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(54) **DEVICE WITH IMPROVED EJECTOR**

(57) The present invention relates to a device (1), comprising:

- a mould container (2) with at least one mould cavity (4), wherein the mould cavity (4) is bounded by a bottom (12) and at least one wall (13);
- at least one ejector (8) per mould cavity (4), comprising

the bottom (12) which is movable in the mould cavity (4) for the purpose of ejecting a green brick (3) formed in the mould cavity (4); and

- a separator (14) configured to release the green brick (3) from the bottom (12).

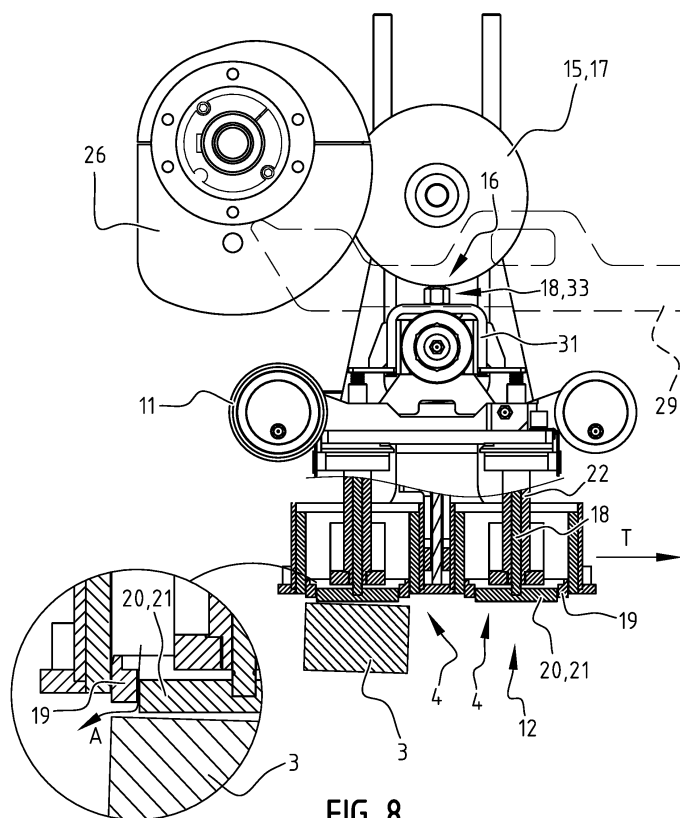


FIG. 8

Description

[0001] The invention relates to a device with an improved ejector. The invention relates more particularly to a device, comprising:

- a mould container with at least one mould cavity, wherein the mould cavity is bounded by a bottom and a wall; and
- at least one ejector per mould cavity, comprising the bottom which is movable in the mould cavity for the purpose of ejecting a green brick formed in the mould cavity.

[0002] In so-called mould container presses, to which the present invention relates, deformable clay is pressed in mould cavities. The green brick formed in the mould cavity is then released in order to be dried and fired. Such a mould container press comprises a chain conveyor, also referred to as mould conveyor, which is assembled from a large number of mutually connected mould containers. Each mould container generally comprises a plurality of mould cavities in which the green bricks are formed. Ejectors are arranged in each mould cavity for the purpose of pressing the green brick from the respective mould cavity in a downward direction. During demoulding the opening of the respective mould cavity is directed downward, whereby the force of gravity contributes to the green brick releasing from the bottom.

[0003] Clay is pressed in the mould cavities with great force, whereby a desired degree of filling of the mould cavity is achieved and the green brick obtains a desired shape. In order to facilitate the release of the green bricks from the mould cavity, the mould cavities are usually covered in sand prior to being filled with clay. The green brick will thereby have one or more than one sand-covered side.

[0004] For some applications it is however undesirable for a green brick to have a sand-covered side, such as when a brick of the so-called "Wasserstrich" type is being manufactured. Such Wasserstrich bricks must have a smooth, levelled-off surface structure which is not covered with sand.

[0005] The applicant intends to produce Wasserstrich bricks with a mould container pressing device for manufacturing green bricks from clay for the brick manufacturing industry, wherein the mould container pressing device comprises a circulating conveyor formed from connected mould containers. Such a mould container pressing device provides several significant advantages relative to devices traditionally applied for the manufacture of Wasserstrich bricks. These advantages are on the one hand the possibility of producing larger numbers of green bricks per unit of time. On the other hand, the brick thickness can be easily adjusted by varying the position of the bottom of the mould cavity. This possibility exists because, in a mould container pressing device, the green brick is removed on the same side of the mould cavity

as from where the clay was initially arranged in the mould cavity. On the other hand, bottoms with protruding parts (so-called frogs) can be applied in simple manner in order to reduce the volume of clay per green brick and to thus save raw materials.

[0006] In addition to the many advantages of the application of a mould container pressing device of the above described type, there is however also a drawback. Because Wasserstrich bricks must have a smooth, levelled-off surface structure which is not covered with sand, the covering of the mould cavities with sand must be dispensed with in the manufacture of Wasserstrich bricks. As a result of this, it was a common occurrence during demoulding of a green brick formed in the mould cavity that the green brick would remain stuck to the bottom of the mould cavity.

[0007] Known from BR 9 201 837 is a device with which green bricks can be pressed out of a mould container. It shows a drum with mould containers arranged therein, wherein an ejecting member is provided on the bottom of each mould container. This ejecting member can be displaced away from the bottom via a drive rod which runs along a cam, and thus press a green brick from a mould cavity.

[0008] EP 1 595 665 in the name of applicant is recognized as further prior art.

[0009] The invention now has for its object to provide a device of the above stated type, wherein said drawbacks do not occur, or at least do so to lesser extent.

[0010] Said object is achieved according to the invention with a device, comprising:

- a mould container with at least one mould cavity, wherein the mould cavity is bounded by a bottom and a wall;
- at least one ejector per mould cavity, comprising the bottom which is movable in the mould cavity for the purpose of ejecting a green brick formed in the mould cavity; and
- a separator configured to release the green brick from the bottom.

[0011] Because the device comprises in addition to the ejector a separator which is configured to release the green brick from the bottom, the chance of a green brick remaining stuck to the bottom of the mould cavity during demoulding is reduced.

[0012] According to a first preferred embodiment of the device, the separator comprises a division of the bottom into a first part and a second part, wherein the second part is surrounded by the first part. Because the second part is surrounded by the first part, a substantially flush surface is created. As a result, the device according to the invention is less susceptible to soiling than the device known from BR 9 201 837. The ejecting member therein after all lies against the bottom, whereby the clay extends all the way around the ejecting member and on the side walls of the ejecting member reaches to a position close

to the edges of the ejecting member facing toward the bottom. A green brick is made from a viscous and sticky substance, and will thereby tend to stick to the ejecting member. Particularly in the case of Wasserstrich bricks, for which the device of the invention is highly suitable and intended, green bricks display a very high degree of adhering behaviour due to the mould cavities not being covered with sand. When a green brick does not release from the bottom properly, a clay residue will remain behind. As long as this residue is present in the mould cavity this is not necessarily a problem, and it will be replenished with new clay in the subsequent filling step of the mould cavity. Problems do however occur when the press-out mechanism lying behind the bottom becomes soiled with clay residue. In the device of BR 9 201 837 the clay extends all the way around the ejecting member and can thus easily find its way between the ejecting member and the bottom as soon as the ejecting member moves back in the direction of the bottom. According to the invention, this is effectively prevented by a division of the bottom into a first part and a second part, wherein the second part is surrounded by the first part. This is because the clay hereby only comes into contact with a surface of the first and the second bottom part which faces toward the open side of the mould cavity.

[0013] According to a further preferred embodiment, the second part is a release plate displaceable relative to the first part of the bottom.

[0014] According to yet another preferred embodiment, the device comprises:

- a frame;
- a circulating conveyor which is formed from connected mould containers and can be driven in stepwise manner relative to the frame; and
- wherein the separator comprises a driver with a stop arranged on the frame, wherein the stop is configured to transmit an impulse to the bottom in a stepwise displacement of the conveyor.

[0015] A circulating conveyor formed from connected mould containers is driven in stepwise manner so that the one or more than one mould cavity of the mould containers can be filled during a brief standstill. This stepwise displacement is effectively utilized in a demoulding stage by arranging a stop on the frame, which is configured to transmit an impulse to the bottom in a stepwise displacement of the conveyor. In the demoulding stage the bottoms of the mould cavity have already been displaced outward to an extent such that the green bricks are situated largely outside the mould cavity and are preferably hanging only from the bottoms. When the stepwise displacement of the conveyor is accelerated and decelerated, the green bricks hanging from the bottom are likewise accelerated and decelerated. In addition thereto, a rather sudden and strong impulse is transmitted to the bottoms in that a collision with the stop arranged on the frame takes place. Because of this jolt, the green bricks will

release from the bottoms more easily.

[0016] In a further preferred embodiment the ejector comprises for this purpose a drive rod extending from the release plate through the mould container bottom, and the drive rod is configured to collide with the stop in a stepwise displacement of the conveyor.

[0017] Further preferred embodiments form the subject-matter of the dependent claims. It is particularly noted that the different preferred embodiments described in the claims are related to three operating mechanisms of the separator.

[0018] According to a first mechanism, the separator can thus transmit an impulse to the bottom in order to knock loose the green brick. If desired, this impulse is transmitted only to a specific part of the bottom. It is also possible to envisage the separator comprising an air supply configured to bring air between the bottom and the green brick formed in the mould cavity. According to a second mechanism, an optionally present vacuum between the green brick and the bottom can hereby be released, and the sticking of the green brick to the bottom will be reduced. The green brick will then release from the bottom more easily under the influence of the force of gravity. The force of gravity also forms the basis of the third mechanism, wherein the separator comprises a division of the bottom into a first part and a second part, which are movable relative to each other. Owing to the movement (for instance pivoting) or displacement relative to each other of the first part and the second part it is possible to effectively ensure that the green brick releases from at least one of the first part and the second part. Because the green brick will now hang only from the other of the first part and the second part, the green brick will then most probably release from the bottom under the influence of the force of gravity.

[0019] It is particularly noted that there are particularly advantageous preferred embodiments wherein two or more of the above stated mechanisms apply.

[0020] Preferred embodiments of the present invention are further elucidated in the following description with reference to the drawing, in which:

Figure 1 is a perspective view of a pressing device for forming green bricks from clay in mould containers;

Figure 2 is a perspective view of a device according to the invention;

Figure 3 is a cross-sectional side view of the device shown in Figure 2;

Figures 4 and 5 are perspective detail views of the ejectors;

Figures 6-8 are successive steps during operation of the device shown in Figures 2 and 3; and

Figures 9 and 10 are perspective views of a device according to a further preferred embodiment.

[0021] The perspective view of Figure 1 shows a pressing device 1 for forming green bricks 3 from clay in mould

containers 2. Green bricks 3 are formed in mould cavities 4 which are provided in the mould containers 2. Clay is here pressed from a reservoir 5 into the mould cavities 4 of mould containers 2 (Figure 1). Mould containers 2 are connected to form a chain/conveyor 6, which is generally referred to as mould conveyor and is tensioned between chain wheels 7, and is supported by travel rollers 11. Only one chain wheel 7 is shown in Figure 1, and the other has been omitted so as to show the ejectors 8 lying therebehind. After the clay has been arranged in mould cavities 4, mould cavities 4 are trimmed on their open upper side by a trimmer (not shown), after which drying plates 9 are placed on mould containers 2. After green bricks 3 have been released from mould cavities 4 they are discharged on the drying plates 9 via discharge conveyor 10 for further treatment, comprising of drying and firing of the green bricks.

[0022] Figures 2 and 3 show respectively a perspective view and a cross-sectional side view of a device comprising a mould container 2 with at least one mould cavity 4, wherein the mould cavity 4 is bounded by a bottom 12 and a wall 13. The device further comprises at least one ejector 8 per mould cavity 4, comprising the bottom 12 which is movable in mould cavity 4 for the purpose of ejecting a green brick 3 formed in mould cavity 4, and a separator 14 configured to release green brick 3 from bottom 12.

[0023] Separator 14 comprises inter alia a driver 15. The shown driver 15 is configured to transmit an impulse to bottom 12, and in the shown embodiment is a stop 16 (Figure 8) with a curved stop surface 17. Stop 16 takes the form of a disc. Figure 8 shows the function of stop 16 when a drive rod 18 comes into contact therewith, as will be further elucidated in the following. Stop 16 then transmits an impulse via the drive rod to bottom 12. The skilled person will appreciate that stop 16 need not necessarily take the form of disc 17. If desired, stop 16 can take the form of a sawtooth profile (not shown), which will result in a vibration of bottom 12. In that case a series of smaller impulses is transmitted to bottom 12, instead of a large impulse transmitted once.

[0024] Separator 14 further comprises an air supply 19 configured to bring air between bottom 12 and the green brick 3 formed in mould cavity 4. This air flow A is shown in Figure 8.

[0025] As shown in Figure 1, during demoulding of green bricks 3 the opening of the respective mould cavity 4 is directed downward, whereby the force of gravity contributes to green brick 3 releasing from bottom 12. Green brick 3 will however tend to remain stuck to bottom 12. Green brick 3 releases from bottom 12 as soon as the force of gravity is greater than the adhesive force present in the contact surface between bottom 12 and green brick 3. Shown separator 14 preferably comprises a division of bottom 12 into a first part 19 and a second part 20, wherein first part 19 and second part 20 of bottom 12 are movable relative to each other. By reducing the contact surface the adhesive force can be reduced, and green

brick 3 will release from bottom 12 under the influence of the force of gravity.

[0026] Figures 4 and 5 show that second part 20 is surrounded by first part 19 of bottom 12. Second part 20 forms here a release plate 21 displaceable relative to first part 19 of bottom 12. In this embodiment the first part 19 of bottom 12 defines a fixed bottom part.

[0027] Driver 15 is preferably configured to transmit an impulse to the release plate 21 of bottom 12. Release plate 21 covers a smaller surface area than the whole bottom 12, whereby the knock will be even more effective. All stated mechanisms for releasing green brick 3 from bottom 12 co-act when the impulse is transmitted only to release plate 21, instead of to the whole bottom 12. Release plate 21 will then after all be able to move relative to first part 19 of bottom 12 and, in addition to an impulse transmission, will here also be able to admit air between green brick 3 and bottom 12, wherein an optionally present vacuum between green brick 3 and bottom 12 is released. In addition, the effective contact surface between bottom 12 and green brick 3 can be reduced.

[0028] Ejector 8 further comprises a hollow ejector shaft 22 which extends from bottom 12 through a mould container bottom 23. Drive rod 18 of detector 8 extends from release plate 21 through mould container bottom 23. A particularly compact device is obtained when drive rod 18 extends through the hollow ejector shaft 22 (Figure 4).

[0029] When driver 15 is configured to drive the drive rod 18, it will drive release plate 21 via drive rod 18. The driver can thus displace release plate 21 and thereby transmit an impulse to green brick 3, admit air between green brick 3 and bottom 12, and reduce the effective contact surface between green brick 3 and bottom 12. All these aspects contribute to the releasing of green brick 3 from bottom 12.

[0030] It is possible to envisage that drive rod 18 is a pull rod (not shown) and that driver 15 is configured to displace release plate 21 relative to first part 19 of bottom 12 in the direction of mould container 2. Such a device can make use of two mechanisms of separator 14. The inward displacement of the release plate allows air to come between green brick 3 and bottom 12, and reduces the effective contact surface between green brick 3 and bottom 12. When release plate 21 is pulled back sufficiently far, in the preferred embodiment shown in Figures 2-8 the green brick 3 will only remain in contact with first part 19 of bottom 12.

[0031] The drive rod is however more preferably a push rod. This is because, if drive rod 18 is a push rod and driver 15 is configured to displace release plate 21 away from mould container bottom 23 and first part 19 of bottom 12, three mechanisms of separator 14 are employed. The outward displacement of release plate 21 transmits an impulse, allows air to come between green brick 3 and bottom 12, and reduces the effective contact surface between green brick 3 and bottom 12. When release plate 21 is pushed out sufficiently far, green brick 3 will only

remain in contact with release plate 21, i.e. with the second part 20 of bottom 12 in the preferred embodiment shown in Figures 2-8.

[0032] Device 1 according to the invention is preferably a mould container pressing device for manufacturing green bricks 3 from clay for the brick manufacturing industry, wherein the mould container pressing device comprises a circulating conveyor 6 formed from connected mould containers 2, and wherein ejector 8 is configured to eject during a demoulding stage a green brick 3 present in mould cavity 4. Such a mould container pressing device is shown in Figure 1.

[0033] Such a mould container pressing device moreover makes it possible to provide bottoms 12 with protruding parts 34 (shown only in Figure 3), also referred to as frogs, whereby material can be saved and whereby the necessary durations of a drying step and a firing step in the production process of the Wasserstrich bricks can be reduced. Such material and energy-saving provisions are not applicable in conventional production processes for the manufacture of Wasserstrich bricks. If material has to be saved in a conventional production process for Wasserstrich bricks, then this material must be actively removed from the green brick in an additional production step after forming of the green brick.

[0034] Successive steps of the device during operation are now elucidated with reference to Figures 6-8. The device comprises an elongate carrier 24 which is provided on the end surfaces with pressure rollers 25. Just before the step of demoulding, pressure rollers 25 come into contact with a cam disc 26 which is drivable in a circuit with a cam disc drive shaft 27. By rotating cam disc 26 in the direction R the pressure rollers 25 are pushed away counter to the action of compression springs 28. Pressure rollers 25 displace carrier 24, which is connected via hollow ejector shaft 22 to bottoms 12. A rotation R of the cam disc drive shaft 27 drives the bottoms 12 of mould cavities 4 in mould container 2 via the cam disc 26, pressure rollers 25, carrier 24 and hollow ejector shaft 22 for the purpose of pressing the green bricks 3 out of mould cavities 4. Figure 6 shows a first situation in which bottoms 12 and the green brick are in a retracted position, while Figure 7 shows an extended situation of bottoms 12 and green bricks 3, wherein green bricks 3 are otherwise still stuck to bottoms 12.

[0035] The speed with which bottoms 12 are displaced during demoulding of green bricks 3 can be adjusted with the shape of cam disc 26 and the rotation speed of cam disc 26.

[0036] After cam disc 26 has pushed away pressure rollers 25, i.e. displaced them downward in figures 6-8, pressure rollers 25 can be further supported by a longitudinal guide 29. Compression springs 28 press the pressure rollers 25 against longitudinal guide 29 during the further transport in transport direction T. It is noted that longitudinal guide 29 is preferably provided with an inclining surface 30 which serves as temporary provision in the event that cam disc 26 were to break down.

[0037] The shown embodiment with cam disc 26 is advantageous because it provides additional adjustability, which also provides the possibility for relatively rapid pressing out. If such an adjustability is however unnecessary, the skilled person will appreciate that, as an alternative, pressure rollers 25 can be carried via an inclining surface (in accordance with inclining surface 30) onto longitudinal guide 29. In that case the incline of the inclining surface will however preferably be more moderate than shown in the figures.

[0038] Figure 8 shows a situation in which the head 33 of a bolt 32 comes into contact with stop edge 16. In the shown embodiment a bracket 31 with bolt 32 is arranged around carrier 24. It is noted that some relative displacement between carrier 24 and bracket 31, i.e. in downward direction in Figure 3, is preferably possible, whereby bracket 31 can move relative to carrier 24, and can herein drive the drive rod 18, when head 33 collides with stop 16. Stop 16 functions here as driver 15, and transmits via bracket 31 and the drive rod 18 connected thereto an impulse to release plate 21. Drive rod 18 moves here in the longitudinal direction of hollow ejector shaft 22, and release plate 21 is displaced away from first part 19 of bottom 12. This results in the occurrence of the already discussed mechanisms which contribute to the releasing of green brick 3 from bottom 12: the impulse, the supply of air between bottom 12 and green brick 3, and the reduction of the contact surface between bottom 12 and green brick 3.

[0039] The driving of bottom 12 inside mould cavity 4 takes place in two steps. In a first step carrier 24 is displaced, wherein bottom 12 is driven as a whole. The whole bottom 12 consists of first part 19 and second part 20. Second part 20 forms the release plate 21. In a second step bolt 32 comes into contact with stop 16 with its head 33, and bracket 31 is thereby displaced relative to carrier 24. In this second step release plate 21 is driven relative to first part 19 of bottom 12. Because the displacement of release plate 21 in the second step can take place independently of carrier 24, the impulse transmission is optimized.

[0040] Figures 9 and 10 show an alternative embodiment wherein the first part 19 of bottom 12 is the release plate 21 and wherein the second part 20 of bottom 12 is the fixed bottom part. This is therefore the reverse of the preferred embodiment described above with reference to Figures 2-8, although the operating principle remains substantially unchanged. Once again, a relative displacement takes place between first bottom part 19 and second bottom part 20, whereby green brick 3 obtains a reduced contact surface and releases from bottom 12 more easily under the influence of the force of gravity. In the embodiment shown in Figures 9 and 10 the second part 20 is also surrounded by first part 19, whereby the fixed bottom part is in this embodiment surrounded by release plate 21, which is displaceable relative to the fixed bottom part. The fixed bottom part further comprises a protrusion 34, also referred to as a frog, which extends

into the mould cavity and with which the volume of clay per green brick 3 can be reduced in order to thus save raw materials.

[0041] The application of a device 1 with mould containers 2 provided with at least one mould cavity 4 makes it possible to apply frogs 34 in the manufacture of Wasserstrich bricks. As already described, Wasserstrich bricks are characterized by a smooth, levelled-off surface structure which is not covered with sand. Because mould cavities 4 cannot be covered with sand in the manufacture of Wasserstrich bricks, it was a common occurrence during demoulding that green brick 3 would remain stuck to bottom 12 of mould cavity 4. The device shown in figures 9 and 10 is however particularly advantageous because the protrusion 34 extending into mould cavity 4 not only saves raw materials, but also contributes to the releasing of green brick 3 from mould cavity 4 and from bottom 12. Tests have shown that releasing of the green brick 3 formed in mould cavity 4 is particularly easy when the centre of bottom 12 is a fixed bottom part and release plate 21 extends to a position very close to walls 13 of mould cavity 4. Green brick 3 is hereby easily slid away along walls 13, whereby an effective release of green brick 3 takes place even when mould cavities 4 are not covered with sand, and the characteristic smooth and levelled-off surface structure of Wasserstrich bricks is obtained.

[0042] Although they show preferred embodiments of the invention, the above described embodiments are intended solely for the purpose of illustrating the present invention and not to limit the scope of the invention in any way. When measures in the claims are followed by reference numerals, such reference numerals serve only to contribute toward understanding of the claims, but are in no way limitative of the scope of protection. The rights described are defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Device, comprising:

- a mould container (2) with at least one mould cavity (4), wherein the mould cavity (4) is bounded by a bottom (12) and at least one wall (13);
- at least one ejector (8) per mould cavity (4), comprising the bottom (12) which is movable in the mould cavity (4) for the purpose of ejecting a green brick (3) formed in the mould cavity (4); and
- a separator (14) configured to release the green brick (3) from the bottom (12).

2. Device according to claim 1, wherein:

- the separator (14) comprises a division of the bottom (12) into a first part (19) and a second

part (20); and

- wherein the second part (20) is surrounded by the first part (19).

3. Device according to claim 2, wherein one of the first part (19) and the second part (20) of the bottom (12) is a release plate (21), and the other of the first part (19) and the second part (20) of the bottom (12) defines a fixed bottom part, relative to which the release plate (21) is displaceable.

4. Device according to any one of the foregoing claims, comprising:

- a frame;
- a circulating conveyor (6) which is formed from connected mould containers and can be driven in stepwise manner relative to the frame; and
- wherein the separator (14) comprises a driver (15) with a stop (16) arranged on the frame, wherein the stop (16) is configured to transmit an impulse to the bottom (12) in a stepwise displacement of the conveyor (6).

5. Device according to at least claims 3 and 4, wherein the stop (16) of the driver (15) is configured to transmit an impulse to the release plate (21).

6. Device according to at least claims 3 and 4, wherein:

- the ejector (8) comprises a drive rod (18) extending from the release plate (21) through the mould container bottom (23); and
- the drive rod (18) is configured to collide with the stop (16) in a stepwise displacement of the conveyor (6).

7. Device according to claim 6, wherein:

- the ejector (8) comprises a hollow ejector shaft (22) which extends from the bottom (12) through a mould container bottom (23); and
- the drive rod (18) extends through the hollow ejector shaft (22).

8. Device according to claim 6 or 7, wherein the driver (15) is configured to drive the drive rod (18).

9. Device according to at least one of the claims 6-8, wherein the drive rod (18) is a push rod and the driver (15) is configured to displace the release plate (21) away from the mould container bottom (23) and from the fixed bottom part.

10. Device according to at least one of the foregoing claims, wherein:

- the first part (19) of the bottom (12) is the re-

lease plate (21);

- the second part (20) of the bottom (12) is the fixed bottom part; and

- the fixed bottom part comprises a protrusion (34) extending into the mould cavity (4).

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11. Device according to claim 10, wherein the release plate (21) extends to a position close to the at least one wall (13) bounding the mould cavity (4).

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12. Device according to at least one of the foregoing claims, wherein the separator (14) comprises an air supply (19) configured to bring air between the bottom (12) and the green brick (3) formed in the mould cavity (4).

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13. Device according to at least one of the foregoing claims, wherein the device (1) is a mould container pressing device for manufacturing green bricks (3) from clay for the brick manufacturing industry, wherein the ejector (8) is configured to eject during a demoulding stage a green brick (3) present in the mould cavity (4).

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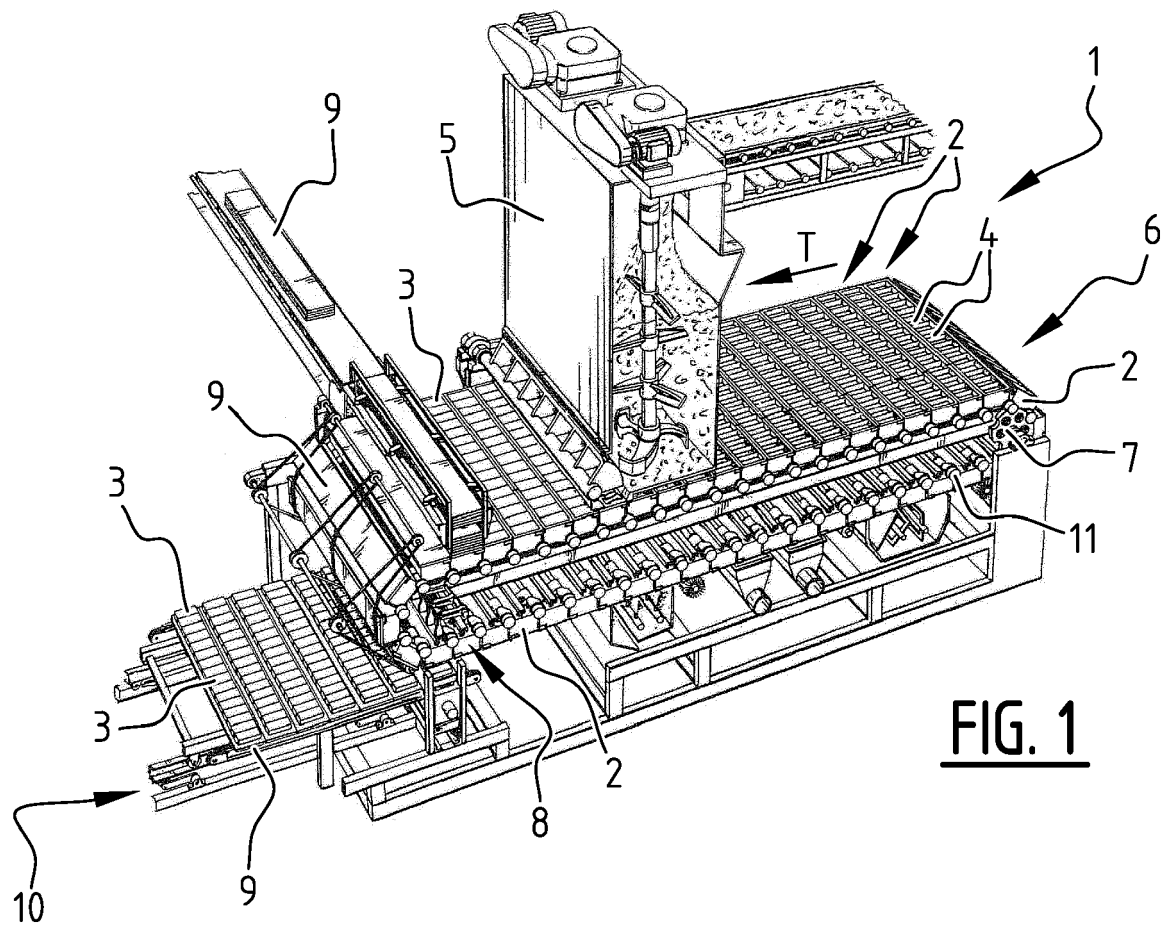
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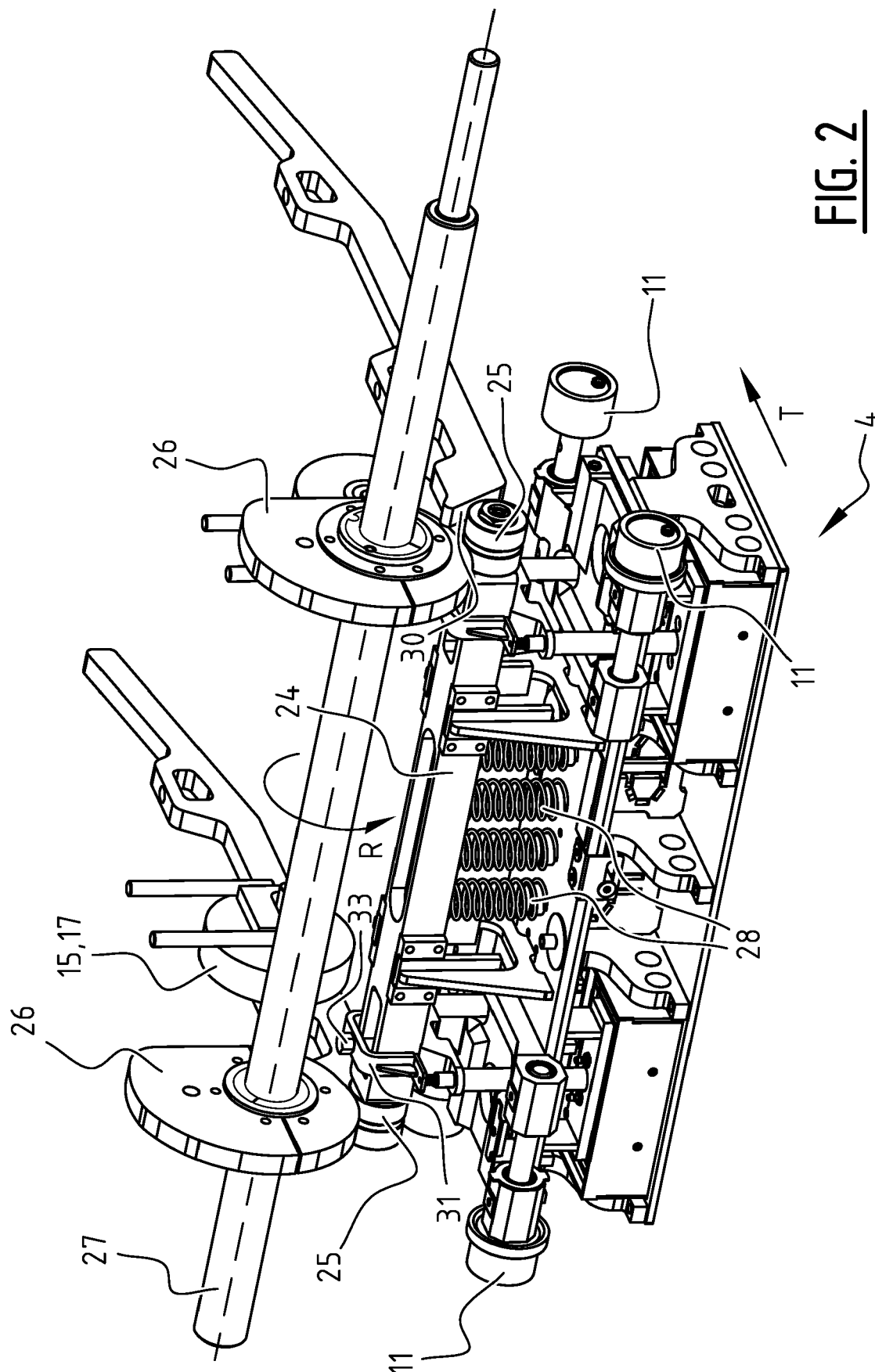
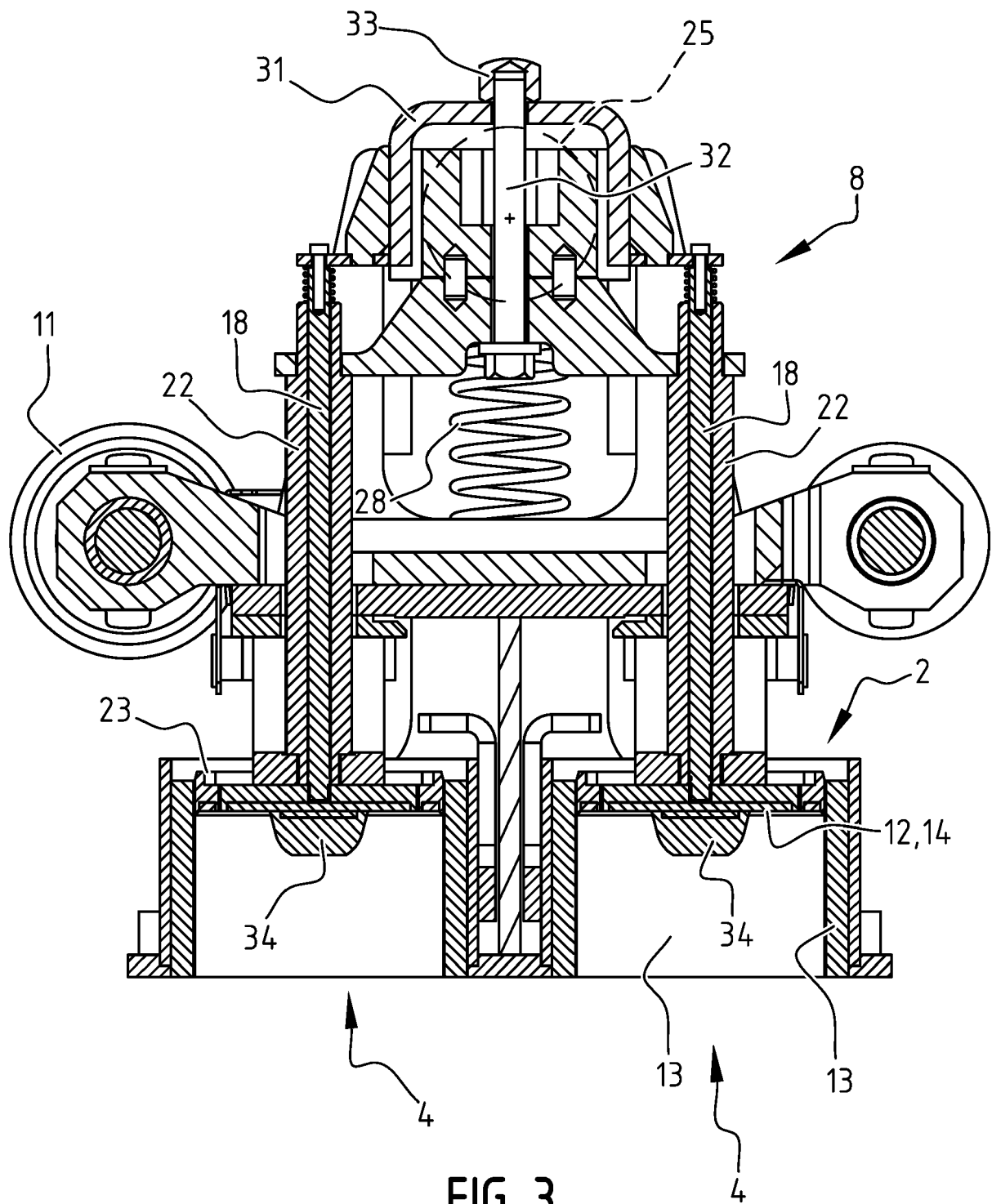
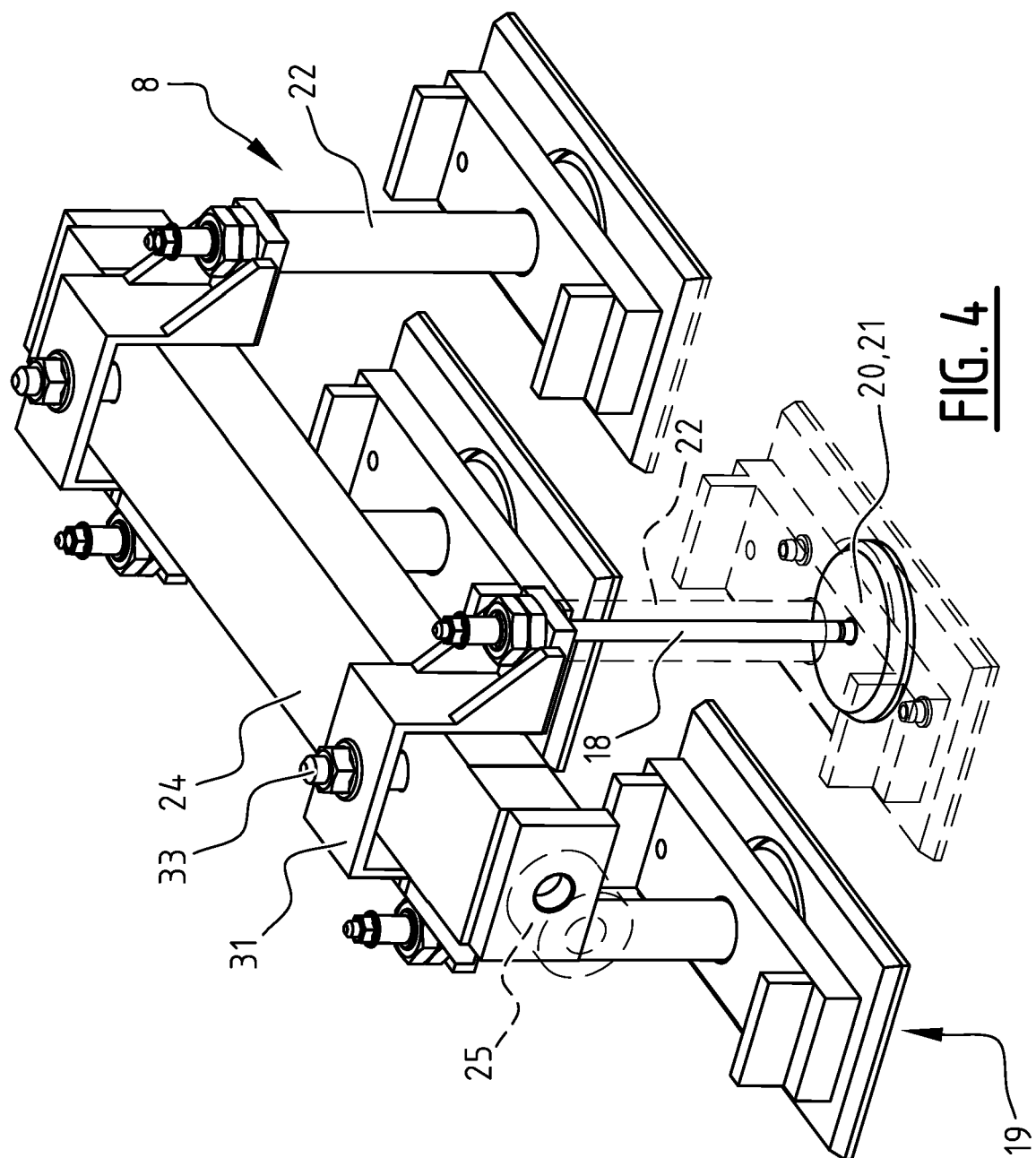
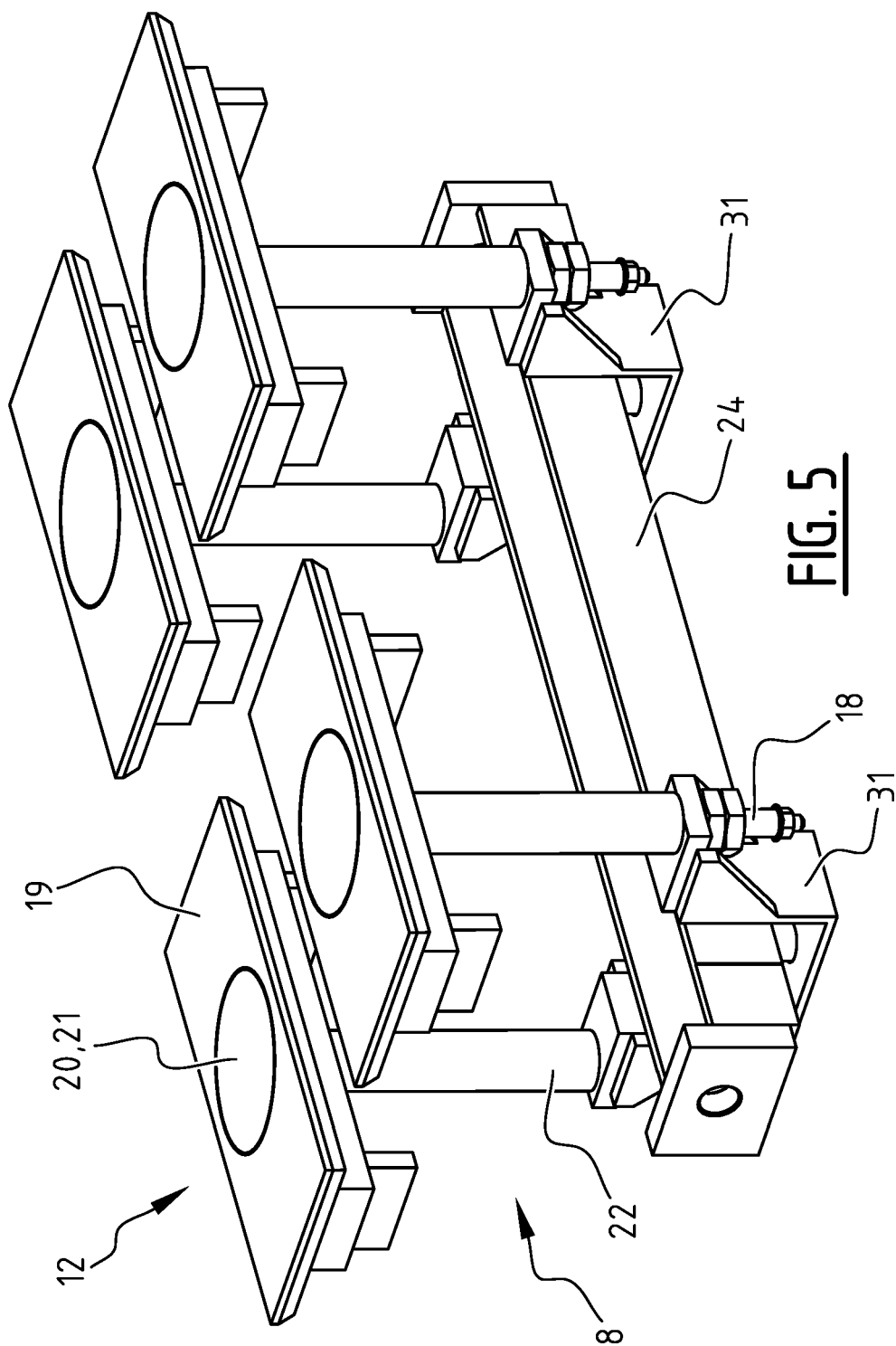


FIG. 2







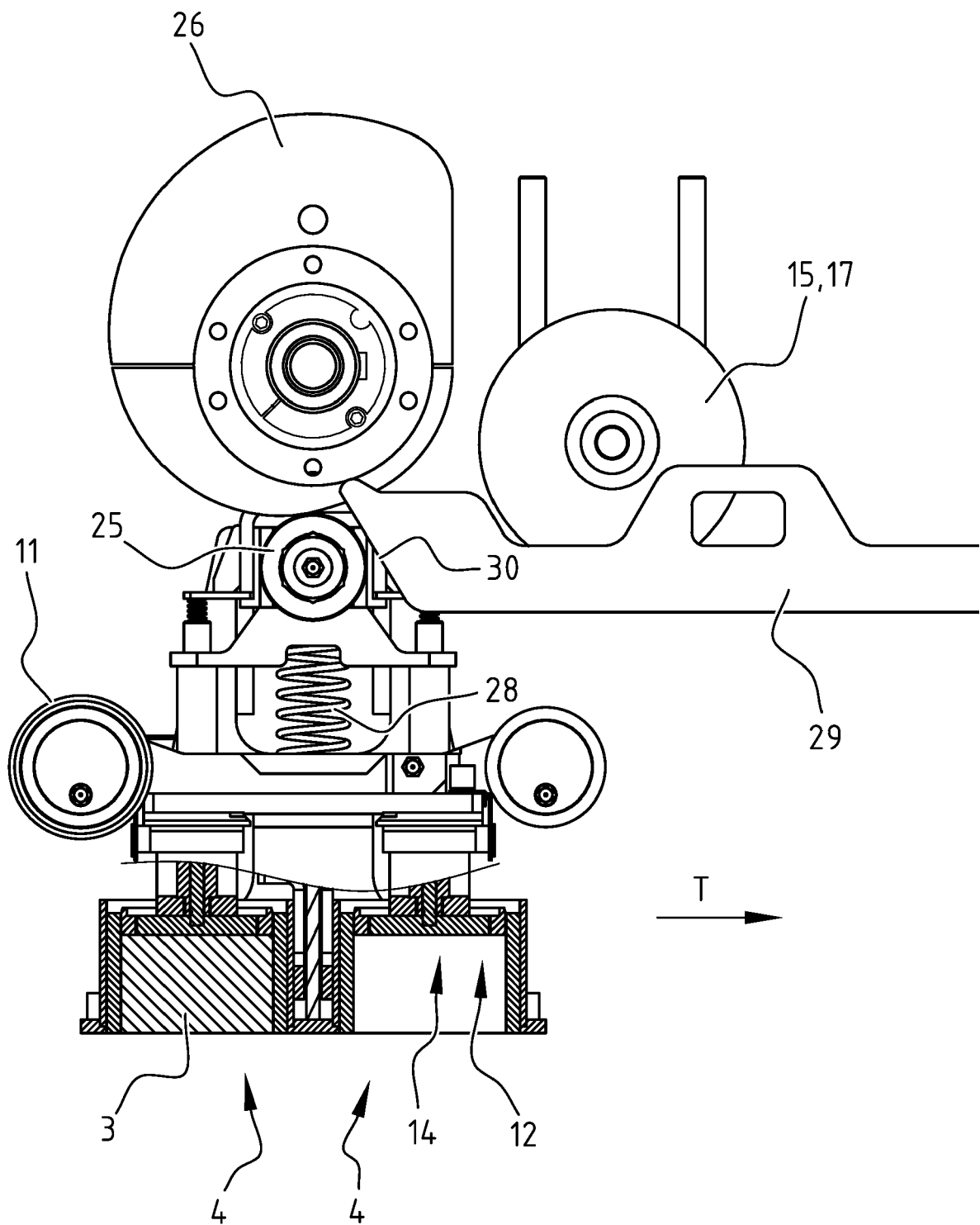


FIG. 6

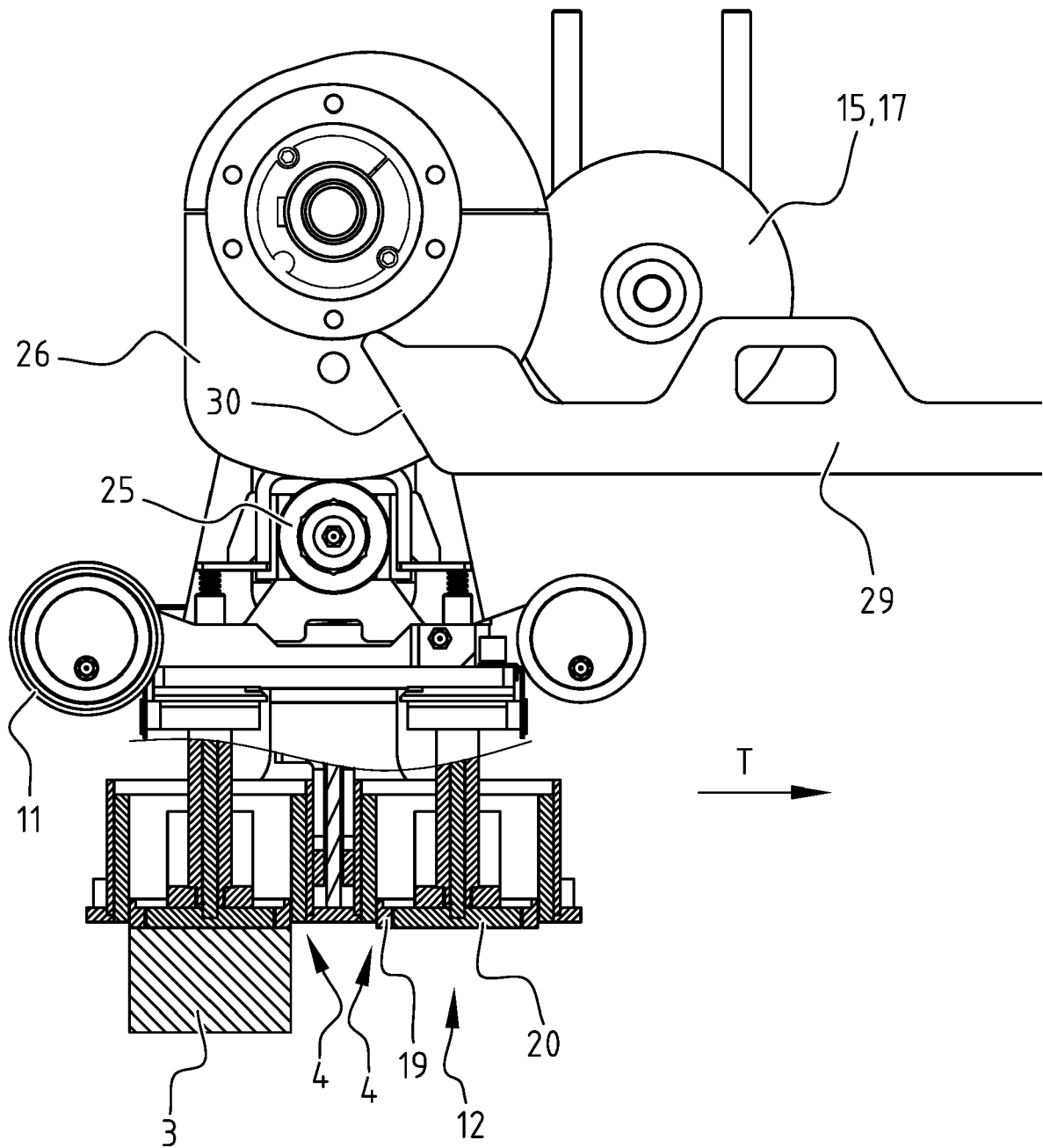
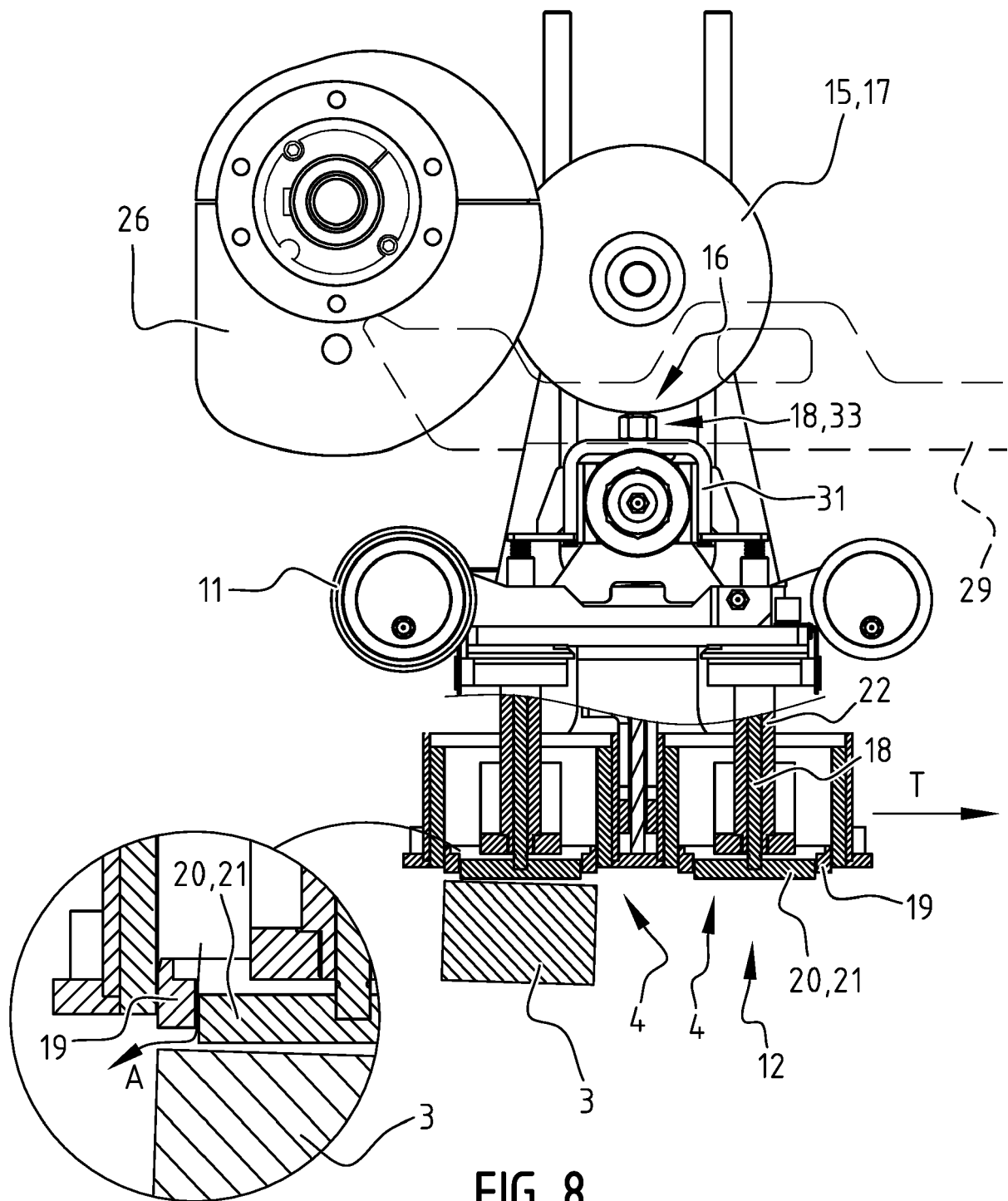
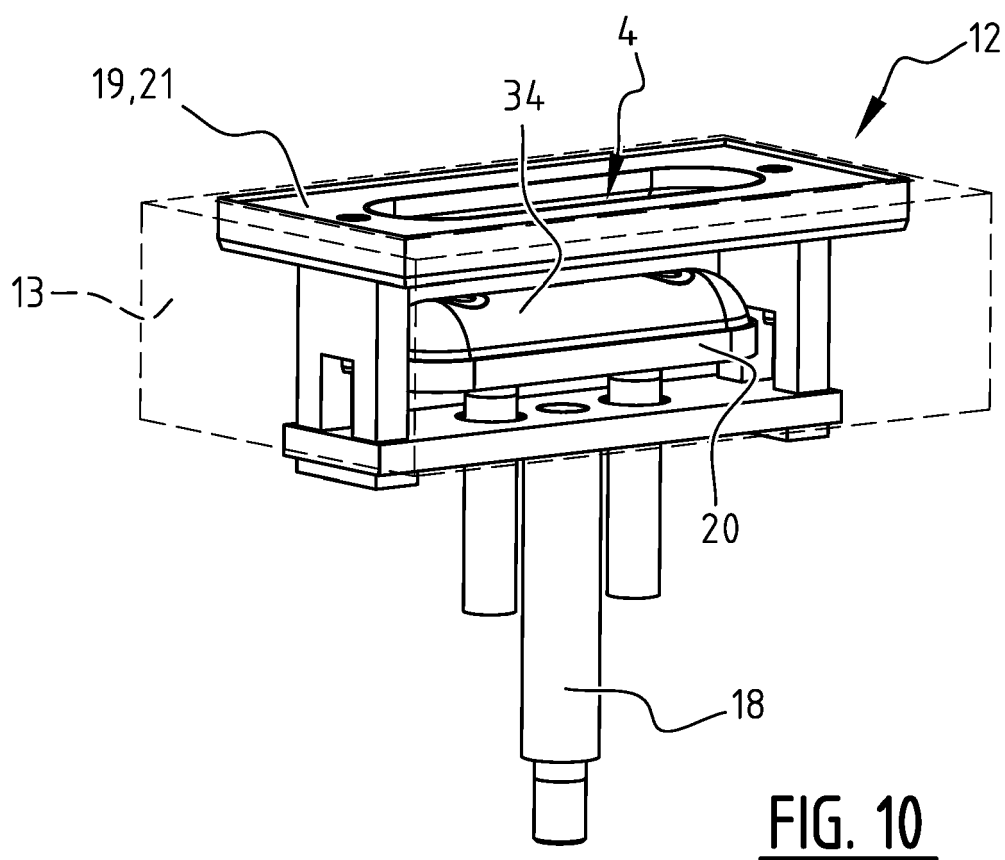
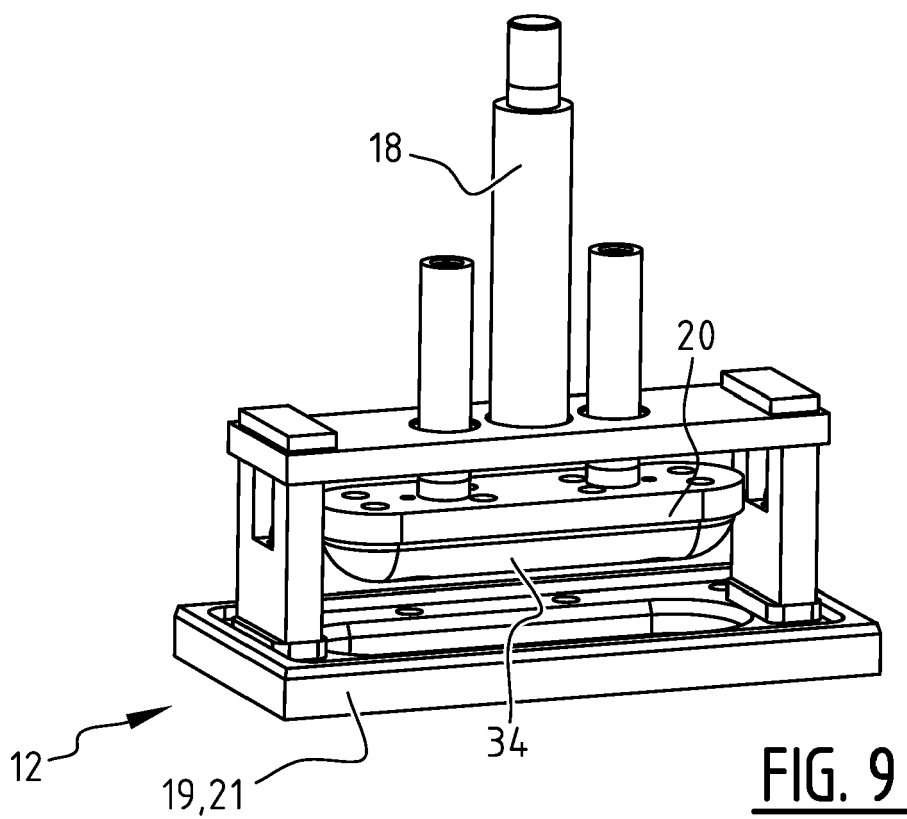


FIG. 7







EUROPEAN SEARCH REPORT

Application Number
EP 18 20 1915

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Place of search The Hague		Date of completion of the search 13 February 2019	Examiner Orij, Jack
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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REFERENCES CITED IN THE DESCRIPTION

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