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(71) Applicant: **E.M.G. Srl**
26010 Pozzaglio ed Uniti (CR) (IT)

(72) Inventor: **GATTI, Giorgio**
26100 Cremona (IT)

(74) Representative: **Mari, Marco Giovanni et al**
Ing. Mari & C. S.r.l.
Via Garibotti, 3
26100 Cremona (IT)

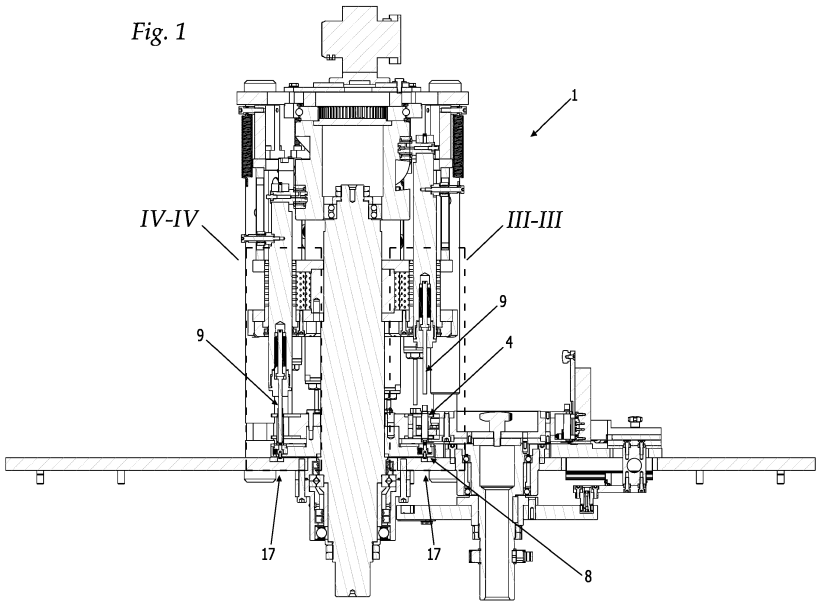
(54) **PRIMING MACHINE FOR CARTRIDGES WITH A METAL CASE**

(57) The invention relates to a priming machine (1) for cartridges with a metal case comprising a support frame (3); means (4) for feeding a plurality of metal cases (2) comprising a hollow body (5) having a longitudinal axis of symmetry and a head (6) shaped to contain a primer cup (7), and means (8) for feeding a plurality of primer cups (7); means for pushing said primer cups (7) inside the head (6) of said metal cases (2); means for moving and ejecting the primed cases; motor means and a control unit.

Said push means comprise a piston (9) designed to cooperate with the inner surface (6') of the head (6) of the case (2) in order to move said case (2) vertically in relation to a reference plane, and enable the coupling of a cup (7) inside a case (2).

Said priming machine (1) comprises a fixed lower surface (11) on which said primer cups (7) rest, and an upper surface (12) movable along the axis of the cases (2), on which the head (6) of the case rests. Said upper movable surface (12) is designed to enable a vertical movement (Δ) of each case (2) defined in relation to the corresponding underlying primer cup (7), thus enabling the outer surface (6") of said head (6) to be used as a reference plane for the insertion of said cup (7) inside said case (2).

Fig. 1



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Description

[0001] The invention relates to the sector of machines for the production and loading of ammunition, and particularly of cartridges used in the sports and military sectors.

[0002] More in detail, the invention concerns a priming machine for cartridges with a metal case, particularly of the type made of brass and steel alloys, designed to insert primer cups inside the head of said case.

[0003] The case substantially comprises a hollow body, generally of a truncated cone or substantially conical shape, that contains the gunpowder, closed on the underside by a flat head that is centrally shaped with a perforated seat adapted to contain a primer cup, i.e. a small charge that, when hit by the striker of the firearm, makes the main charge of propellant explode.

[0004] According to the known art, priming machines for cartridges substantially comprise a supporting frame, means for feeding a plurality of metal cases and a corresponding plurality of primer cups, means for pushing said primer cups inside said metal cases, and means for moving and ejecting the cases once they are complete with a primer.

[0005] Such machines also comprise motor means for driving said feeding, moving and ejecting means.

[0006] All movements and the synchronism between the various machine components are managed by an appropriate electronic unit for controlling its electromechanical parts.

[0007] During the feeding of the components to be assembled, the primer cup is placed, with the bottom of the cup uppermost, on the outer surface of the head, which faces upwards.

[0008] The push means provided on the priming machines push the primer cup inside the seat provided on the head of the case. The push means traditionally comprise two pistons: a first piston is designed to slide inside the hollow body of the case and cooperate with the inner surface of the head; a second, opposing piston is designed to cooperate with the bottom of the primer cup to keep it in position during the insertion of the head inside the seat.

[0009] The piston inside the case cooperates with the opposing piston to enable a stable interference coupling of the cup with the case.

[0010] The first piston, inserted inside the case, brings a pushing force to bear on the inner surface of the head that enables a pre-set amount of vertical movement of the whole case. The length of this movement is usually calculated as a function of the height of the primer cup to be inserted.

[0011] Such priming machines have several drawbacks and disadvantages.

[0012] For the firearm, i.e. both the striker and the breechblock, to function properly, the primer cup must be fully inserted in its seat with the bottom of the cup a pre-set distance (specified by the manufacturer) further inside the case in relation to the plane identified by the outer surface of the head of the case. Said distance is specified as a function of the type of ammunition and of the type of firearm in which it is used. The positioning tolerance is approximately 0.03 mm.

[0013] The main problem lies in the difficulty of inserting the primer cup precisely and at the right distance inside the seat provided on the head of the case.

[0014] A disadvantage of currently-used priming machines lies in that they rely on the inner surface of the head of the case as a reference plane to define the movement of the case being pushed by the piston. Unfortunately, the distance between the inner surface and the outer surface, and the depth of the seat for containing the cup, may vary from one case to another, even for cartridges of the same calibre. In fact, the manufacture of these cases includes a drawing phase in their machining and shaping, and this operation cannot assure a constant dimensional precision for all the cases.

[0015] This drawing phase consists in converting a flat sheet of rolled metal material into a hollow object of more or less complex shape by means of one or more steps completed inside moulds. This drawing process induces a variation in the thickness of the original sheet, leading to the manufacture of cases that are of different thicknesses in various places. This makes it very difficult to obtain cases of constant thickness, even when the allowable dimensional tolerances are met.

[0016] Since conventional priming machines use a case-cup coupling system that involves relying on the inner surface of the head as a reference plane to establish the length of the movement needed to ensure that the case incorporates the cup, any dimensional variations in the hollow body of the case, such as different heights of the head or different depths of the seat, will give rise to an imprecise positioning of the cup inside its seat.

[0017] There is consequently a risk of the primer cup being pushed too far inside the head of the case or, worse still, it may remain partially outside the case, with the risk of it being accidentally bumped and broken, or damaged and interfering with the explosion of the gunpowder, or giving rise to firearm jamming or malfunctioning.

[0018] Disadvantageously, the need to achieve a coupling with such a narrow tolerance is incompatible with the unavoidable dimensional inaccuracies of the various cases, and the operation cannot be guaranteed if the inner surface of the head is used as the reference plane to calculate the movement of the piston because it often varies from one case to another.

[0019] A further drawback of the known art concerns the safety of the machine as a whole, and stems from the orientation of the cups and cases during their feeding and handling in traditional priming machines.

[0020] The feed means are arranged so that the cases move forward on a lower level with the opening in the hollow body facing downwards, while the cups advance on a higher level with their loading side facing downwards, and therefore always towards the inside of the

machine, where its working parts are located.

[0021] Disadvantageously, during the handling of the cups, there is a risk of the priming powder escaping from the side facing downwards, which is not always perfectly sealed. As a consequence, it is easy for the sliding surfaces of the machine to be soiled by the powder falling out, making clean and servicing operations continuously necessary.

[0022] An even greater disadvantage lies in that any build-up of the explosive powder is very dangerous; it can cause fire, trigger explosions and lead to accidents and injuries.

[0023] The invention proposes to overcome these drawbacks by means of a priming machine for cartridges with a metal case that is efficient and precise in the manufacturing phases; that enables properly assembled cases that comply with the required dimensional tolerances to be obtained, and that guarantees the utmost safety for operators, the working environment and the machine itself.

[0024] These objectives are achieved with a priming machine for cartridges with a metal case comprising:

- a supporting frame;
- feed means for feeding a plurality of metal cases comprising a hollow body having a longitudinal axis of symmetry and a head shaped so as to contain a primer cup;
- feed means for feeding a plurality of primer cups;
- push means for pushing said primer cups inside the head of said metal cases;
- means for moving and ejecting the primed cases;
- motor means;
- a machine control unit,

wherein said push means comprise a piston adapted to cooperate with the inner surface of the head of the case in order to move said case vertically in relation to a reference plane and to allow the mutual forced coupling of a cup inside a case, characterized in that said priming machine comprises a fixed bottom surface on which said primer cups rest and an upper surface, movable along the axis of the cases on which the head of said cases rests, wherein said movable upper surface is adapted to allow a given vertical movement of each case in relation to the corresponding underlying primer cup, thereby enabling the outer surface of said head to be used as the reference plane for the insertion of said primer cup inside said case.

[0025] According to a first aspect of the invention, said movable upper surface comprises elastic means adapted to enable the reversibility of its movement.

[0026] Said movable upper surface advantageously comprises stop means adapted to define the maximum length of the movement of said cases according to the height of said primer cups.

[0027] In addition, said piston is elastically yielding.

[0028] In particular, said piston is divided into two portions connected together in a telescopic manner, with the interposition of elastic means.

[0029] In a preferred embodiment, said elastic means interposed in said telescopic connection comprise disc springs.

[0030] The main advantage of the invention derives from having changed the reference plane used to calculate the amount of movement of the case, having made it no longer dependent on the geometrical structure and internal dimensions of the case.

[0031] Though still pushing from the inside of the hollow body of the case, it uses as a reference plane the outer surface of the head, and this guarantees a constant, equal and correct insertion of the cup inside the head below its reference surface, irrespective of the dimensional tolerances of the inside of the case.

[0032] During the actual insertion of the primer, the cup remains at a standstill while the head is lowered onto and around the cup.

[0033] Pre-setting the maximum length of this movement, and particularly of the lowering of the surface on which the case rests, by means of an appropriate positioning of the stop means guarantees the uniformity of assembly of all the cases, optimising their production.

[0034] The elastically yielding piston enables any excess pushing force to be absorbed and compensates for the more ample movement induced by the machine on the piston in relation to the distance by which the surface on which the head of the case rests is lowered.

[0035] Feeding the cases from above and keeping the underlying cups resting on the fixed surface with their open end facing upwards offer important safety benefits for the machine and its operators, since there is no longer any risk of gunpowder falling out and dropping inside the machine.

[0036] Moreover, the cup is always kept resting on the feed line and does not run any risk of being damaged during its handling.

[0037] The advantages of the invention will emerge more clearly in the following description of a preferred embodiment, given as a non-limiting example, with the aid of the figures wherein:

Figures 1 and 2 show vertical and horizontal sections, respectively, of a priming machine for cartridges with a metal case according to the invention;

Figures 3 and 4 show a vertical section of a detail of the machine in Figs. 1 and 2, coming within the dotted lines III-III and IV-IV, in two different working positions;

Figures 5 and 6 show a vertical section, with slightly deformed proportions for the sake of clarity, of details drawn from Figures 3 and 4, respectively.

[0038] With reference to Figures 1 and 2, showing a priming machine 1 for cartridges with a metal case 2, generally made of brass and steel alloy, and used in the sporting and military sectors.

[0039] Said priming machine 1 essentially comprises a support frame 3 on which there are: feed means 4 for a plurality of metal cases 2, and feed means 8 for a plurality of primer cups 7; means for pushing said primer cups 7 inside the head 6 of said cases 2; means for moving and ejecting the cartridges once complete with primers.

[0040] Said priming machine 1 comprises a plurality of stations 17 where the primer cups are inserted in the bottoms of the cases, positioned in a circular arrangement. Said machine is therefore designed to operate in a continuous cycle because each insertion station 17 corresponds to a precise insertion phase.

[0041] Said feed means 8 for said plurality of primer cups 7 are provided along the lower portion of said machine 1, underneath the feed means 4 for said plurality of cases 2.

[0042] Said feed means 8 for said plurality of primer cups 7 and said feed means 4 for said plurality of cases 2 converge towards said insertion stations 17.

[0043] Said machine 1 is also equipped with motor means and a control unit designed to superintend all the machine's functions.

[0044] With particular reference to the detailed cross sections of Figures 3 and 4, and even more specifically in the enlarged cross sections of Figures 5 and 6, said insertion stations 17 can be seen in two distinct working stages: Figures 3 and 5 refer to a station in which the case 2 and the primer cup 7 are simply positioned so as to be axially aligned, one above the other; Figures 4 and 6 refer instead to a station where the push means located inside the case are actually inserting the primer cup 7 in the head 6.

[0045] Said metal cases 2 comprise a hollow body 5 in the shape of a truncated cone with a longitudinal axis of symmetry, closed underneath by a flat head 6 that is shaped centrally to form a seat 16 designed to contain a primer cup 7.

[0046] Said primer cups 7 likewise comprise a cylindrical hollow body of limited height in relation to the dimensions of the cases, and a seal for closing said hollow body designed to retain the priming mixture inside it.

[0047] The remainder of this description concerns the components of a generic insertion station 17.

[0048] For each insertion station 17 of said priming machine 1, said push means comprise a movable piston 9 connected to said motor means, which enable a reversible movement of vertical displacement.

[0049] Said piston 9 is designed to cooperate with the inner surface 6' of the head 6 of the case 2, to facilitate its displacement.

[0050] Said piston 9 is elastically yielding, being composed of two telescopically connected portions 10', 10" with the interposition of elastic means.

[0051] Said elastic means comprise disc springs 15 chosen in number and size as a function of the type and dimension of the case 2 to be primed.

[0052] In line with each insertion station 17, said priming machine 1 comprises a fixed lower surface 11, of circular shape, supporting the primer cup 7 coming from the respective feed means 8. Said fixed lower surface 11 has a diameter substantially equating to the diameter of the base of said primer cup 7.

[0053] Generally speaking, said primer cups 7 rest on the fixed lower surface 11 oriented with their closing seals facing upwards, so that the priming mixture remains contained inside the hollow body of the cup and is not spilt inside the machine (Figures 3 and 5).

[0054] Again in line with each insertion station 17, said priming machine 1 also comprises an un movable upper surface 12, shaped in the form of a circular crown, which supports the head 6 of the case 2 to be primed. Said movable circular crown is designed so that it can fit around the corresponding fixed lower surface 11 of circular shape.

[0055] In particular, said movable upper surface 12 in the shape of a circular crown supports the outer surface 6" of the head 6 surrounding the seat 16 for containing the cups 7, which is also in the shape of a circular crown.

[0056] Said movable upper surface 12 is designed to enable the vertical displacement of each case 2 due to the effect of the pushing force brought to bear on the case by the piston 9.

[0057] The lowering of said movable surface 12 is thus designed to enable a displacement Δ of each case 2 defined in relation to the fixed surface 11 supporting the respective primer cup 7.

[0058] This displacement movement enables the case 2 to incorporate said cup 7, by forced interference, inside the seat 16 in the head 6 (Figures 4 and 6).

[0059] Irrespective of the force delivered by the motor means and brought to bear by the piston 9 on the inner surface 6' of the head 6, the case 2 advantageously moves by a defined quantity Δ that is pre-set during the construction of the machine by means of the appropriate positioning of the stop means 14.

[0060] Said stop means 14 consist of the base of the priming machine 1, and the movement Δ that the movable surface 12 can perform is determined by the structural distance, established during the assembly of the machine, between said base and the underside of said movable surface.

[0061] Any excess force brought to bear by the piston 9 is absorbed by the disc springs 15 inserted in the telescopic connection between the components 10', 10" of the piston 9, which enable the piston to absorb any dimensional differences inside the case 2, while always completing the full displacement Δ required to ensure the appropriate positioning of the primer cup 7 inside the seat 16 in the head 6 of the case 2.

[0062] Being able to compensate for said force by means of the disc springs 15 makes it unnecessary to set particular parameters for said motor means, which may consequently always bring the same amount of pressure to bear on the piston 9.

[0063] In addition, to ensure the appropriate insertion

of the cup 7 inside the case 2, irrespective of the dimensions of the cases, it is only necessary to set the maximum extent of the movement Δ of the movable surface 12 as the height h of the cup plus a few millimetres (specified by the manufacturer), such that the cup fits well within the seat 16 in the head, bearing in mind the tolerances.

[0064] The elastic means and, to be specific, helical springs 13 located underneath said movable surface 12, ensure the reversibility of the downward movement of said surface.

[0065] After positioning the cup 7 in the seat 16 of the head 6, the piston 9 and the movable surface 12 move upwards, releasing the case 2 so that it can be forwarded to the moving and ejecting means.

Claims

1. A priming machine (1) for cartridges with a metal case comprising:

- a support frame (3);
- feed means (4) for feeding a plurality of metal cases (2) comprising a hollow body (5) having a longitudinal axis of symmetry and a head (6) shaped so as to contain a primer cup (7);
- feed means (8) for feeding a plurality of primer cups (7);
- push means for pushing said primer cups (7) inside the head (6) of said metal cases (2);
- means for moving and ejecting the primed cases;
- motor means;
- a machine control unit,

wherein said push means comprise a piston (9) adapted to cooperate with the inner surface (6') of the head (6) of the case (2) to move said case (2) vertically in relation to a reference plane and to allow mutual forced coupling of a cup (7) inside a case (2), **characterized in that** said priming machine (1) comprises a fixed bottom surface (11) on which said primer cups (7) rest and an upper surface (12), movable along the axis of the cases (2), on which the head (6) of said cases rests, wherein said movable upper surface (12) is adapted to allow a given vertical movement (Δ) of each case (2) in relation to the corresponding underlying primer cup (7), thereby enabling the outer surface (6") of said head (6) to be used as reference plane for the insertion of said primer cup (7) inside said case (2).

2. The priming machine (1) according to claim 1, **characterized in that** said movable upper surface (12) comprises elastic means (13) adapted to enable the reversibility of its movement.

3. The priming machine (1) according to claim 1, **characterized in that** said movable upper surface (12) comprises stop means (14) adapted to define the maximum length of the movement (Δ) of said cases (2) according to the height (h) of said primer cups (7).

4. The priming machine (1) according to claim 1, **characterized in that** said piston (9) is elastically yielding.

5. The priming machine (1) according to claim 4, **characterized in that** said piston (9) is divided into two portions (10', 10") connected together in a telescopic manner with the interposition of elastic means.

6. The priming machine (1) according to claim 5, **characterized in that** said elastic means interposed in said telescopic connection comprise disc springs (15).

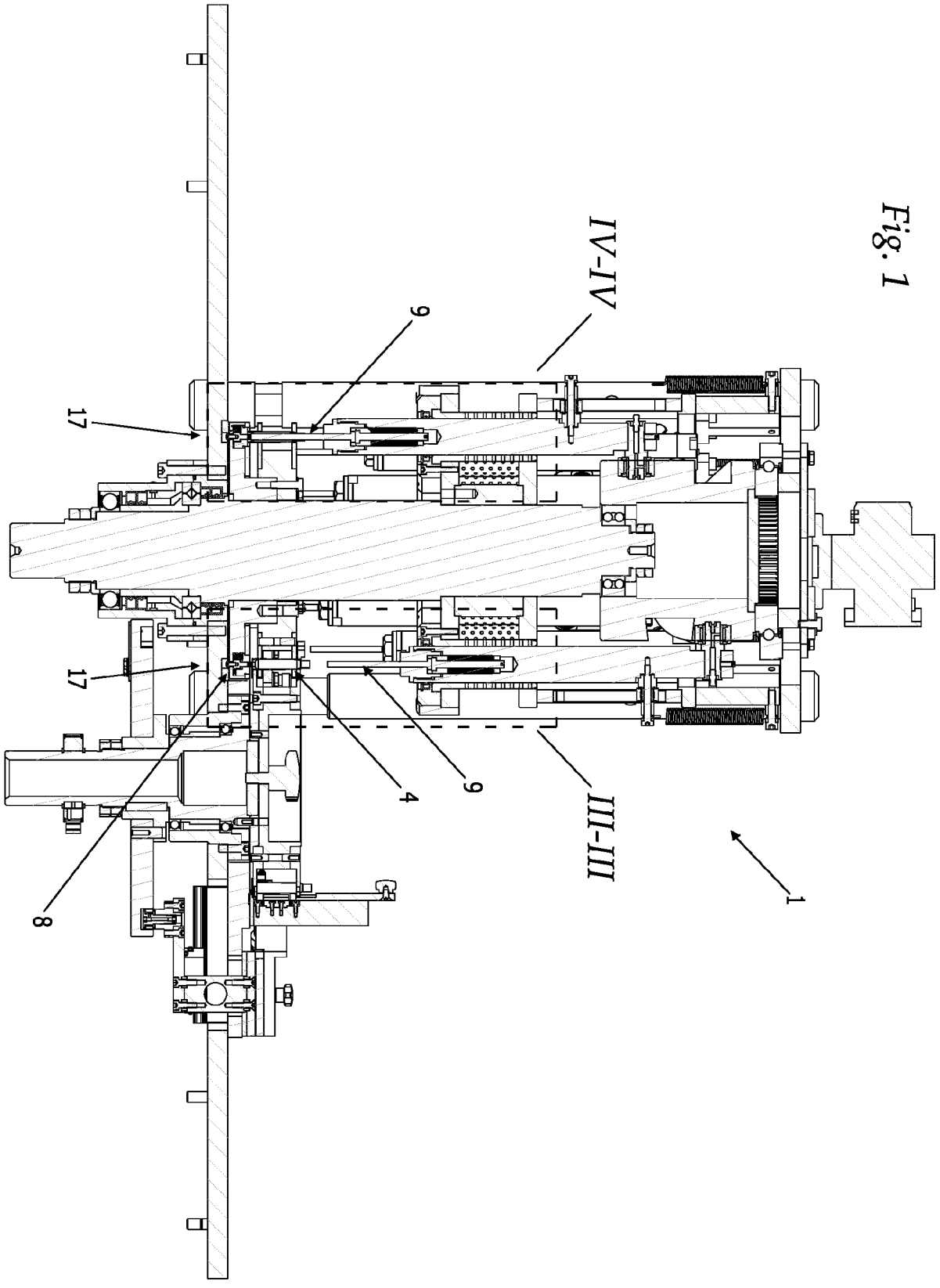

Fig. 1

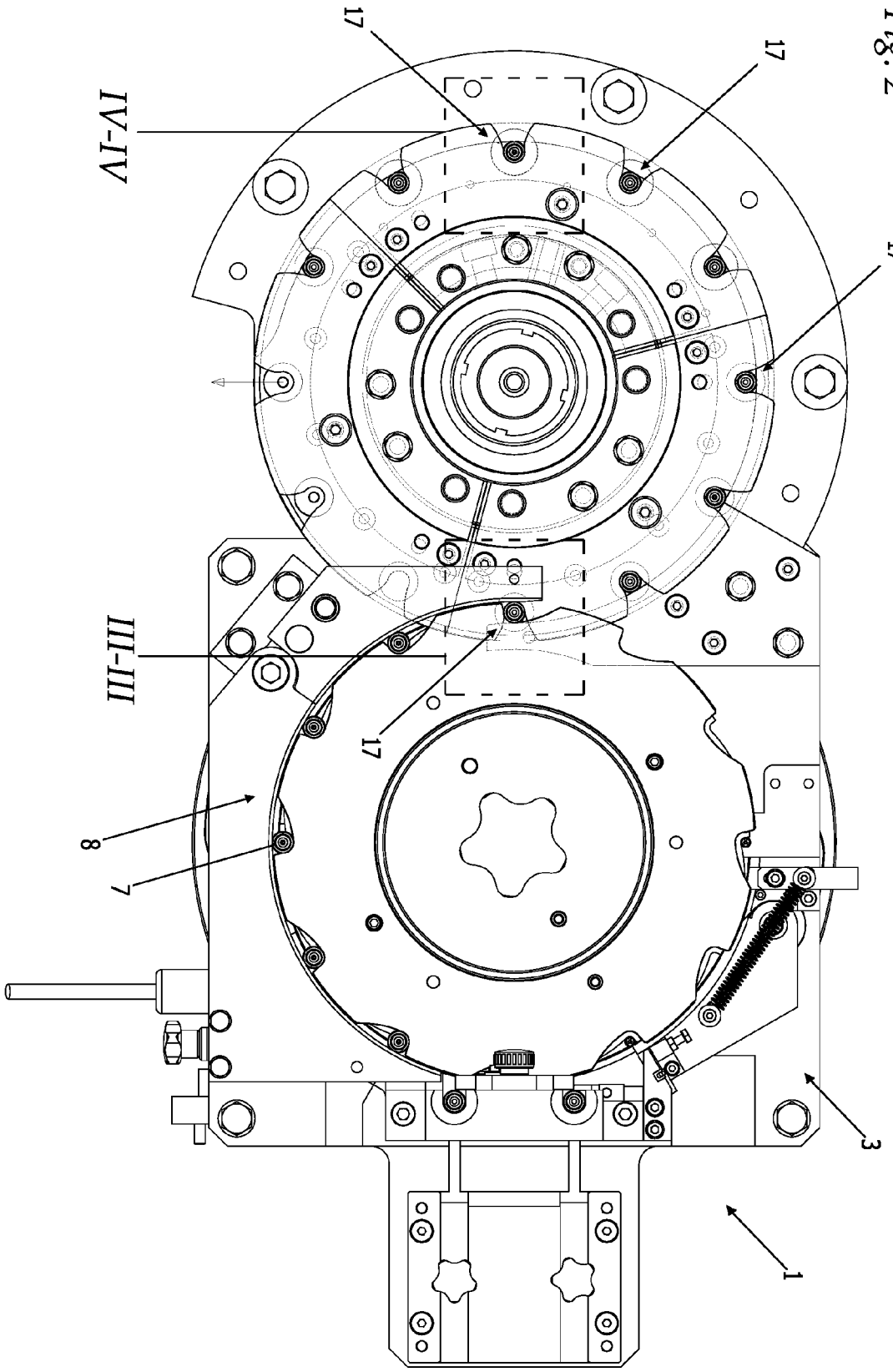

Fig. 2

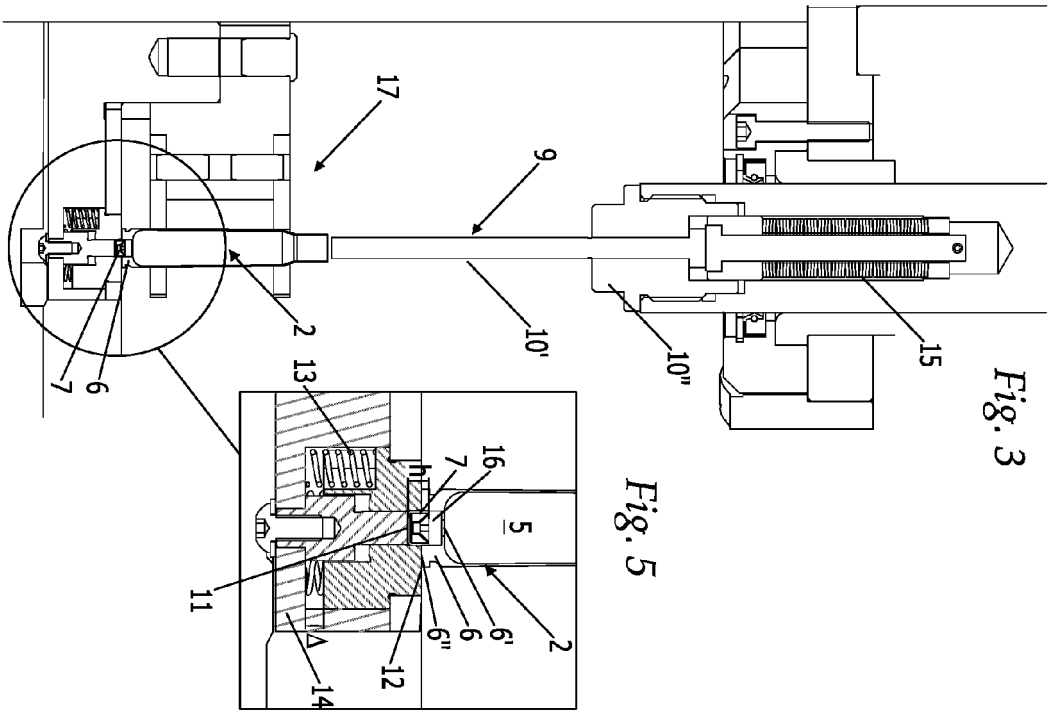

Fig. 3

Fig. 5

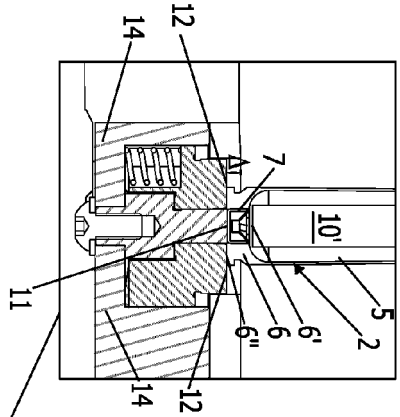

Fig. 6

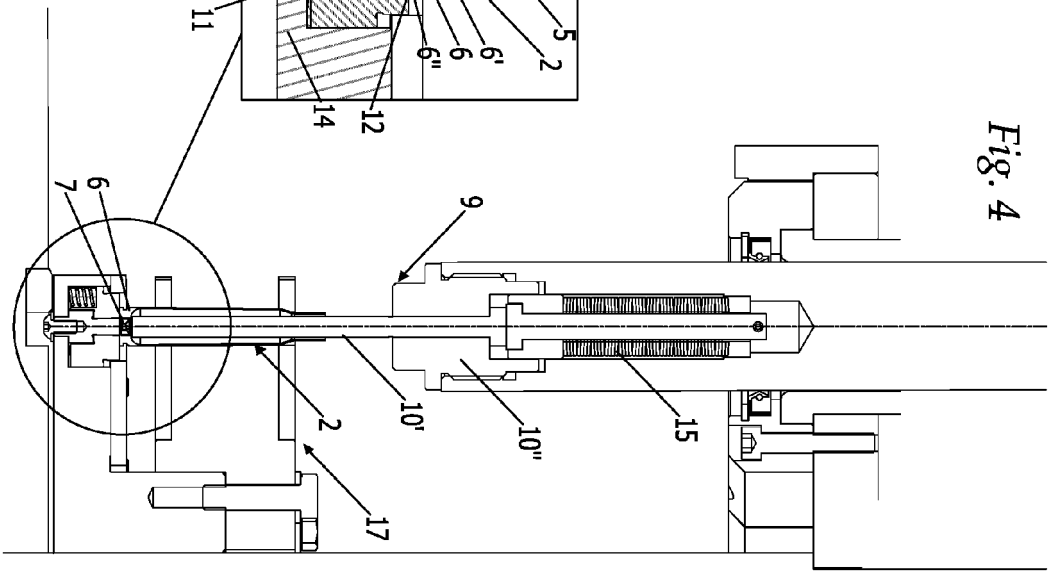

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 7176

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2 748 648 A (MILLER WILLIS C) 5 June 1956 (1956-06-05) * column 3, lines 42-45 * * column 4, line 30 - column 5, line 4 * * figures 7,8 * -----	1-6	INV. F42B33/00 F42B33/04
Y	US 4 498 234 A (GRESLIN BERNARD P [FR] ET AL) 12 February 1985 (1985-02-12) * column 4, line 66 - column 11, line 4 * * figure 1 * -----	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

F42B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 January 2016	Menier, Renan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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20-01-2016

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