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(71) Applicant: **Smyth S.r.l. Coniolo (IT)**

(72) Inventor: **Cerruti, Mauro 14036 MONCALVO (IT)**

(74) Representative: **Jorio, Paolo et al Studio Torta S.p.A. Via Viotti, 9 10121 Torino (IT)**

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(54) **Sewing machines for signatures**

(57) A sewing machine for stitching signatures (4), wherein a sewing device (2) at a fixed sewing station (3) cooperates with a movable saddle (5), for transporting the signatures (4), to successively receive and stitch the signatures (4) together; the movable saddle (5) being oscillated, about an axis (16) and by an actuating device (18), between a pickup station (7), where the movable

saddle (5) receives an open signature (4), and the sewing station (3); the pickup station (7) being adjustable selectively into at least two distinct positions about the axis (16); and the oscillating angle of the movable saddle (5) being adjustable to allow the movable saddle (5) to oscillate between each of the two distinct positions and the fixed sewing station (3).

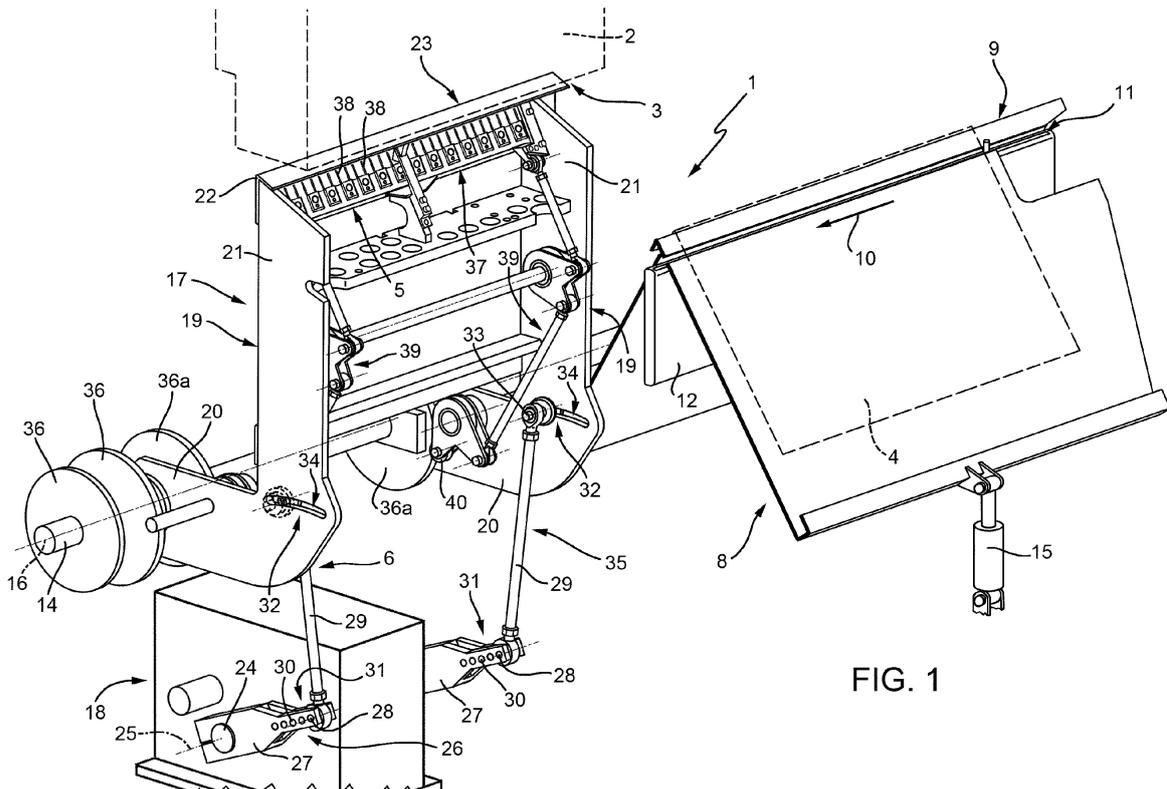


FIG. 1

Description

[0001] The present invention relates to a signature sewing machine.

[0002] More specifically, the present invention relates to a signature sewing machine of the type comprising a sewing device located at a sewing station to successively receive and stitch together the signatures; and a movable saddle, which moves back and forth between a pickup station, where the movable saddle receives an open signature, and the sewing station, where the movable saddle cooperates with the sewing device to stitch and bind the signature.

[0003] As it moves back to the pickup station, the movable saddle must be able to withdraw from the signature stitched at the sewing station by the sewing device. This does not necessarily imply that the distance between the pickup and sewing stations must be at least equal to the width of the signature, i.e. the distance between the back and a parallel lateral edge of the signature. In fact, on known sewing machines, the signature may be wider than the distance between the pickup and sewing stations; in which case, a release device is used to remove from the movable saddle the portion of the signature still resting on the movable saddle when the back of the signature is at the sewing station, and the movable saddle is at the pickup station. For the release device to work, however, there is a limit to the width of the portion still resting on the movable saddle, over and above which it cannot be removed.

[0004] For a given operating speed of the movable saddle, the output rate of the sewing machine may generally be said to be inversely proportional to the distance between the signature pickup station and the sewing station, in that reducing this distance reduces the downtime of the sewing machine.

[0005] As a result, known relatively high-output sewing machines are not only expensive but also poorly adaptable, i.e. are only capable of stitching signatures within a relatively small range of widths. To stitch a wide range of signatures at high output rates, a number of sewing machines are required, each with a movable saddle with a given travel distance.

[0006] It is an object of the present invention to provide a sewing machine designed to eliminate the above drawback.

[0007] According to the present invention, there is provided a sewing machine as claimed in Claim 1 and preferably in any one of the Claims depending directly or indirectly on Claim 1.

[0008] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which :

Figure 1 shows a schematic view in perspective, with parts removed for clarity, of a preferred embodiment of the sewing machine according to the present invention;

Figure 2 shows a schematic view in perspective, with parts removed for clarity, of a detail of Figure 1; Figure 3 shows operating diagrams of the Figure 1 and 2 machine in different operating positions.

[0009] Number 1 in Figure 1 indicates as a whole a sewing machine comprising a known sewing device 2 located at a fixed sewing station 3 to successively receive and stitch signatures 4 into a book (not shown). The sewing machine 1 further comprises a known movable saddle 5, and a supporting and actuating assembly 6 for supporting and moving movable saddle 5 back and forth between a position-adjustable pickup station 7, where movable saddle 5 receives an open signature 4, and fixed sewing station 3, where movable saddle 5 cooperates with sewing device 2 to stitch and bind signature 4.

[0010] Sewing machine 1 also comprises a fixed feed saddle 8, which is located directly upstream from pickup station 7, is inverted-V-shaped in known manner, and has a straight, upward-facing ridge 9 extending parallel to movable saddle 5 in a feed direction 10 in which signatures 4 are fed to pickup station 7. At the top, fixed saddle 8 has a substantially horizontal slit 11 parallel to feed direction 10 and ridge 9, and along which slide a succession of appendages (not shown) on an endless conveyor (not shown) located next to a supporting beam 12 of fixed saddle 8 to feed signatures 4 successively to pickup station 7.

[0011] At the bottom, fixed saddle 8 has a number of brackets 13 (only one shown), each fitted in rotary manner to a main supporting shaft 14 parallel to feed direction 10. Fixed saddle 8 also has an actuating device 15 for adjusting the angular position of fixed saddle 8 about an axis 16 of main shaft 14.

[0012] Supporting and actuating assembly 6 comprises a frame 17 supporting movable saddle 5 and fitted in rotary manner to main shaft 14 to oscillate about axis 16 and move movable saddle 5 between pickup station 7 and sewing station 3; and an actuating device 18 connected to frame 17 to oscillate frame 17, together with movable saddle 5, about axis 16.

[0013] More specifically, frame 17 is L-shaped, and is defined laterally by two opposite L-shaped levers 19 supporting movable saddle 5 between them, and each comprising a first arm 20 hinged at its free end to main shaft 14, and a second arm 21 fitted on its free end with movable saddle 5.

[0014] Movable saddle 5 comprises a front plate 22 facing sewing device 2, and a top portion of which is bent into a V (with its concavity facing downwards) to form, with the rest of front plate 22, a ridge edge 23, which is parallel to feed direction 10 and axis 16, cooperates internally with the back of an open signature 4 resting astride movable saddle 5, is positioned coaxial with ridge 9 of fixed saddle 8 when movable saddle 5 is at pickup station 7, and is positioned directly beneath sewing device 2 when movable saddle 5 is at sewing station 3.

[0015] As shown in Figure 1, actuating device 18 is

located beneath frame 17, and comprises a shaft 24 powered to oscillate - in the example shown, but not necessarily, by roughly 45° - about an axis 25 parallel to feed direction 10. For each lever 19, actuating device 18 comprises a crank mechanism 26, in turn comprising an oscillating crank 27, one end of which is fitted to shaft 24, and the other end of which is hinged to one end of a connecting rod 29 by a pin 28 parallel to axis 25.

[0016] In a variation not shown, pin 28 engages a single hole 30 formed through crank 27, parallel to and a given distance from axis 25. In the example embodiment shown, connecting rod 29 is connected to crank 27 by an adjusting device 31 comprising, in addition to pin 28, a number of holes 30, in each of which pin 28 is insertable selectively to adjust the work length of crank 27.

[0017] The other end of connecting rod 29 is hinged to respective lever 19 by an adjusting device 32 comprising a pin 33 parallel to axis 25 and fitted to connecting rod 29; and a slot 34, which is formed in lever 19, at the junction between arms 20 and 21, extends along an arc of a circle coaxial with axis 25, and is fitted through with pin 33, which can be locked transversely to lever 19, in any position along slot 34.

[0018] In a variation not shown, slot 34 of adjusting device 32 is replaced with two or more holes selectively engageable by pin 33, and two of which are preferably located at points corresponding to respective ends of slot 34.

[0019] In other words, crank mechanism 26 and respective lever 19 define an articulated quadrilateral 35 comprising a fixed frame extending between axes 16 and 25; a connecting rod 29; a first oscillating crank 27; and a second oscillating crank defined by arm 20 of lever 19; and in which adjusting devices 31 and 32 provide for adjusting the work lengths of the two cranks. Given that the purpose of this adjustment is to adjust the distance frame 17, and therefore movable saddle 5, oscillates from fixed sewing station 3 in response to oscillation of crank 27 about axis 25, both or only one of adjusting devices 31, 32 may be provided.

[0020] As shown in the drawings, the length of connecting rod 29 is selected so that crank 27 remains substantially parallel to arm 20 of respective lever 19 as crank 27 oscillates about axis 25.

[0021] Sewing device 2 and movable saddle 5 comprise, in known manner, a number of known moving parts synchronized with one another and with actuating device 18 by a number of cams 36 fitted to shaft 14. For example, Figure 1 shows one of these moving parts comprising a slide 37 mounted to run along movable saddle 5 and fitted with a number of needles 38, which are movable, through respective holes (not shown) formed through and along edge 23 of plate 22, between a withdrawn rest position and an extracted position, and are controlled by two known transmissions 39 fitted to frame 17 and each comprising a cam follower 40 contacting a respective cam 36a, the profile of which is designed to keep needles 38 in the withdrawn rest position at least as movable sad-

dle 5 moves from pickup station 7 to sewing station 3.

[0022] Operation of sewing machine 1 will now be described with reference to Figure 3, in which :

- 5 - only adjusting device 32 is used, i.e. the length of crank 27 is not adjustable, and there is no adjusting device 31;
- crank 27, which is the first crank of articulated quadrilateral 35, performs a constant oscillation of roughly 45°; and
- 10 - arm 21 of each lever 19 is positioned substantially vertically when movable saddle 5 is in a fixed reference position defined by sewing station 3.

15 **[0023]** As shown in Figure 3:

- the oscillating angle of movable saddle 5 about axis 16, from said fixed reference (sewing) position and in response to the given fixed oscillation of crank 27, is inversely proportional to the length of the second crank of each articulated quadrilateral 35, i.e. to the distance between pins 33 and axis 16; and
- 20 - the corresponding transverse travel of edge 23 of movable saddle 5 varies in proportion to the oscillating angle of movable saddle 5.

[0024] The same results can be achieved using adjusting device 31 or a length-adjustable connecting rod 29, and adjusting the length of connecting rod 29.

30 **[0025]** Whichever the case, by adjusting the position of pins 33 along respective slots 34, the timing of sewing machine 1 can be optimized by simply adjusting the transverse travel of edge 23 to just slightly exceed the width of signatures 4.

35 **[0026]** Once this adjustment is made - which provides for handling a wide range of signatures 4, by minimizing surplus travel of movable saddle 5 for each type of signature 4 - movable saddle 5 is simply arrested at pickup station 7, actuating device 15 is operated to position ridge 9 coaxially with edge 23, and sewing machine 1 is ready to operate. Obviously, simplifying adjusting device 32 (by replacing slot 34 with two holes for pin 33), to only set movable saddle 5 to two pickup positions, also makes fixed saddle 8 easier to set.

40 **[0027]** In connection with the above, it is important to note that sewing machine 1 is made easy to set by movable saddle 5 and fixed saddle 8 both pivoting about the same axis 16 of shaft 14.

45 **[0028]** Moreover, unlike most known sewing machines, the fact that shaft 14, to which movable saddle 5 of sewing machine 1 is hinged, also supports cams 36 means cams 36 are unaffected by the amount of oscillation of movable saddle 5.

55 Claims

1. A sewing machine for stitching signatures (4), the

- sewing machine (1) comprising a sewing device (2) located at a fixed sewing station (3) to successively receive and stitch the signatures (4) together; a movable saddle (5); and a supporting and actuating assembly (6) for supporting and moving the movable saddle (5) back and forth between a pickup station (7), where the movable saddle (5) receives an open signature (4), and the sewing station (3), where the movable saddle (5) cooperates with the sewing device (2) to stitch and bind the signature (4); the supporting and actuating assembly (6) comprising a frame (17) supporting the movable saddle (5) and mounted to oscillate about an axis (16) to move the movable saddle (5) between the pickup and sewing stations (7, 3); and actuating means (18) connected to the frame (17) to oscillate the frame (17) about said axis (16); and the sewing machine (1) being **characterized in that** the pickup station (7) is adjustable selectively into at least two distinct positions about said axis (16); and the supporting and actuating assembly (6) is adjustable to selectively impart to the frame (17) one of at least two different oscillations, starting from the fixed sewing station (3).
2. A sewing machine as claimed in Claim 1, and comprising a fixed saddle (8) for feeding the signatures (4) successively to the pickup station (7); the fixed saddle (8) being adjustable about said axis (16) into a position coaxial with the movable saddle (5) when the movable saddle (5) is at the pickup station (7).
3. A sewing machine as claimed in Claim 2, and comprising a main shaft (14) to which the movable saddle (5) and the fixed saddle (8) are hinged; the main shaft (14) being coaxial with said axis (16).
4. A sewing machine as claimed in Claim 3, and comprising at least one moving part (37) fitted to the movable saddle (5); at least one control cam (36a) fitted to said main shaft (14); and transmission means (39) movable with the movable saddle (5) about said axis (16) and interposed between the control cam (36a) and the moving part (37).
5. A sewing machine as claimed in one of the foregoing Claims, wherein the frame (17) has a first end traversed by and mounted to rotate about said axis (16); and a second end supporting the movable saddle (5); the actuating means (18) being connected to an intermediate portion of the frame (17).
6. A sewing machine as claimed in Claims 3 and 5, wherein the frame (17) comprises two L-shaped levers (19) on opposite sides of the movable saddle (5); each lever (19) comprising a first arm (20) hinged by its free end to the main shaft (14), and a second arm (21) fitted on its free end with the movable saddle (5); and said intermediate portion being located at the junction between the first and second arm (20, 21) of each L-shaped lever (19).
7. A sewing machine as claimed in Claim 5 or 6, wherein adjusting means (32) are provided to adjust the distance between said intermediate portion and said axis (16).
8. A sewing machine as claimed in Claim 6, wherein the actuating means (18) are designed to define, with the first arm (20) of each L-shaped lever (19), an articulated quadrilateral (35) comprising three members (20, 27, 29), in turn comprising a powered first oscillating crank (27), a connecting rod (29), and a second oscillating crank defined by the first arm (20) of the respective L-shaped lever (19); the actuating means (18) comprising adjusting means (31; 32) for adjusting the length of at least one of said three members (20, 27, 29).
9. A sewing machine as claimed in Claim 8, wherein the adjusting means (32) adjust the length of the second oscillating crank (20).

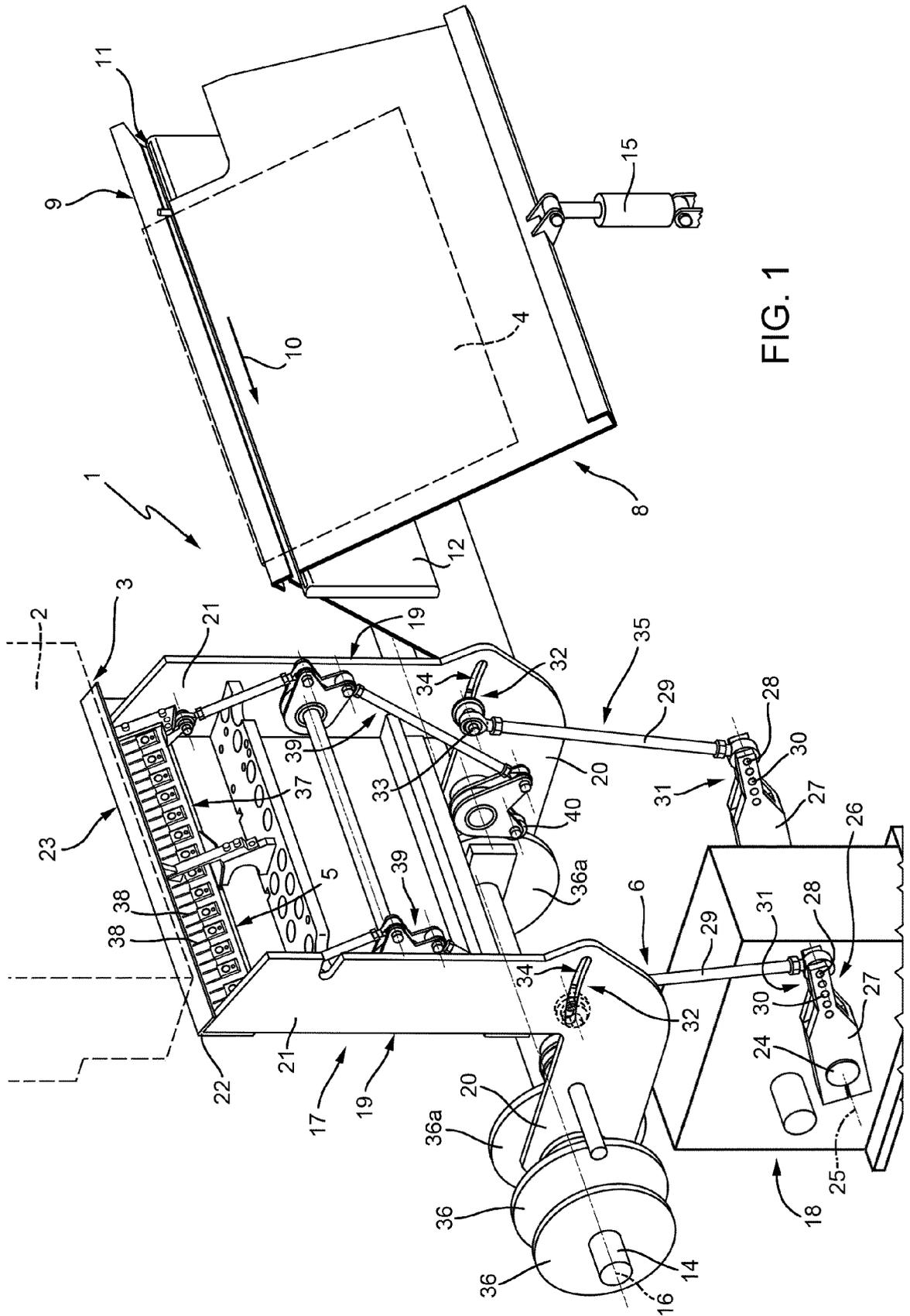


FIG. 1

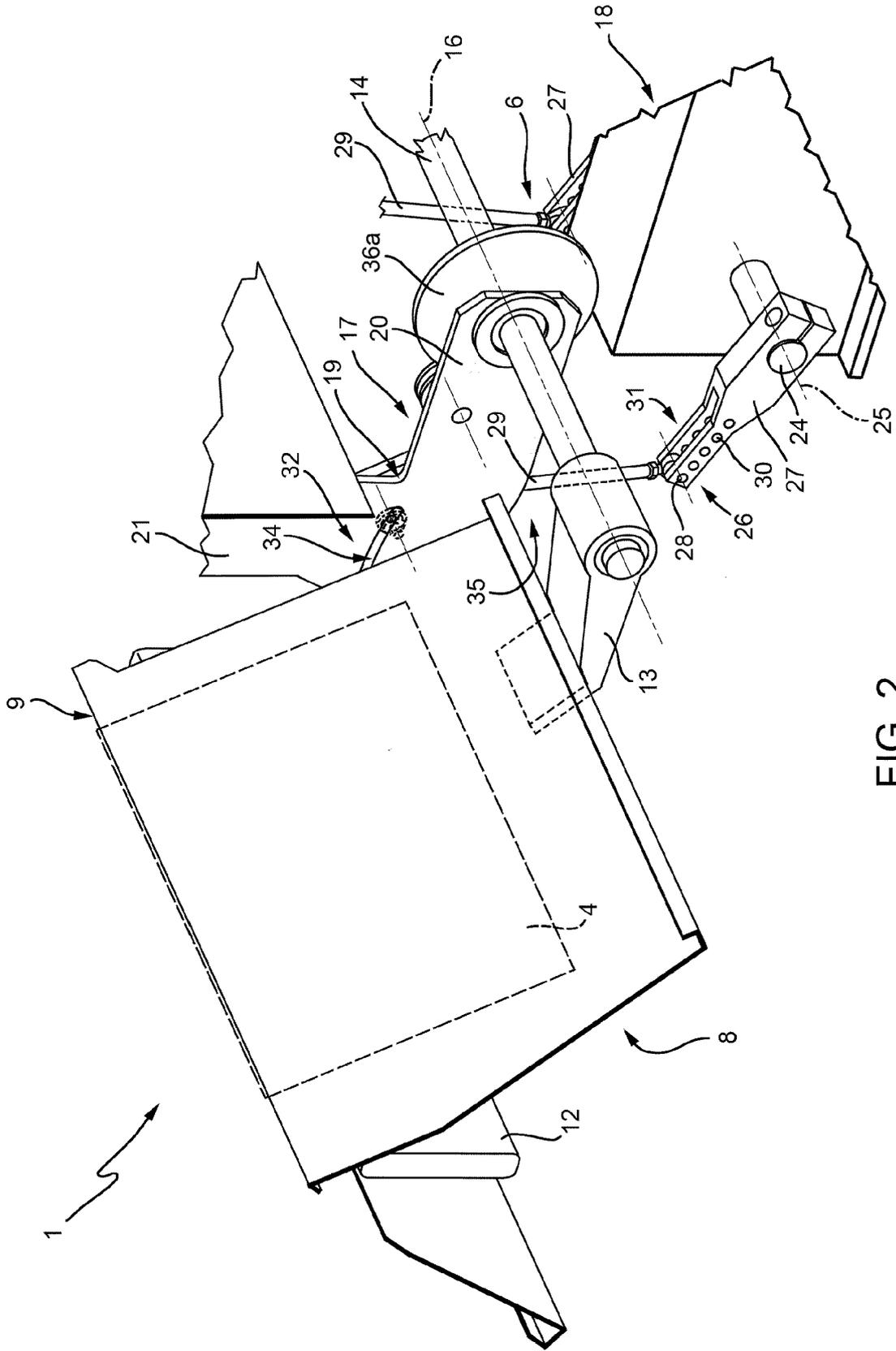


FIG. 2

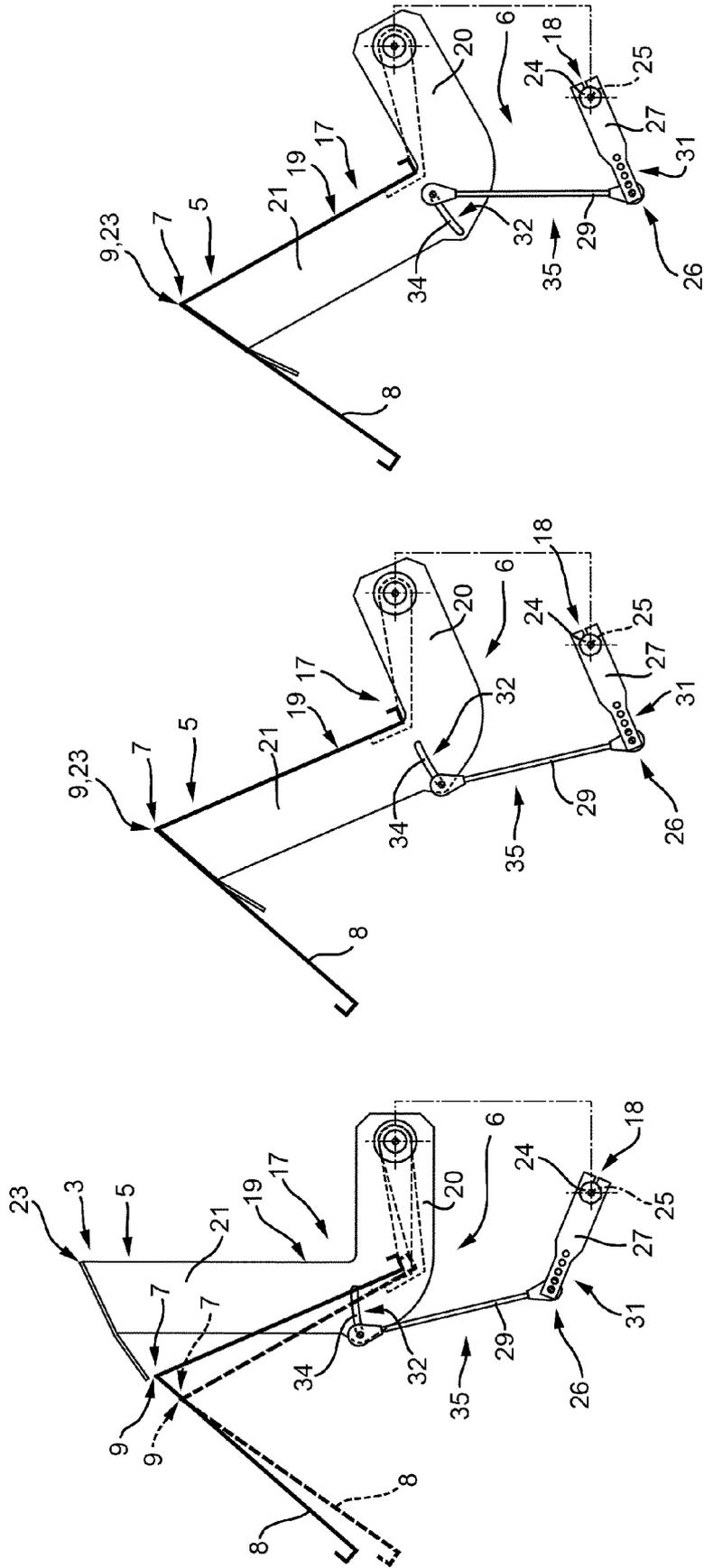


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
EP 12 17 8396

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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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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