes place in a second drop formation point on the peripheral edge of the head surface, in particular in an area diametrically opposite to the first drop formation point.

[0016] The accumulation of sealing material of the first dripping position is thus redistributed in a more uniform way in the capsule just formed, in particular in the head surface thereof. When the bottle is brought back to its final position, the capsule material is homogeneously distributed, avoiding local accumulations and consequent formation of drops along the neck.

[0017] In a preferred embodiment, the bottle is initially gripped in the initial position and finally released in the final position, in which initial position and final position the bottle is erected with the neck facing upwards.

[0018] This allows the bottle to be gripped only during the sealing operation described above, starting from an initial resting position, in which the bottle lies stably on a supporting surface, and reaching a final position identical to the initial one. This allows the method described to be included in a wider industrial automated process.

[0019] In an executive example, in the first dripping position the inclination of the longitudinal axis of the bottle with respect to said vertical plane is comprised between 20° and 80°.

[0020] In a further executive example, in the second dripping position the inclination of the longitudinal axis of the bottle with respect to said vertical plane is comprised between 5° and 45°.

[0021] Object of the present invention is also a machine for sealing the mouth of at least one bottle by creating a capsule of sealing material around at least the neck of the bottle. The machine comprises a base, a tank for a sealing material in the molten state, a head movably fixed to the base, which head is provided with means of rotation around a horizontal axis and means of translation along a vertical axis and is provided with of gripping means for one or more bottles. The machine also comprises a control unit for the rotation means and the translation means of said head. The control unit is configured to operate the rotation means and the translation means of said head so as to perform the method described above.

[0022] In particular, the control unit comprises processing means configured for the execution of a logical program to activate the head. In this way the control unit is configured to initially activate a rotation or rototranslation of the bottle around a horizontal axis from an initial position to an immersion position, in which immersion position the bottle has the neck facing downwards and immersed at least partially in a bath of said sealing material in the molten state. Subsequently the control unit activates the head to rotate or rototranslate the bottle to a first dripping position, in which first dripping position the bottle is completely extracted from the sealing material bath and has the neck facing downwards and has its own longitudinal axis inclined with respect to a vertical plane. Subsequently, the control unit activates the head to make a rotation or rototranslation of the bottle in a second dripping position, in which second dripping position the bottle is completely extracted from the bath of sealing material and has the neck facing downwards and has its own longitudinal axis inclined with respect to said vertical plane in opposite direction compared to said first dripping position. Finally, the control unit operates the head to rotate or rototranslate the bottle to a final position.

[0023] According to an executive example, the gripping means are configured to grasp a plurality of bottles arranged side by side.

[0024] In this way it is possible to perform the method simultaneously for a greater number of bottles, preferably with a single tank.

[0025] According to a further executive example, an area for picking and releasing the bottles by the gripping means is provided, a conveyor belt being provided for the delivery of the bottles in the pick-up and drop area and for the removal of the bottles from the pick-up and drop zone.

[0026] In this way the bottles are positioned side by side in the picking up and release area by means of a conveyor belt on which the bottles lie resting in an upright condition. For each cycle of the method, the belt places a predetermined number of bottles in the collection and release area, and subsequently removes them. This allows the automation of the sealing phase of the mouth of the bottles within a wider industrial line, for example by providing an automated station downstream of the machine for stamping the head surface of the formed capsules.

[0027] These and other features and advantages of the present invention will become clearer from the following description of some exemplary embodiments illustrated in the attached drawings wherein:

fig. 1 illustrates an executive example of the machine, with the bottles in the initial position;
fig. 2 illustrates the pick up phase of the bottles;
fig. 3 illustrates the bottles in a pre-immersion position;
fig. 4 illustrates the immersion phase of the neck of the bottles;
fig. 5 illustrates the bottles in the first dripping position;
fig. 6 illustrates the bottles in the second dripping position;
fig. 7 illustrates the bottles brought to the final position.

[0028] The figures illustrate an executive example of the machine object of the present invention. The machine is adapted to seal the mouth of a plurality of bottles 2 by creating a capsule of sealing material around the neck 20 of the bottle 2. In the view of the figures only one bottle 2 is visible, but the machine is designed to act on a plurality of bottles, for example 8 or 12 or preferably 14 bottles. However, it is possible to provide even fewer bottles, even up to a single bottle.

[0029] The machine comprises a base 10, only partially illustrated in the figures.

[0030] The base 10 supports a tank 11 for a molten sealing material, such as wax or shellac. The tank 11 is of such a size as to contain a quantity of sealing material in the molten state sufficient to immerse at least the entire neck of the bottles 2. Preferably the tank 11 is provided with means for heating the sealing material to keep it in a molten condition, such as for example one or more electrical resistances arranged in the peripheral walls of the tank 11. The tank 11 is surrounded at least on two opposite sides by inclined slides 110 for the recovery of the sealing material dripped outside the tank 11 and for its funnelling back inside the tank 11. Preferably also the slides 110 are at least partially heated, so as to avoid hardening and resulting accumulation of the sealing material on the slides 110 themselves.

[0031] The machine also comprises a head 3 movably fixed to the base 10 and provided with means of translation along a vertical axis and means for rotation around a horizontal axis and provided with means for gripping the bottles 2.

[0032] The translation means of the head 3 comprise a translation section 30 preferably constituted by two supporting mounts arranged translatable on the base 10 and driven in translation along the vertical axis by actuation means, between two extreme positions, lower and upper respectively. The actuation means can be of any type currently known, preferably comprising an electric motor equipped with a frequency variator, or inverter, and a ball screw worm gear. Other currently known actuation means can be used, such as for example hydraulic cylinders, rack and pinion systems or the like.

[0033] The rotation means around a horizontal axis comprise a rotation section 31 fixed to an end constrained to the translation section 30, so as to present an opposite free end which can thus be rotated about the horizontal axis R constraining between the two sections by suitable actuation means. Also in this case, the drive means can be of any currently known type, preferably comprising an electric motor equipped with a frequency variator, or inverter, and connected to a shaft passing through said horizontal axis R constraining between the two sections and integral to the rotation section 31.

[0034] The head 3 therefore comprises two sections respectively of translation 30 and of rotation 31 articulated together in a horizontal axis R.

[0035] The gripping means are configured to grasp a plurality of bottles 2 arranged side by side and preferably comprise one or more grippers 32 suitable for grasping the body of each bottle 2 on two diametrically opposite contact areas. As an alternative or in combination it is possible to provide suction cup gripping systems or other currently known systems suitable for gripping or holding the bottles 2.

[0036] The machine comprises a collection and release area 34 of the bottles 2 by the grippers 32 and a conveyor belt 4 for the delivery of the bottles 2 in the collection and release area 34, from which the bottles 2 can be taken by the grippers 32 to be immersed in the tank 11. In the same way, the conveyor belt 4 removes the bottles 2 from the pick-up and drop zone 34 once they are repositioned back there after the formation of capsule. The bottles 2 lie resting on the conveyor belt 4 in an upright condition, that is, with its own vertical longitudinal axis and with the neck facing upwards. For each sealing cycle of the bottles 2 by forming the capsules of sealing material, the conveyor belt 4 positions in the pick-up and release zone 34 and subsequently removes the aforementioned predetermined number of bottles 2 from the same.

[0037] The method of operation of the machine is now illustrated.

[0038] In the initial phase of figure 1, the translation section 30 is translated upwards, so as to position the rotation section 31 above the bottles 2, allowing the conveyor belt 4 to position the bottles 2 in the pick-up and release area 34.

[0039] In this phase, the bottles 2 are delivered in the pick-up and drop zone 34 from the conveyor belt 4 and are therefore in the initial position in which they are placed erect with the neck 20 facing upwards.

[0040] In the gripping phase, illustrated in Figure 2, the translation section 30 is lowered until the grippers 32 provided on the rotation section 31 are brought to the two diametrically opposite gripping areas of the body of the bottles. In this position the grippers 32 grasp the bottles 2, which then become integral with the rotation section 31.

[0041] The rotation section 31 is then rotated to a pre-immersion position, illustrated in Figure 3. In this position, the longitudinal axis of each bottle 2 has an inclination A with respect to the horizontal plane comprised between

35° and 80°.

[0042] The rotation section 31 then continues its rotation until the bottles 2 are brought into an immersion position, in which the bottles 2 have the neck 20 facing downwards and immersed in the bath of sealing material in the molten state provided in the tank 11. The immersion position is preferably the one illustrated in Figure 4, in which the bottles 2 are arranged with their own longitudinal in a vertical position vertical axis and immerse the neck 20 for most of its extension. However, it is possible to provide an immersion position in which the bottles 2 are inclined, to obtain a capsule with a diagonal edge with respect to the longitudinal axis of the bottle 2.

[0043] Once the bottles 2 have been immersed in the tank 11 for long enough to guarantee the application of the sealing material, the capsules are formed and the excess material must be dripped and cooling with consequent solidification of the capsules must be performed.

[0044] To do this, the translation section 30 is being raised, to extract the bottles from the tank 11, and the rotation section 31 is rotated in the opposite direction compared to that of the previous steps until the bottles 2 are brought to a first dripping position, illustrated in figure 5. In this first dripping position, the bottles 20 are completely extracted from the bath of sealing material and have the neck facing downwards, each with its own longitudinal axis inclined with respect to a vertical plane. Preferably, in the first dripping position the inclination B of the longitudinal axis of the bottles with respect to the vertical plane is comprised between 20° and 80°. In the preferred embodiment illustrated in the figures, the first dripping position provides the neck 20 of the bottle 2 inclined in the direction of removal from the pick-up and drop zone 34.

[0045] The bottles 2 are kept in this first dripping position for the time needed to remove a large part of the excess sealing material from the capsule just formed.

[0046] The rotation section 31 is then rotated again in the direction of rotation of the first phases to bring the bottles 2 into a second dripping position, illustrated in figure 6. In the second dripping position the bottles 2 are completely extracted from the bath of sealing material and have the neck 20 facing downwards with its longitudinal axis inclined with respect to the vertical plane in the opposite direction compared to the first dripping position. Therefore, in the preferred embodiment illustrated in the figures, the second dripping position provides the neck 20 of the bottles 2 inclined in the direction of approaching the pick-up and drop zone 34.

[0047] Preferably, in the second dripping position the inclination C of the longitudinal axis of the bottles 2 compared to the vertical plane is comprised between 5° and 45°.

[0048] The bottles 2 are kept in this second dripping position for the time needed to remove the material in excess completely and to make the distribution of the material in the capsule homogeneous.

[0049] The rotation section 31 is then rotated in the direction of rotation opposite to that of the first phases to bring the bottles 2 to the final position, in which the bottles 2 are in the pick-up and drop area 34 in an upright position with the neck 20 facing the top, as shown in figure 7.

[0050] When the bottles 2 are returned to their final position, they are released on the conveyor belt 4 by the grippers 32. The translation section 30 is then raised returning to the position illustrated in figure 1. The bottles 2 with the capsule formed are then removed by the conveyor belt 4 and a new set of bottles 2 still to be treated is brought into the pick-up and release area 34 by the conveyor belt 4, to start a new cycle of the method.

[0051] The removed bottles 2 can therefore optionally enter a stamping station downstream of the pick-up and release area 34.

[0052] The machine is equipped with automated control means for carrying out the movements described above, in particular an electronic control unit for controlling the driving means of the translation section 30 and the rotation section 31 respectively. By acting on the parameters of the electronic control unit, it is possible to set the translation and rotation speeds and the residence times in the various positions. Preferably the machine is provided with a user interface, through which the residence times in the various positions in the light of the sealing material used and / or the room temperature can be modified to obtain the desired capsule.

Claims

1. Method for sealing the mouth of at least one bottle (2) by creating a capsule of sealing material around at least the neck (20) of the bottle (2),
characterized in that
it includes the following steps:

   a) rotation or rototranslation of the bottle (2) around a horizontal axis (R) from an initial position to an immersion position, in which immersion position the bottle (2) has the neck (20) facing downwards and immersed at least partially in a bath of said sealing material in a molten state;
   b) rototranslation of the bottle (2) up to a first dripping position, in which first dripping position the bottle (2) is completely extracted from the sealing material bath and has the neck (20) facing downwards and has its longitudinal axis inclined compared to a vertical plane;
   c) rotation or rototranslation of the bottle (2) in a second dripping position, in which second dripping position the bottle (2) is completely extracted from the sealing material bath and has the neck (20) facing downwards and has its longitudinal axis inclined with respect to said vertical plane in opposite direction compared to said first dripping position;

d) rotation or rototranslation of the bottle (2) to a final position.

2. Method according to claim 1, wherein said vertical plane passes through the axis of rotation or rototranslation of the bottle.

3. Method according to claim 1 or 2, wherein the first dripping position and the second dripping position alternatively identify two diametrically opposite points of the end edge of the bottle neck as lower extreme point of the bottle.

4. Method according to one or more of the preceding claims, in which the bottle (2) is initially grasped in the initial position and finally released in the final position, in which initial and final positions the bottle (2) is erected with the neck (20) facing upwards.

5. Method according to one or more of the preceding claims, wherein in the first dripping position the inclination (B) of the longitudinal axis of the bottle (2) with respect to said vertical plane is comprised between 20° and 80°.

6. Method according to one or more of the preceding claims, wherein in the second dripping position the inclination (C) of the longitudinal axis of the bottle with respect to said vertical plane is comprised between 5° and 45°.

7. Machine for sealing the mouth of at least one bottle (2) by creating a capsule of sealing material around at least the neck (20) of the bottle, comprising a base (10), a tank (11) for a sealing material in a molten state, a head (3) movably fixed to the base (10), which head is provided with means of rotation (31) around a horizontal axis (R) and means of translation (30) along a vertical axis and is provided with gripping means (32) for one or more bottles (2), and furthermore comprising a control unit for controlling the rotation means and the translation means of said head, **characterized in that**
said control unit is configured to operate the rotation means and the translation means of the said head so as to perform the method according to one or more of claims 1 to 6.

8. Machine according to claim 7, wherein the gripping means (32) are configured to grasp a plurality of bottles (2) arranged side by side.

9. Machine according to claim 7 or 8, in which a pick-up and drop area (34) the bottles (2) by the gripping means (32) is provided, a conveyor belt (4) being provided for the delivery of the bottles (2) in the pick-up and drop area (34) and for the removal of the bottles (2) from the pick-up and drop area (34).

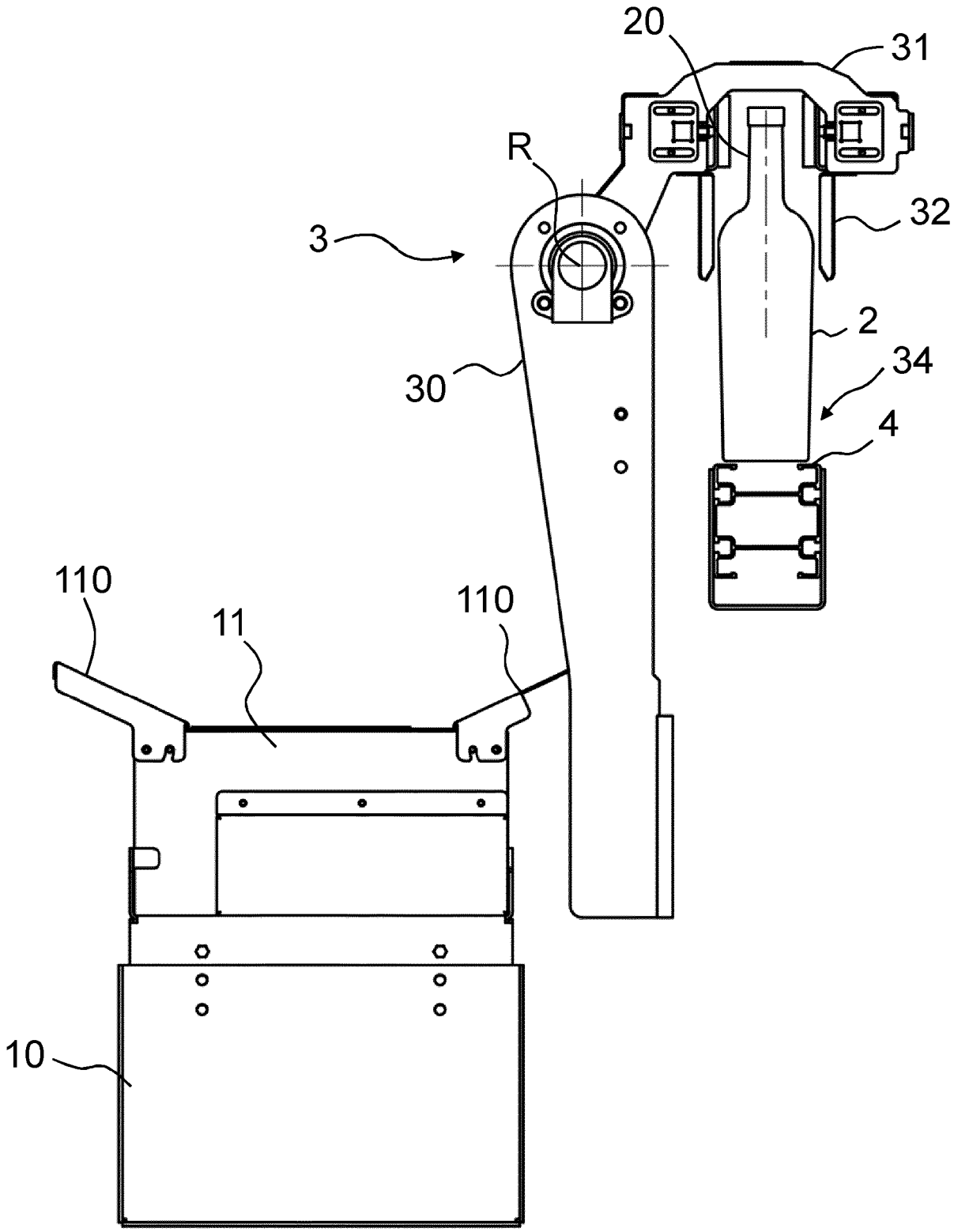

Fig. 1

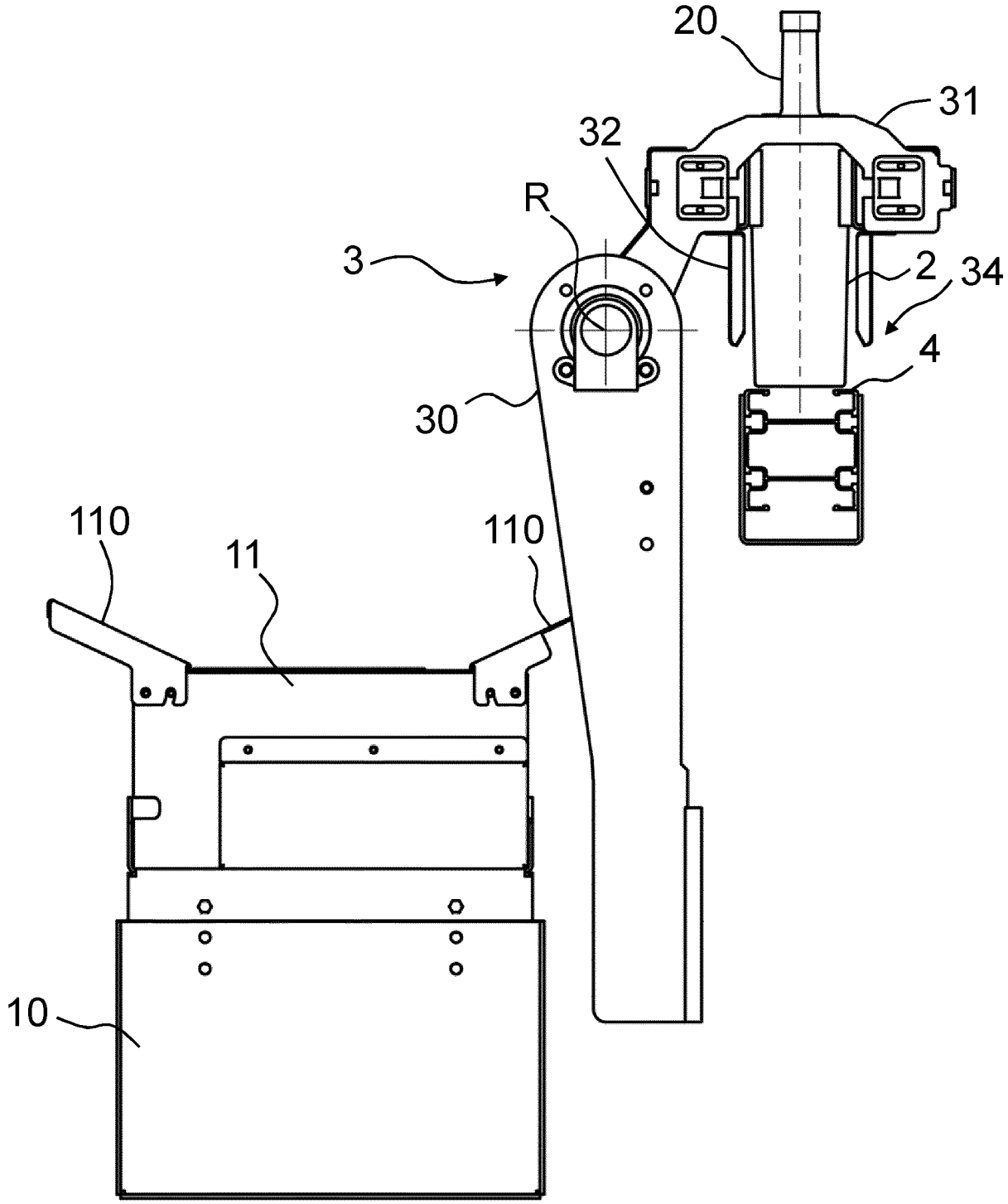

Fig. 2

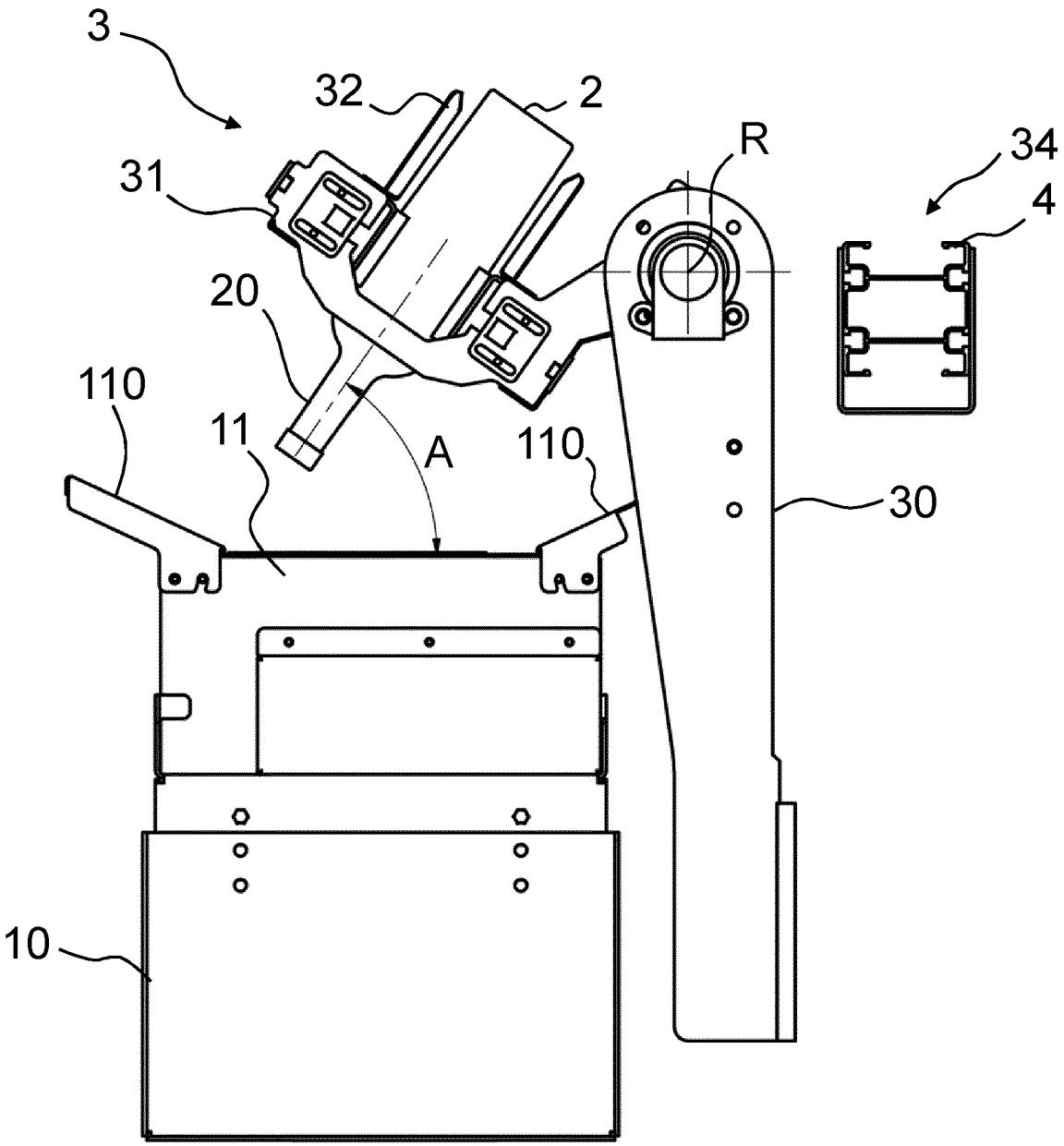

Fig. 3

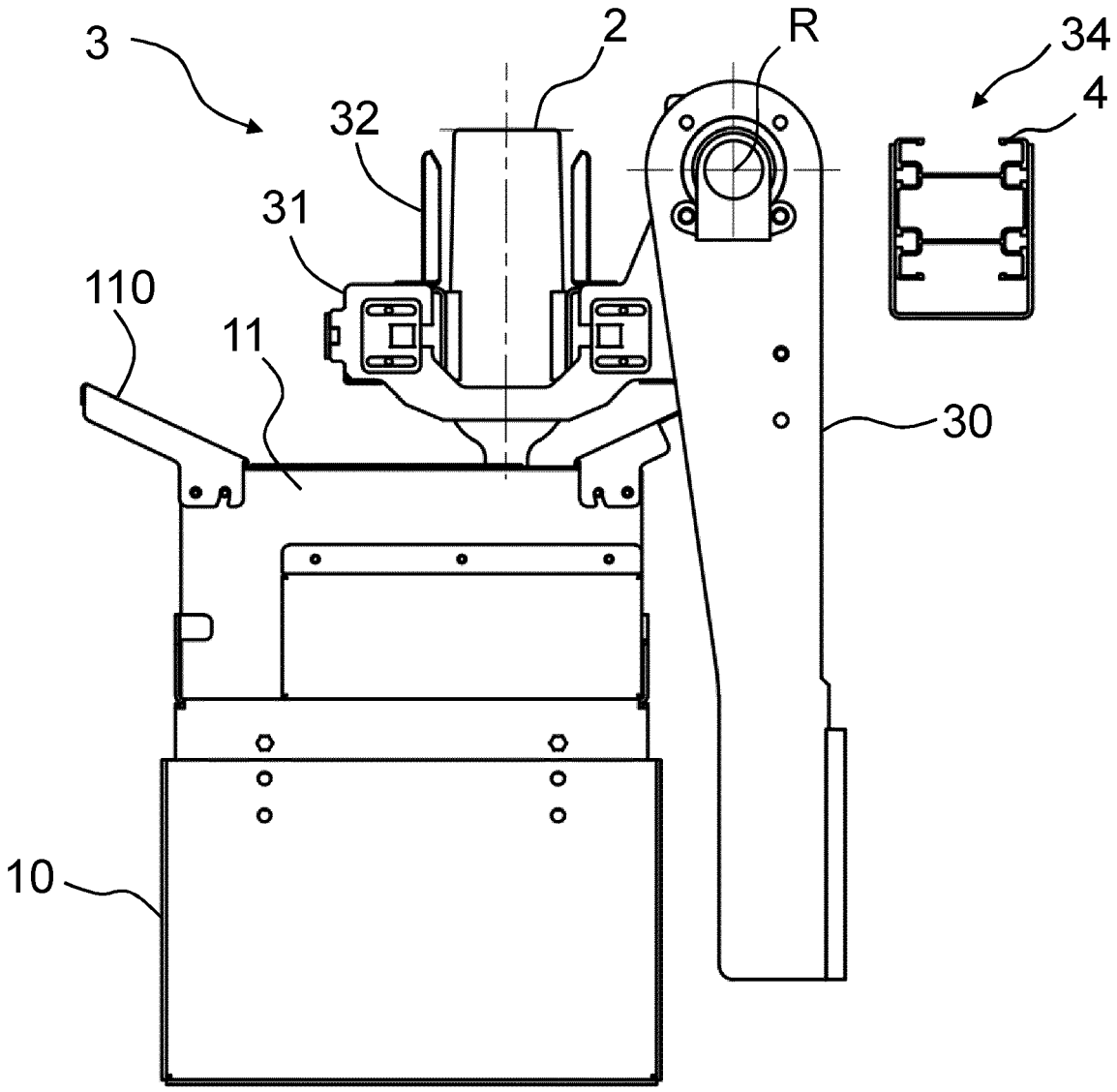

Fig. 4

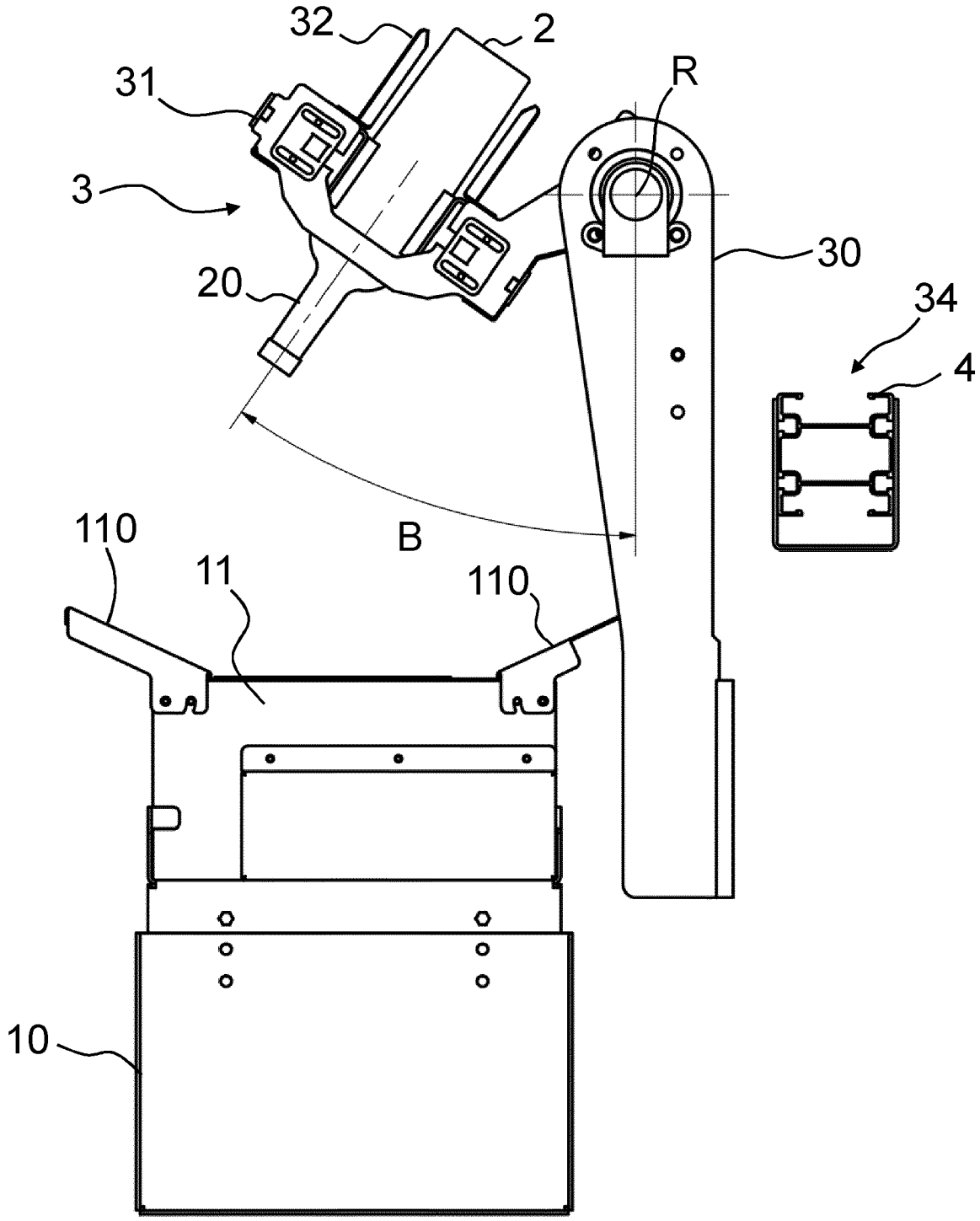

Fig. 5

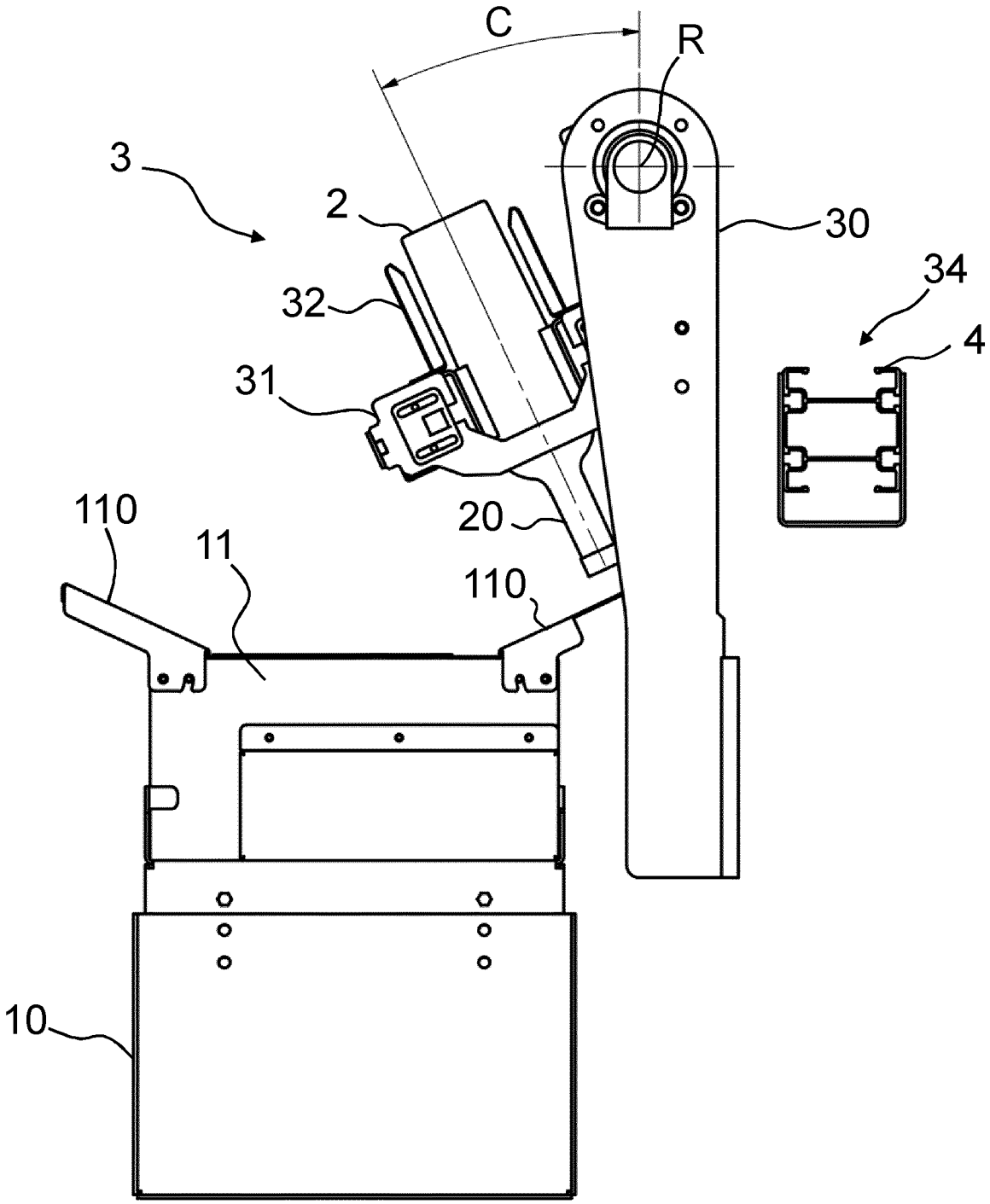

Fig. 6

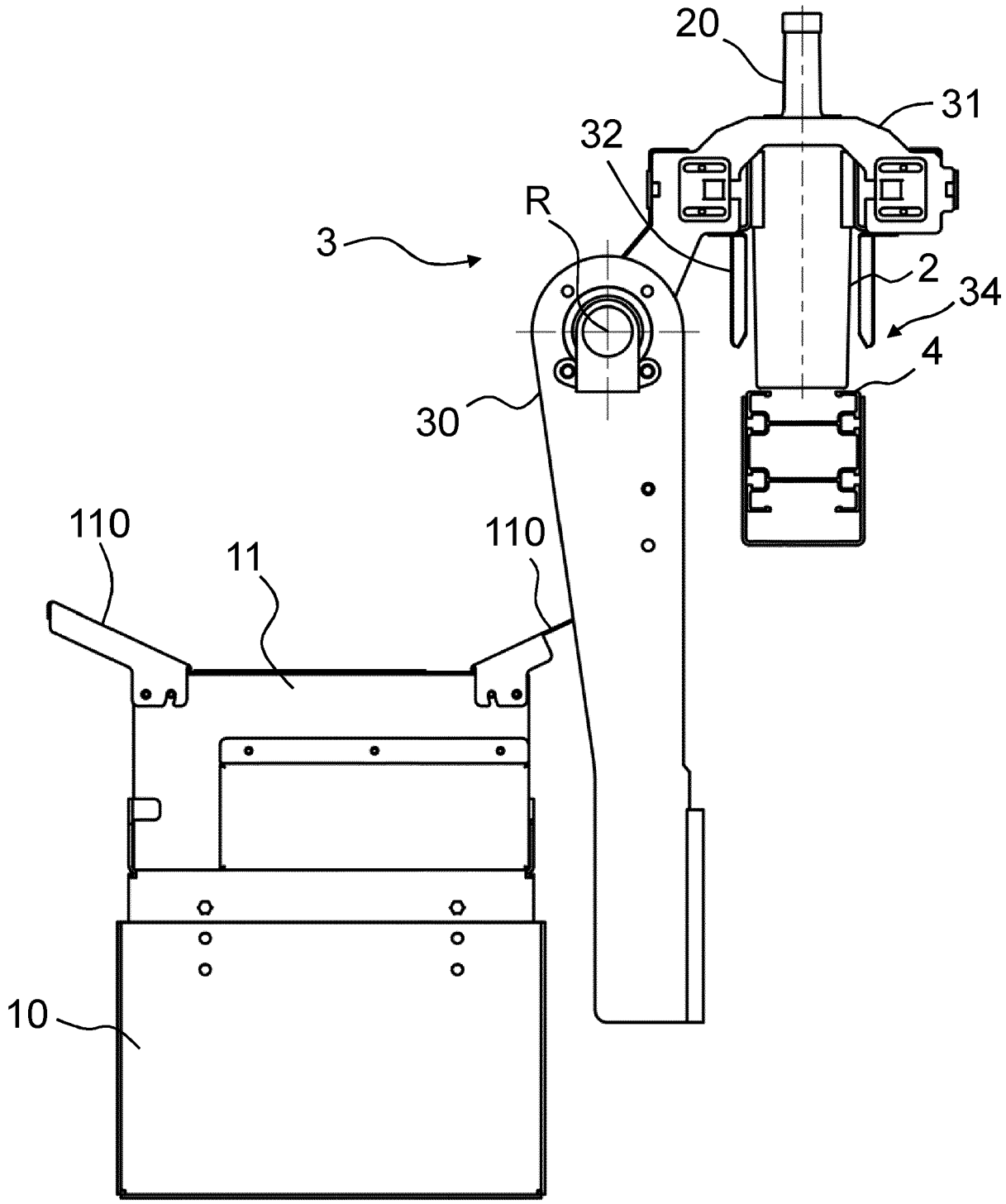

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 7976

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 081 478 A (FERNGREN ENOCH T) 25 May 1937 (1937-05-25)	1,2,4-6	INV. B67B5/05
A	* page 2, left-hand column, line 59 - right-hand column, line 5; figures 1-5 *	7-9	
X	FR 3 001 951 A1 (BERTRAND GUY [FR]) 15 August 2014 (2014-08-15)	7,8	
Y	* page 8, line 5 - page 9, line 21;	9	
A	figures 1-11 *	1-4	
Y	FR 2 698 345 A1 (MAINGUET RENE [FR]) 27 May 1994 (1994-05-27) * page 3, line 9 - line 27; figures 1-3 *	9	

TECHNICAL FIELDS SEARCHED (IPC)

B67B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 September 2020	Wartenhorst, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 16 7976

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09-09-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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FR 3001951 A1	15-08-2014	NONE	
FR 2698345 A1	27-05-1994	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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