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(54) **IMPROVED WORK MACHINE BUCKET HAVING A VARIABLE CAPACITY**

VERBESSERTE SCHAUFEL EINER ARBEITSMASCHINE MIT VARIABLER KAPAZITÄT

GODET DE MACHINE DE TRAVAIL AMÉLIORÉ AYANT UNE CAPACITÉ VARIABLE

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• **LOPREVITE, Mauro**

CAP 10099 San Mauro Torinese (TO) (IT)

(30) Priority: **23.02.2018 IT 201800002984**

(74) Representative: **CNH Industrial IP Department**

**Leon Claeyssstraat 3A
8210 Zedelgem (BE)**

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(73) Proprietor: **CNH Industrial Italia S.p.A.**

10156 Torino (IT)

(72) Inventors:

• **CAPOREALE, Davide**
10072 Caselle Torinese (TO) (IT)

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EP 3 755 845 B1

Description

TECHNICAL FIELD

[0001] The present invention concerns a bucket for a work machine, in particular bucket having variable capacity for an earth moving machine, e.g. a scraper.

BACKGROUND OF THE INVENTION

[0002] Earth moving machines, e.g. a scraper or a wheel loader, comprise a bucket carried by hydraulic controlled booms and configured to allow the handling of a preset quantity of material. The quantity of material which is handled by the bucket is directly proportional to the capacity, i.e. the volume, of the bucket.

[0003] Obviously, the bigger is the bucket, the greater is the quantity of material that the work machine may handle. However a big bucket is heavier and more difficult to control with respect to a small bucket. Moreover, a big capacity may be required only in peculiar working operations.

[0004] To address such problem, it is known to provide bucket having a variable capacity.

[0005] An examples of suck buckets are disclosed in GB2541751 A while CN104452848 show a bucket able to decrease its capacity. These buckets comprise a width that is reversibly adjustable between a minimum and a maximum value. Such solutions however are not suitable in condition of narrow space.

[0006] Other known solution is to provide so-called "rock guard" or "spill guard", e.g. as one disclosed in WO2015006809 A1, attached to a top edge of the bucket and configured to avoid material to fall out from the bucket when this latter is full of material and it is handled by booms of work vehicle. However such guards are not suitable for really increasing the capacity of the bucket and moreover they limit the movement of the bucket; indeed, a rotation around an axis passing from the connection of the bucket with booms of work machine is limited in view of such guards.

[0007] Therefore, the need is felt to provide a bucket which has a variable capacity while not interfering work machine movements and requirements.

[0008] An aim of the present invention is to satisfy the above mentioned needs in an optimized and cost-effective way.

SUMMARY OF THE INVENTION

[0009] The aforementioned aim is reached by a bucket for a work machine, the bucket having a variable capacity as claimed in independent claim 1 with preferred embodiments forming the subject-matter of the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] For a better understanding of the present invention, a preferred embodiment is described in the following, by way of a non-limiting example, with reference to the attached drawings wherein:

- Figure 1 is a perspective exploded view of a bucket for work machine according to the present invention;
- Figure 2 is a perspective view of a bucket for work machine according to the present invention in a first operative condition;
- Figure 3 is a perspective view of a bucket for work machine according to the present invention in a second operative condition;
- Figure 4 is a lateral view of the bucket of figure 2;
- Figure 5 is a lateral view of the bucket of figure 3;
- Figure 6 is a perspective view of the bucket of figure 3 when attached to a carrying element of a work machine;
- Figure 7 is a lateral schematic view of a work machine comprising a bucket according to the present invention in two operative conditions;
- Figure 8 is a lateral schematic view of a work machine comprising a bucket according to the present invention in a third operative condition;

DETAILED DESCRIPTION OF THE INVENTION

[0011] Figures 1 to 5 show a bucket 1 for a work machine essentially comprising a bottom wall 2 and a plurality of outside walls 3 which define a volume 4 in which material may be housed to be handled. Volume 4 is the capacity of the bucket.

[0012] According to the described and non-limiting embodiment, bucket 1 comprises a bottom wall 2 having a curved and concave shape towards volume 4 and four outside walls 3, in particular a pair of lateral walls 3a, a front wall 3b and a rear wall 3c. Outside walls 3 are fixedly connected together, preferably made as one piece, e.g. by casting.

[0013] The distance between lateral walls 3a defines a width W of bucket 1, while the distance between bottom wall 2 and respective upper edges of front, rear and lateral walls 3a, 3b and 3c defines a height H of bucket 1.

[0014] As better shown in figure 6, front wall 3b may comprise, at its outer edge, a plurality of teeth 7 configured to scratch the material to be handled. According to the described embodiment, teeth 7 extend parallel with respect to front wall 3b and get away from outer edge of front wall 3b.

[0015] Bucket 1 may further comprise connection means 8 configured to allow the connection of bucket 1 to work machine. According to the described embodiment connections means 8 may comprise a pair of flanges 9 extending perpendicularly from rear portion 3c opposite with respect to volume 4 and spaced apart symmetrically with respect to a symmetry plane of bucket 1.

Flanges 9 may be provided with holes 9a configured to allow the insertion of an element fixed to booms of work machine so as to connect bucket 1 to work machine 1 in a fixed or rotatable manner.

[0016] According to the present invention bucket 1 further comprises extension means configured to vary the volume 4 of bucket 1 from a first, minimum, value to of volume 4 a second, maximum, value of volume 4 of bucket 1 while the width W of bucket 1 remains constant.

[0017] According to the described embodiment extension means comprise an extension plate 11 carried by bucket 1 and configured to assume a position with respect to the bucket 1 from a first position defining a minimum height H' of bucket 1 and a second position defining a maximum height H of bucket 1.

[0018] Preferably extension plate 11 is carried by bucket 1 and is housed inside volume 4.

[0019] In particular, extension plate 11 may comprise a pair of lateral walls 12a, 12b and a rear wall 13, each having a shape complementary with respect to the shape of lateral walls 3a and rear wall 3c of bucket 1 towards these latter are faced.

[0020] Advantageously extension plate 11 may comprise guide means configured to guide the movement of extension plate 11 with respect to bucket 1. Guide means may comprise a guide 15 realized in each of lateral walls 12a, 12b configured to cooperate in sliding manner with respective protrusions 17 extending perpendicularly from lateral walls 3a of bucket 1.

[0021] Preferably, guide 15 are realized as two parallel openings 18, preferably having a substantial rectangular shape, in which protrusions 17, having a shape complementary with respect to the shape of the opening 18, may slide. Advantageously protrusions 17 may be realized as fixing screws configured to unscrew from lateral walls 3a of bucket 1 allowing lateral walls 12, 12b to slide with respect to lateral walls 3a and to screw into lateral walls 3a to fix lateral walls 12, 12b on this latter.

[0022] Extension means are further configured not to interfere with movements of bucket 1 with respect to work machine 1. Accordingly extension plate 11 comprises a cut-out portion 20 configured to avoid undesired contact between extension plate 11 and connection means 8.

[0023] According to the described embodiment, rear wall 3c comprises a cut-out portion 20 extending from upper edge of rear wall 3c and having a length and a width so as to allow the movement of extension plate 11 between first and second position with respect to bucket 11 without interfering with connection means 8. According to the described embodiment cut-out portion 20 is therefore wider than the space interposed between flanges 9 added to the width of flanges 9 and its height is at least equal to the maximum displacement of extension plate 11 with respect to bucket 1.

[0024] The operation of the bucket 1 according the present invention is as follows.

[0025] In a first operative condition of bucket 1, as disclosed in figure 4, extension plate 11 is totally housed

inside volume 4 and therefore the volume of bucket 1 is at its minimum value.

[0026] In a second operative condition of bucket 1, as disclosed in figure 5, extension plate 11 is slid so that extension plate 11 reaches its maximum displacement therefore the volume of bucket 1 is at its maximum value.

[0027] Sliding of extension plate 11 with respect to bucket 1 is realized thanks to gravity. When bucket 1 is in a rest condition, i.e. with bottom wall 2 faced with respect to ground, protrusion 17 are placed in correspondence of an upper extremity of opening 18 and therefore extension plate is totally housed inside volume 4. Conversely, when bucket 1 is in an operative condition (see figure 7), i.e. with bottom wall 2 faced opposite with respect to the ground, extension plate 11 slides to that protrusion 17 are placed in correspondence of a lower extremity of opening 18 and extension plate 11 reaches its maximum height.

[0028] Figure 7 shows a work machine 100, e.g. a scraper, comprising a boom 101 hydraulically operated and a bucket 1 as described above coupled to the extremity of the boom 101.

[0029] The user can therefore unscrew protrusion 17 and control boom 101 which operates bucket 1 in scraping position, i.e. with bottom wall 2 faced opposite with respect to the ground and teeth 7 directed to this latter. In this condition, as described above, extension plate 11 slides to define a maximum value of volume 4. Then, user may fix screw protrusion 17 into lateral walls 3a so as to fix extension plate 11 with respect to bucket 1. Then, the user may operate boom 101 to handle material which can be safely handled by work machine 100.

[0030] It has to be noted that, once extracted from volume 4, extension plate 11 does not interfere with the visual field of the user of the work machine 100. In fact, as shown in figure 8, a user from a cabin of said machine 100 can always see where teeth 7 of bucket 1 are directed. This is achieved because the height H' of bucket 1, when extension plate 11 is totally extracted from volume 4, is always lower than the height of teeth 7 with respect to bottom plate 2.

[0031] In view of the foregoing, the advantages of bucket 1 having a variable volume for work machine 100 according to the invention are apparent.

[0032] Thanks to the above described extension means, volume of bucket 1 may be varied without increasing the width of the bucket 1. Moreover, the use of a sliding extension plate 11 achieve such result in a cost-effective way.

[0033] The use of an extension plate 11 may increase the volume of bucket 1 of at least 15%.

[0034] Extension plate 11 may be also customized for different shape of bucket 1, without limitation of movement of bucket 1 with respect to boom 101 and always allowing the sight of teeth 7.

[0035] It is clear that modifications can be made to the described bucket having a variable volume for work machine which do not extend beyond the scope of protection

defined by the claims.

[0036] For example, shapes and number of walls of bucket 1 and extension plate 11 may be varied in function of the typology of work machine.

[0037] Moreover, extension plate 11 may be slid with respect to bucket 1 thanks to a mechanical or hydraulic system. Further, extension plate 11 may be carried externally with respect to volume 4.

Claims

1. Bucket (1) for a work machine (100), comprising a plurality of walls (2, 3) defining a volume (4) for handling material, said bucket (1) comprising an extension plate (11) carried in a sliding manner by said bucket configured to increase said volume (4) from a first value to a second value while the width (W) of said bucket (1) remains constant, said bucket (1) is **characterized in that** said sliding of said extension plate (11) with respect to said bucket (1) is achieved by gravity.
2. Bucket according to claim 1, **characterized in that** said extension plate (11) carried by said bucket slides vertically with respect to said bucket (1).
3. Bucket according to claim 1 or 2, **characterized in that** said extension plate (11) slides with respect to said bucket (1) inside said volume (4).
4. Bucket according to any of claims 1 to 3, **characterized in that** said extension plate (11) comprises at least a pair of lateral walls (12a, 12b) and a rear wall (13) each respectively faced to one of said walls (2, 3) of said bucket towards and having a shape respectively corresponding to the shape of said faced walls (2, 3).
5. Bucket according to any of claims 1 to 4, **characterized in that** said sliding of said extension plate (11) with respect to said bucket (1) is achieved by guide means.
6. Bucket according to claim 5, **characterized in that** said guide means comprise at least one opening (18) realized in one between said extension plate (11) and said walls (3a, 3b) and at least one protrusion (17) extending from the other of said extension plate (11) and said walls (3a, 3b), said at least one protrusion (17) being configured to cooperate in sliding manner in said at least one opening (18).
7. Bucket according to claim 6, **characterized in that** said bucket (1) comprises connection means (8) configured to connect said bucket (1) to a boom (101) of said work vehicle (100) and **in that** the extension plate (11) comprises a cut-out portion (20) config-

ured to allow the movement of said extension plate (11) with respect to said bucket (1) without interfering with said boom (101) of said work vehicle (100).

Patentansprüche

1. Schaufel (1) für eine Arbeitsmaschine (100) mit einer Mehrzahl von Wänden (2, 3), die ein Volumen (4) zur Handhabung von Material definieren, wobei die Schaufel (1) eine Erweiterungsplatte (11) aufweist, die in einer gleitenden Art von der Schaufel getragen wird, die dazu eingerichtet ist, das Volumen (4) von einem ersten Wert zu einem zweiten Wert zu vergrößern, während die Breite (W) der Schaufel (1) konstant bleibt,

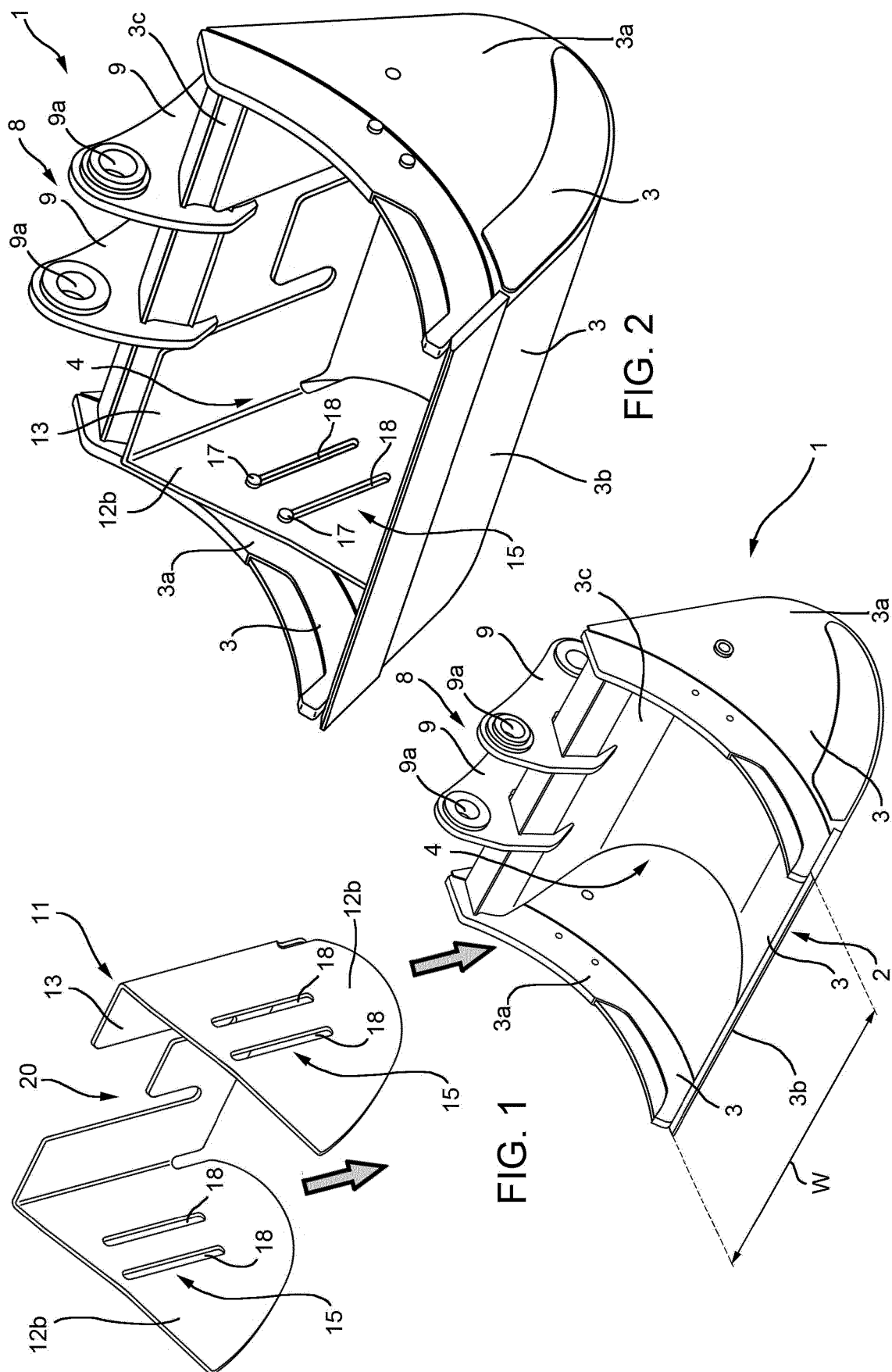
wobei die Schaufel (1) **dadurch gekennzeichnet ist, dass**
das Gleiten der Erweiterungsplatte (11) in Bezug zu der Schaufel (1) mittels der Schwerkraft erreicht wird.
2. Schaufel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Erweiterungsplatte (11), die von der Schaufel getragen wird, in Bezug zu der Schaufel (1) vertikal gleitet.
3. Schaufel nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Erweiterungsplatte (11) in Bezug zu der Schaufel (1) in das Volumen (4) hinein gleitet.
4. Schaufel nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Erweiterungsplatte (11) mindestens ein Paar von Seitenwänden (12a, 12b) und eine Rückwand (13) aufweist, die jeweils entsprechend einer der Wände (2, 3) der Schaufel zugewandt sind und die eine entsprechende Form aufweisen, die der Form der zugewandten Wände (2, 3) entspricht.
5. Schaufel nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** das Gleiten der Erweiterungsplatte (11) in Bezug zu der Schaufel (1) mittels eines Gleitmittels erreicht wird.
6. Schaufel nach Anspruch 5, **dadurch gekennzeichnet, dass** das Gleitmittel mindestens eine Öffnung (18), die in einem Element aus der Erweiterungsplatte (11) und den Seitenwänden (3a, 3b) ausgeführt ist, und mindestens einen Vorsprung (17) aufweist, der sich von dem anderen Element aus der Erweiterungsplatte (11) und den Seitenwänden (3a, 3b) erstreckt, wobei der mindestens eine Vorsprung (17) dazu eingerichtet ist, in einer gleitenden Art mit der mindestens einen Öffnung (18) zusammen zu wirken.

7. Schaufel nach Anspruch 6, **dadurch gekennzeichnet, dass** die Schaufel (1) ein Verbindungsmittel (8) aufweist, das dazu eingerichtet ist, die Schaufel (1) mit einem Ausleger (101) des Arbeitsfahrzeugs (100) zu verbinden und darin, dass die Erweiterungsplatte (11) einen Ausschnittsabschnitt (20) aufweist, der dazu eingerichtet ist, die Bewegung der Erweiterungsplatte (11) in Bezug zu der Schaufel (1) zu ermöglichen, ohne den Ausleger (101) des Arbeitsfahrzeugs (100) zu beeinträchtigen. 5 10

7. Godet selon la revendication 6, **caractérisé en ce que** ledit godet (1) comprend des moyens de connexion (8) configurés pour connecter ledit godet (1) à une flèche (101) dudit véhicule de travail (100) et **en ce que** la plaque d'extension (11) comprend une partie découpée (20) configurée pour permettre le mouvement de ladite plaque d'extension (11) par rapport audit godet (1) sans interférer avec ladite flèche (101) dudit véhicule de travail (100).

Revendications

1. Godet (1) pour machine de travail (100), comprenant une pluralité de parois (2, 3) définissant un volume (4) pour la manipulation de matériau, ledit godet (1) comprenant une plaque d'extension (11) portée de manière coulissante par ledit godet configurée pour augmenter ledit volume (4) d'une première valeur à une seconde valeur alors que la largeur (W) dudit godet (1) reste constante, ledit godet (1) est **caractérisé en ce que** ledit glissement de ladite plaque d'extension (11) par rapport audit godet (1) est réalisé par la gravité. 15 20 25
2. Godet selon la revendication 1, **caractérisé en ce que** ladite plaque d'extension (11) portée par ledit godet coulisse verticalement par rapport audit godet (1). 30
3. Godet selon la revendication 1 ou 2, **caractérisé en ce que** ladite plaque d'extension (11) coulisse par rapport audit godet (1) à l'intérieur dudit volume (4). 35
4. Godet selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** ladite plaque d'extension (11) comprend au moins une paire de parois latérales (12a, 12b) et une paroi arrière (13) faisant chacune respectivement face à l'une desdites parois (2, 3) dudit godet vers et ayant une forme correspondant respectivement à la forme desdites parois (2, 3) se faisant face. 40
5. Godet selon l'une quelconques des revendications 1 à 4, **caractérisé en ce que** le glissement de ladite plaque d'extension (11) par rapport audit godet (1) est réalisé par des moyens de guidage. 45
6. Godet selon la revendication 5, **caractérisé en ce que** lesdits moyens de guidage comprennent au moins une ouverture (18) réalisée dans l'une parmi ladite plaque d'extension (11) et lesdites parois (3a, 3b) et au moins une saillie (17) s'étendant de l'autre de ladite plaque d'extension (11) et desdites parois (3a, 3b), ladite au moins une saillie (17) étant configurée pour coopérer de manière coulissante dans ladite au moins une ouverture (18). 50 55



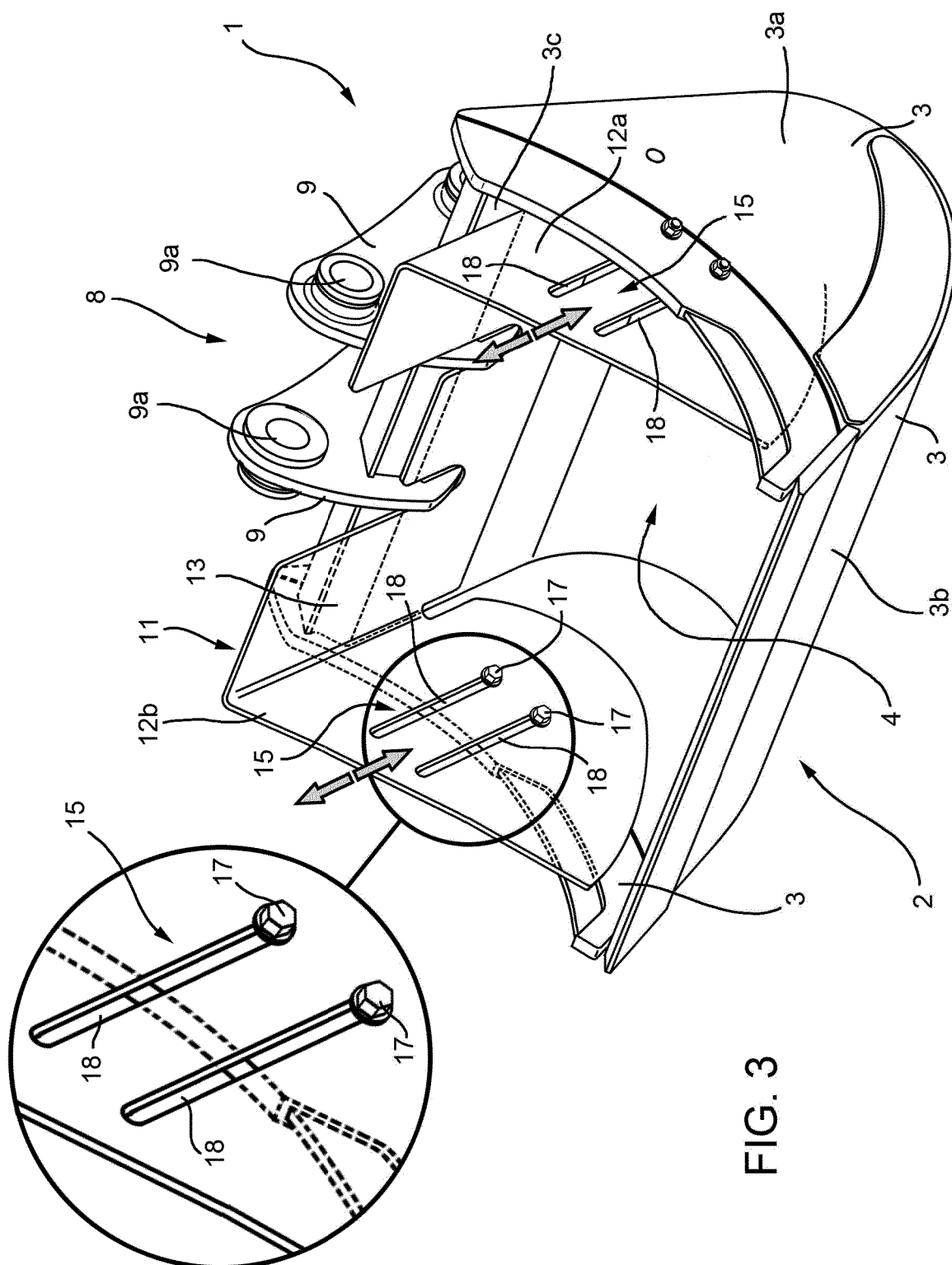
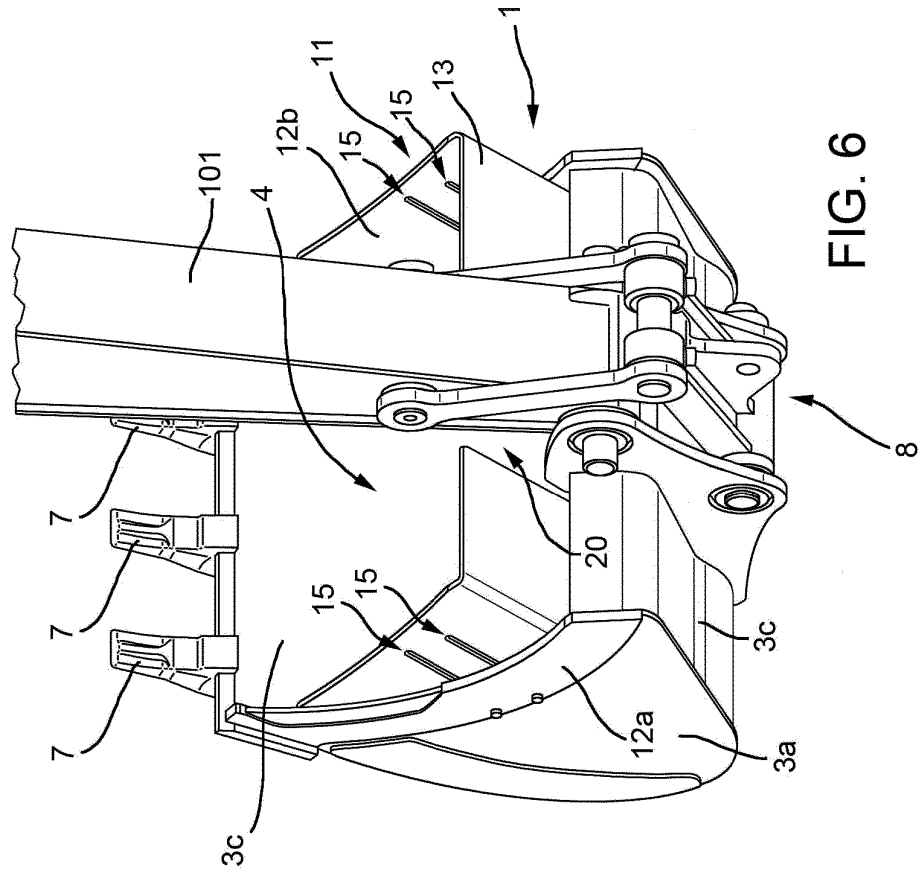
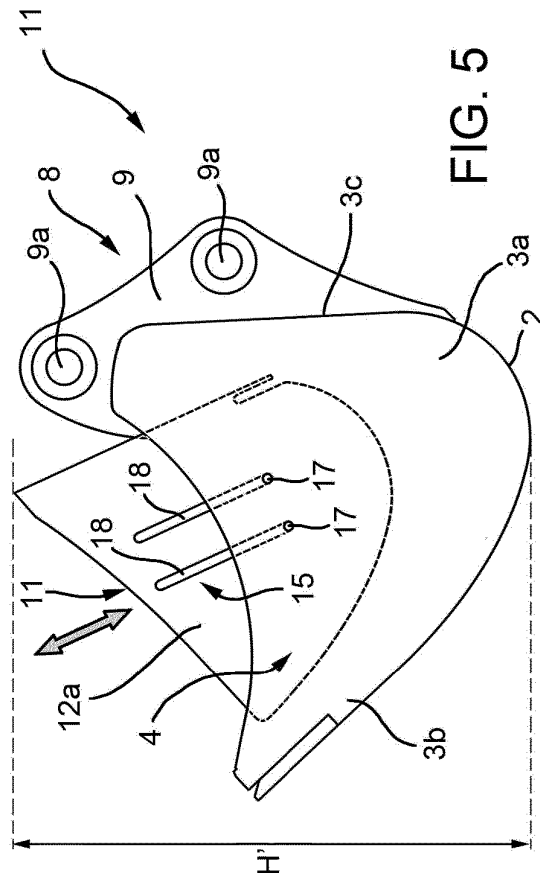
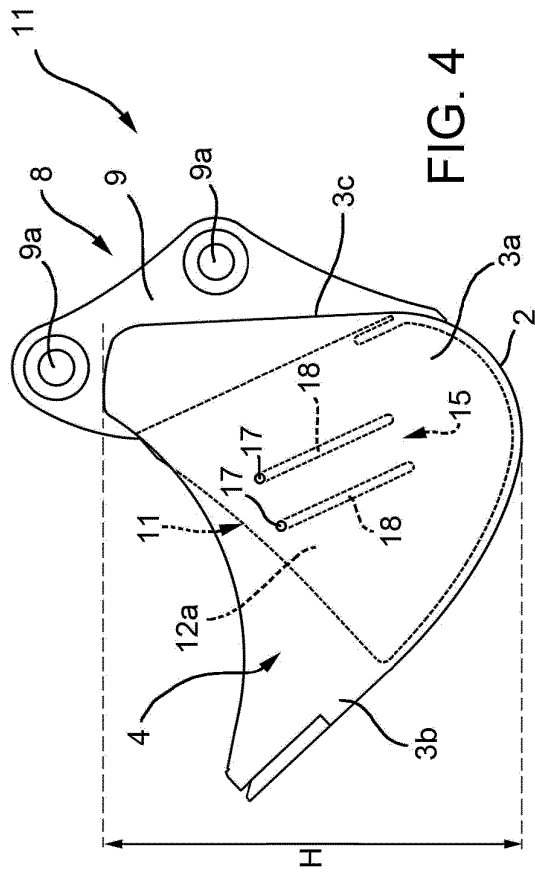


FIG. 3



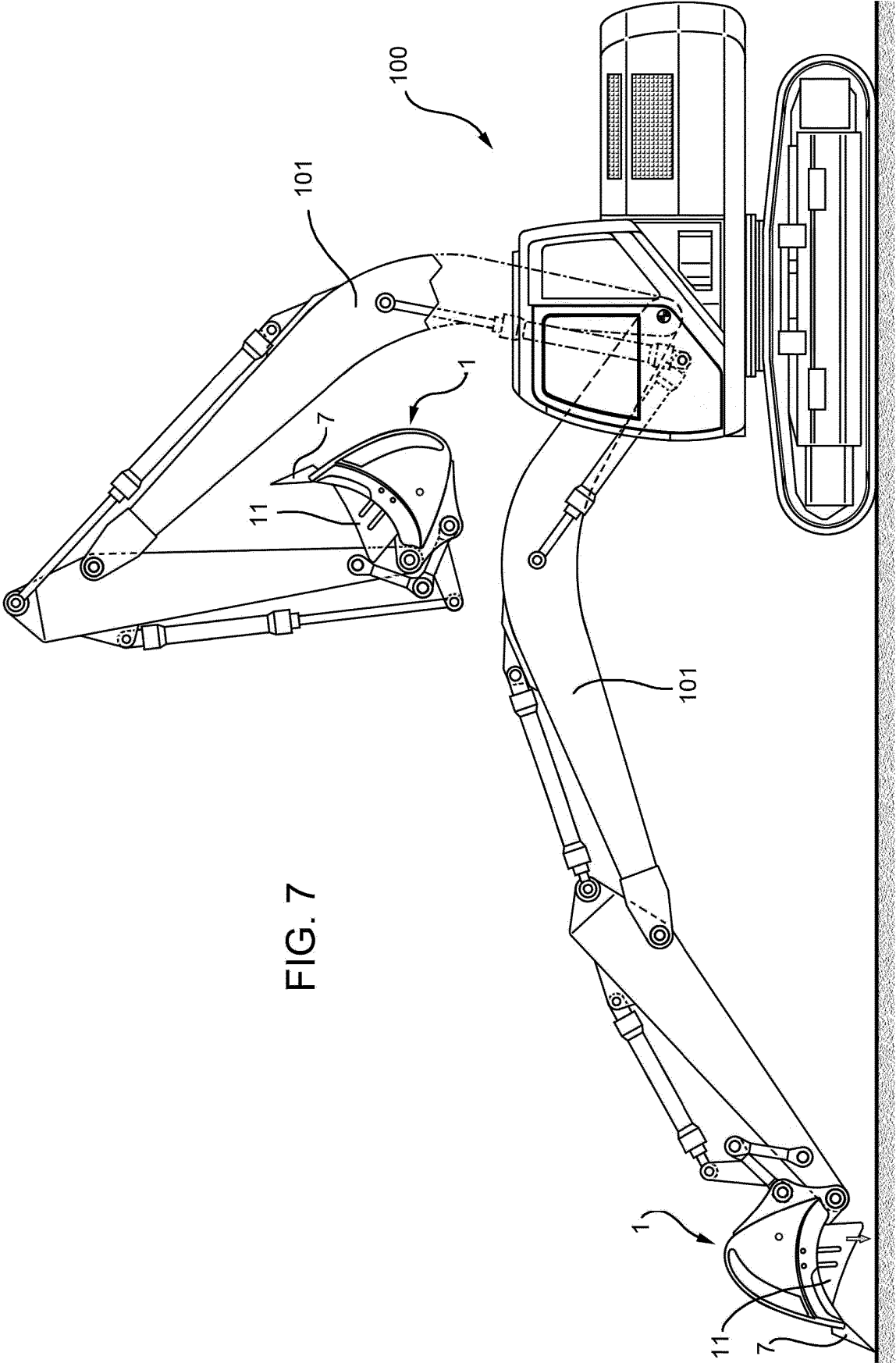
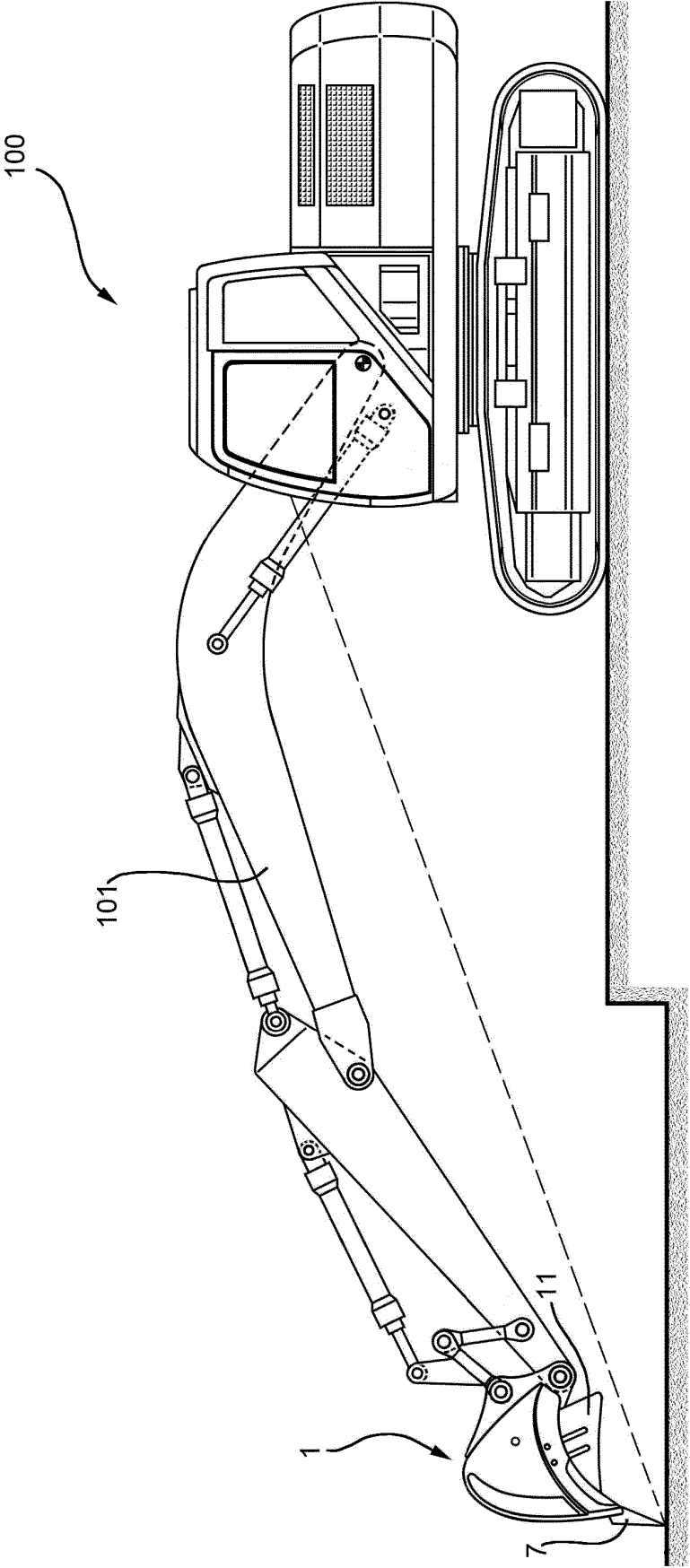


FIG. 8



REFERENCES CITED IN THE DESCRIPTION

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