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(54) Device for presenting weft threads on weaving machines.

(57) Device for presenting weft threads on weaving machines, with the characteristic that it consists essentially of a combination of a number of thread presentation elements (2), which move to and fro; per thread presentation element (2) an eccentric (6), which through its rotation can provide the to and fro displacement (A) of the associated thread presentation element (2); rotating drive elements (7); clutch devices (8), consisting of friction clutches, in order to couple the eccentrics (6) with the rotating drive elements (7); and control means (9) which direct the clutch devices (8).

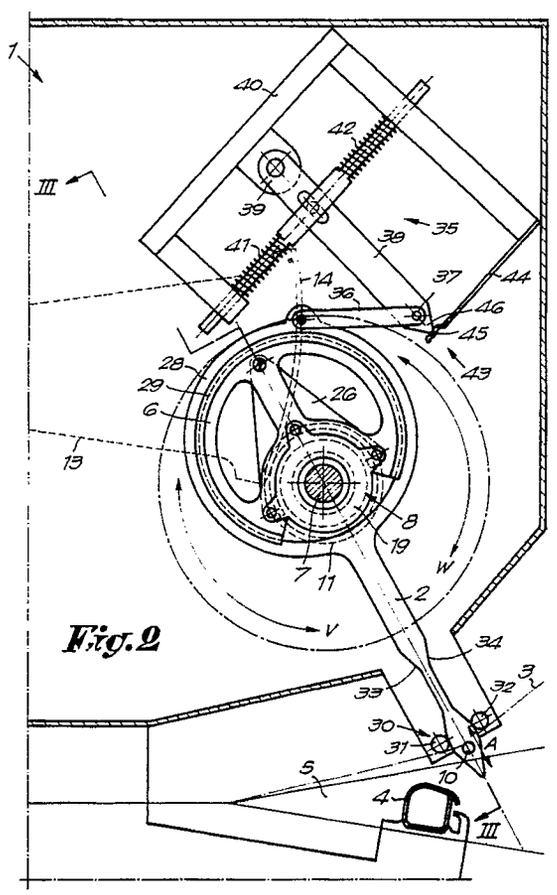

Fig.2

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Device for presenting weft threads on weaving machines

This invention concerns a device for presenting weft threads on weaving machines, in particular rapier weaving machines and similar machines, where several weft threads corresponding to a desired weaving pattern are presented into the path of the picking device, for instance the gripper.

Generally established devices for presenting weft threads on weaving machines consist of continuously revolving cams and cooperating cam followers, which use locking means, set either on or off, to couple the thread presentation elements to the cam followers during certain periods. Such devices are, amongst others, known from European patent application No. 290.788. These devices suffer from the disadvantage that the coupling between the cam followers and the thread presentation elements must take place at precise moments in time, given that the coupling can only work at certain positions of the cam followers. A further disadvantage of these devices is that they comprise a high number of stops and other cooperating elements, which are highly sensitive to wear and which are also relatively noisy due to the pushing of these cooperating elements on the stops.

The present invention is intended as a device without the above-mentioned disadvantages, in other words a device with better dynamic behaviour, which means less wear as well as producing less or even no noise, and for which the moment of clutching is less critical.

For this purpose, the invention concerns a device for presenting weft threads, characterized in that it consists essentially of the combination of a number of thread presentation elements moving to and fro; per thread presentation element an eccentric which through its rotation provides the to and fro displacement of the associated thread presentation element; rotating drive elements; clutch devices, consisting of friction clutches, which can be activated or deactivated in order to couple the eccentrics with the rotating drive elements and control means which direct the clutch devices.

In order to explain better the characteristics of the invention, by way of example only and without being limitative in any way, the following preferred embodiments are described with reference to the accompanying drawings, where:

fig. 1 shows a weaving machine which employs a device according to the invention;

fig. 2 shows a device according to the invention;

fig. 3 shows a cross-section that basically corresponds to the line III-III in fig. 2;

fig. 4 shows the part denoted as F4 on fig. 3 to a larger scale;

figs. 5 and 6 show cross-sections along lines V-V and VI-VI in fig. 3 respectively;

fig. 7 shows a cross-section along line VII-VII in fig. 6;

figs. 8, 9, and 10 show the device in different positions according to fig. 2;

figs. 11 and 12 show variants of the device.

Fig. 1 shows a gripper weaving machine which uses the device 1 according to the invention. This device 1 directs a number of thread presentation elements 2, such that the weft threads 3 can be respectively presented into the path of the feed gripper 4, in order to insert the different colours or sorts of weft threads in the right order into the shed 5, corresponding to the weaving pattern.

As shown in figs. 2 to 5 the device 1 according to the present invention consists essentially of the combination of a number of thread presentation elements 2 which move to and fro, an eccentric 6 per thread presentation element 2 which through its rotation, provides the to and fro displacement A of the cooperating thread presentation element 2; rotating drive elements 7; clutch devices 8, consisting of friction clutches, which can be activated or deactivated in order to couple the eccentrics 6 to the rotating drive elements 7 respectively and control means 9 which direct the clutch devices 8.

The thread presentation elements 2 consist, in a known way, of arms or needles which are equipped with thread eyes 10 at their free ends, through which the weft threads 3 are respectively guided. It is known that, according to a variant, thread clips could be used instead of thread eyes.

In the embodiment according to figs. 2 to 5, the rotating drive elements 7 consist essentially of a shaft turning to and fro over a certain angle. The angle at which the turning takes place, is set preferably at 180 degrees.

The to and fro turning motion of the shaft 7 can indeed be done by any suitable means. Preferably a means such as shown in figs. 3, 6 and 7 is used, by which a gear 11 is mounted on the shaft 7, which is powered by an oscillating element 13, moving around a shaft 12, in the form of a segment of a circle, whose spherical surface cooperates with gear 11 of the shaft 7, this being done, for example, by means of a ring gear 14 which works on gear 11. The element 13 is turned to and fro by means of a cam 15. This cam 15 consists preferably of a slotted cam in the form of an eccentric. A pin 16 is mounted in the element 13 and fits in the slot 17 of the cam 15. The eccentricity of the cam 15 and the radius of the ring gear 14 are so chosen that the turning movement of element 13 produces a given amplitude, such that gear 11 is turned to

and fro through precisely 180 degrees with each revolution of the drive shaft 18 of the cam 15. This drive shaft 18 is coupled to the main shaft of the weaving machine and preferably turns as fast as the main shaft. As a result, the thread presentation element 2 can be moved from its highest to its lowest position and from its lowest to its highest position respectively, with each revolution of the main shaft of the weaving machine.

The said clutch devices 8, which link the eccentrics 6 to the shaft 7 respectively, preferably consist of electro-magnetically driven friction clutches, as shown in figs. 3 and 4. The clutch devices 8 for the respective thread presentation elements 2 are, like the eccentrics 6 and the thread presentation elements 2, mounted next to each other on the end of the shaft 7, which results in a very compact arrangement.

As shown in the detail of fig. 4, the clutch devices 8 per thread presentation element 2 consist essentially of a disc 19 freely revolving round the shaft 7 upon which the eccentric 6 concerned is fastened and an electromagnet 20 fixed to the shaft 7. The disc 19 is borne on shaft 7 by means of a bushing 21 or similar device. The electromagnets 20 of the respective clutch devices 8 each consist of an inner core 22, fixed to the shaft 7, an outer core 23 and with in between a solenoid 24 which is activated at the correct moments by the control means 9.

In order to fully lock the magnetic field, via the cores 22 and 23 and the disc 19, when activating the solenoid 24, a second disc 25 is mounted opposite disc 19 which revolves around the shaft 7 also by means of a bushing 21 or similar device.

On energizing an electromagnet 20, the discs 19 and 25, situated on either side, are attracted to the cores 22 and 23 such that the eccentric 6 starts to rotate in conjunction with the turning of shaft 7.

In order to ensure that the discs 19 and 25 release themselves easily from the cores 22 and 23 upon deactivation, and are not attracted by the remanent magnetism, the clutch devices 8 can be fitted with flexible means 26 which pull the discs 19 and 25 apart. In the embodiment shown in figs. 4 and 5, these flexible means 26 consist of triangular and radially directed plate springs 26, which are fastened on the one hand to the discs 25 and on the other hand, for example, to the eccentric 6. In order to avoid the disadvantages of remanent magnetism, a contact-breaker 27 is built into the magnetic field, at the outer core 23, consisting for instance of a copper inclusion.

As shown in figs. 2 and 3 the connection between an eccentric 6 and the associated thread presentation element 2 consists of a ring 28 which is mounted around the eccentric 6 and upon which is fastened the thread presentation element 2. Around the circumference of the eccentric 6, a seating 29 is provided within which the ring 28, rotatable about the eccentric 6, is held. The ring 28 is locked against turning by means of blocking means 30.

Each thread presentation element 2 preferably consists of an arm which is directly fixed to the said ring 28 and which is preferably constructed as a whole with it. The blocking means 30 are formed in this case by two supports or guide pieces 31 and 32 through which the thread presentation elements 2 pass.

In order that the thread eyes 10 should follow almost straight paths during displacement A of the thread presentation elements 2, the sides 33 and 34 of these thread presentation elements 2 are made with profiled edges. This gives the advantage that the different weft threads will not become tangled with one another. It is clear however that when an eccentric 6 makes a movement V as shown in fig. 2, i.e. on the left-hand side of the circle, measures will have to be taken to ensure that thread presentation element 2, via its side 33, will remain in contact with support 31. Analog measures will have to be taken to ensure that when the eccentric 6 makes a movement W as shown in fig. 2, i.e. to and fro on the right-hand side of the circle, side 34 is kept in contact with support 32, the straight path advantage being otherwise lost. Device 1 is therefore fitted with flexible means 35 which force each thread presentation element 2 in the correct sense of rotation. For this purpose, an arm 36 is hinged to ring 28 and coupled at its free end 37 to a second arm 38, which in turn is hinged by one end 39 to frame 40. The flexible means 35 consist of springs, such as compression springs 41 and 42 which work laterally on arm 38, such that the resultant of the force applied on both sides is zero when the eccentric 6 is found in its highest and lowest positions respectively, i.e. when the thread presentation element 2 in question is in its highest and lowest position.

Locking means 43 are also provided which stop the eccentrics 6 from moving round freely when their positions correspond to the highest and lowest positions of the thread presentation elements 2 in question, as well as in the disengaged position. As shown in fig. 2 these locking means 43 preferably consist of plate springs 44 which exhibit at their free end a recess or seating 45, which act as seatings for projections or elements which are displaced on turning the rings 28, as is the case with the V-form cast free-ends 46 of the arms 38. This gives the advantage that the thread presentation elements 2 can be locked in their highest and lowest positions without the need for traditional stops having to be foreseen for this purpose.

Given a suitable arrangement of the compo-

nents, as in fig. 2, only one locking means 43 needs to be present per thread presentation element 2, as it ensures the locking of the eccentric 6 and the ring 28 both in the highest and lowest position of the thread presentation element 2.

It should be moreover noted that in the case where the springs 41 and 42 are so chosen that a state of equilibrium exists in the position shown in fig. 2, these springs 41 and 42 will force the free end 46 into the seating 45. In this case the locking means 43 in the form of a seating 45 and a cooperating free end 46 are not strictly necessary given that these flexible means 35 themselves serve as lockings.

The working of the device can be simply deduced from the different positions as shown in figs. 2, 8 and 9. For the sake of clarity, only one thread presentation element 2 is shown in each figure. Fig. 2 shows the eccentric 6 and the thread presentation element 2 in their highest position. When a thread presentation element 2 needs to be lowered, the associated electromagnet 20 is energized, which causes the accompanying discs 19 and 25 to be attracted to the cores 22 and 23, causing rotation in conjunction with the turning of the shaft 7. Given that element 13 is turned downwards, as shown in fig. 8, the eccentric 6 is also moved downwards through the half circle, as shown by arrow V. The free end 46 of the arm 38 is freed from the seating 45 of the plate spring 44. Because the spring 41 clamps and the spring 42 releases, the ring 28 is forced in the direction of arrow F, causing the profiled side 33 to slide along the guide piece 31, such that the thread eye 10 describes an almost straight displacement A.

When, as in fig. 9, the oscillating element 13 is in its lowest position, the eccentric 6 is also in its lowest position. The thread presentation element 2 is also then in its lowest position and thus presents the weft thread 3 in question in the path of the feed gripper 4. In this position one notes that the free end 46 of the arm 38 has relocated itself in the seating 45 and that the springs 41 and 42 are once again under equal stress. When the electromagnet 20 is then de-energized, the thread presentation element 2 remains in its lowest position. Further turning of the eccentric 6 by possible frictional forces which may develop in the bushing 21, are thus avoided by the locking means 43.

On turning element 13 upwards again, at least when the said electromagnet 20 is de-energized, the thread presentation element 2 remains in its lowest position. When thereafter, as shown in fig. 10, the electromagnet 20 is re-energized when the element 13 starts its downward turn, the eccentric 6 will be moved back upwards as shown by arrow W. At that instant the side 34 makes contact with the support 32, this contact being guaranteed as the spring 41 releases and the spring 42 clamps.

From the above, it is clear that the major advantage of this invention is that the on and off switching of the clutch devices 8 is not critical, in other words the moments at which these clutch devices need to be activated or deactivated are not linked to precise moments in the weaving process, but do however need to fall within certain tolerance limits.

This advantage is essentially for three reasons.

The first reason is that use is made of friction clutches for the clutch devices 8, which, as is known, can be activated at any time.

The second reason is due to the use of locking means 43 as shown in fig. 2, which ensure that, if something is coupled or uncoupled either too early or too late, the free end 46 is still forced into its correct position by the shape of the seating 45.

The third reason is due to the influence of the flexible means 35 on the neutral position of the arm 38. When the springs 41 and 42 are so chosen that a state of equilibrium is set up, in the position as shown in fig. 2, then it is clear that when coupling or uncoupling happens either too early or too late, the arm 38 will be automatically forced into its position as shown in fig. 2 by the springs 41 and 42.

It is clear that the factors which lie at the basis of the aforementioned three reasons could be either singly or all present.

It is clear that, according to a variant, the rotating drive elements could also consist of a shaft 7 which keeps on turning and preferably comes to a momentary halt at each rotation of 180 degrees.

Fig. 11 shows a schematic variant in which the blocking means 30 in the form of supports 31 and 32 are superfluous. The connections between the rings 28 and the thread presentation elements 2 each consist here of an arm 47 which is mounted on the ring 28 and which is coupled on its free end to a rotating lever 49, which moves about a fulcrum 48 mounted to the frame, and which carries the thread presentation element 2 at its free end. This lever 49 also fulfils the function of blocking means. It is clear that flexible means 35 and locking means 43 are also provided.

In another variant the thread presentation elements 2 pass through straight guide pieces 50, where a movable or hinged coupling 51 is positioned between the arm 47, linked via the ring 28, and the thread presentation element 2. This coupling 51 can, as shown in fig. 12, consist of an arm, or alternatively be formed by a cable or suchlike. Use is made here preferably of a hinged spacer 52 which also fulfils the role of blocking means. Flexible means 35 and locking means 43 are naturally also provided.

The present invention is in no way limited to

the embodiments described and shown in the drawings; on the contrary , such a device for presenting weft threads can be made in various variants and dimensions while still remaining within the scope of the invention.

Claims

1. Device for presenting weft threads on weaving machines, characterized in that it consists essentially of a combination of a number of thread presentation elements (2), which move to and fro; per thread presentation element (2) an eccentric (6), which through its rotation can provide the to and fro displacement (A) of the associated thread presentation element (2); rotating drive elements (7); clutch devices (8), consisting of friction clutches, in order to couple the eccentrics (6) with the rotating drive elements (7); and control means (9) which direct the clutch devices (8).

2. Device according to claim 1, characterized in that the clutch devices (8) consist of electromagnetically activated friction clutches.

3. Device according to claim 2, in which the drive elements consist of a rotating shaft (7), characterized in that the clutch devices (8) consists essentially of discs (19) which revolve freely around this shaft (7), and upon which the said eccentrics (6) are fastened or of which they form a part, and electromagnets (20) fixed to the shaft (7) which once activated radially attract the discs (19) such that they turn in conjunction with the aforementioned shaft (7).

4. Device according to claim 2 or 3, characterized in that the clutch devices (8) feature two discs (19, 25) per thread presentation element (2) which are in turn located respectively on each side of the electromagnets (20), whereby flexible means (26) are located, directly or indirectly between both elements which pull the discs (19, 25) apart.

5. Device according to claim 4, characterized in that the said flexible means consist of a plate spring (26), which essentially extends radially to the shaft (7) over which the discs (19, 25) turn.

6. Device according to one of the above claims, characterized in that it has locking means (43) which can hold each eccentric (6) in its two positions, which correspond to the extreme positions of the thread presentation elements (2).

7. Device according to claim 6, characterized in that the locking means (43) per thread presentation element consist essentially of a profiled plate spring (44) which has a seating (45) and an element (46) that displaces itself over the plate spring (44) as the eccentric (6) moves and which cooperates with the seating (45) whenever the eccentric (6) in question is in one of its positions whereby the associated thread presentation element (2) stands in one of its extreme positions.

8. Device according to claim 7, characterized in that the connection between an eccentric (6) and a thread presentation element (2) consists of a ring (28) which is mounted around the eccentric (6) and to which the thread presentation element (2) is fastened, and that the element which moves over the plate spring (44), consists of a rotatable arm (38) which via its to and fro moving free end (46) comes into contact with the plate spring (44), and which is connected to the said ring (28) by means of an arm (36).

9. Device according to one of the above claims, characterized in that it has flexible means (35) which can force each respective eccentric (6) into its two positions, which correspond to the two extreme positions of the associated thread presentation element (2).

10. Device according to claim 9, characterized in that the flexible means (35) per thread presentation element (2) consist of two springs (41, 42), whereby these springs (41, 42) work respectively along both sides on an hinged arm (38) which is linked at its free end (37), directly or indirectly, with the associated thread presentation element (2), whereby the springs (41, 42) are so mounted that the thread presentation element (2) in question takes up one of its two extreme positions when the whole arrangement is in equilibrium.

11. Device for presenting weft threads on weaving machines, characterized in that it consists essentially of a combination of a number of thread presentation elements (2), which move to and fro; per thread presentation element (2) an eccentric (6), which through its rotation can provide the to and fro displacement (A) of the associated thread presentation element (2); rotating drive elements (7); electromagnetically activated friction clutches, in order to couple the eccentrics (6) with the rotating drive elements (7); control means (9) which direct the electromagnetically activated friction clutches; locking means (43) which can hold each eccentric (6) in its two positions, which correspond to the extreme positions of the thread presentation elements (2); and flexible means (35) which can force each eccentric (6) respectively into its two positions, which correspond to the two extreme positions of the associated thread presentation element (2).

12. Device according to one of the above claims, characterized in that the rotating drive elements consist essentially of a shaft (7) turning to and fro over a certain angle.

13. Device according to claim 12, characterized in that the shaft (7) is powered by an oscillating element (13), moving around a shaft (12), in the form of a segment of a circle, whereby this ele-

ment (13) is coupled to the said shaft (7) by its spherical surface.

14. Device according to claim 13, characterized in that the oscillating element (13) is turned to and fro by means of a cam (15).

15. Device according to claim 12, 13, or 14, characterized in that the shaft (7), moving to and fro, is turned through 180 degrees.

16. Device according to one of the above claims, characterized in that the rotating drive elements consist essentially of a uni-directional moving shaft which comes to a momentary halt after each turn of 180 degrees.

17. Device according to one of the above claims, characterized in that the connections between the eccentrics (6) and the thread presentation elements (2) each consist of a ring (28), which is mounted around the eccentric (6) in question and to which the thread presentation element (2) is fastened, whereby blocking means (30, 49, 52) are provided which prevent the ring (28) from turning.

18. Device according to claim 17, characterized in that the thread presentation elements (2) consist of arms which lie directly on the respective rings (28).

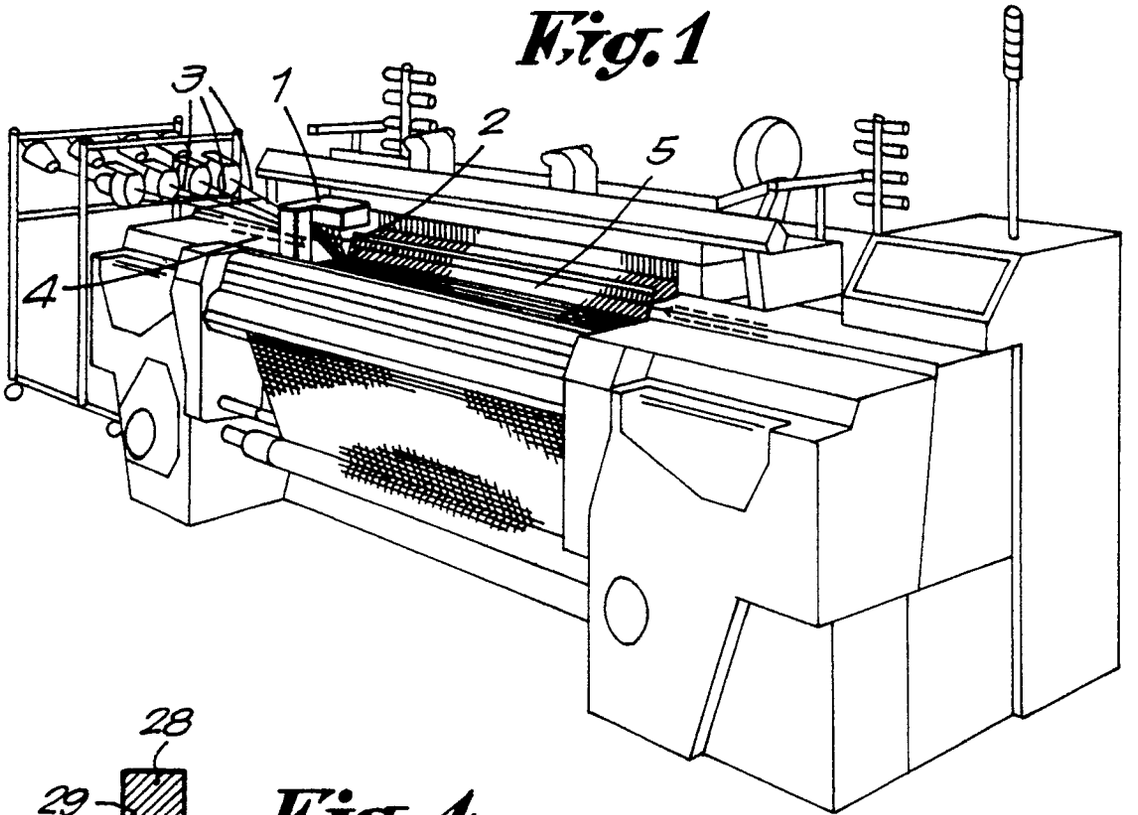
19. Device according to claim 17 or 18, characterized in that the blocking means (30) consist of supports (31, 32) through which the thread presentation elements (2) pass.

20. Device according to claim 19, characterized in that the sides (33, 34) of each thread presentation element (2) feature a profiled shape and that the device (1) is fitted with flexible means (35) which as a function of the position of each eccentric (6), press the cooperating thread presentation element (2) either with the one side (33) or the other side (34) against one of the supports (31, 32), such that the thread presentation elements (2) describe an almost straight displacement (A) at their free ends.

21. Device according to claim 17, characterized in that the thread presentation elements (2) are carried on rotating levers (49), which move about a fixed fulcrum (48), whereby these said levers (49) are coupled respectively to the aforementioned rings (28) by means of intermediate arms (47).

22. Device according to claim 17, characterized in that the thread presentation elements (2) are movable both up and down along straight guide pieces (50) and that the fixations of the thread presentation elements (2) on the respective rings (28) are formed by an arm (47), fixed to the ring (28), and by a coupling (51) which extends between the arm (47) and the associated thread presentation element (2).

Fig. 1



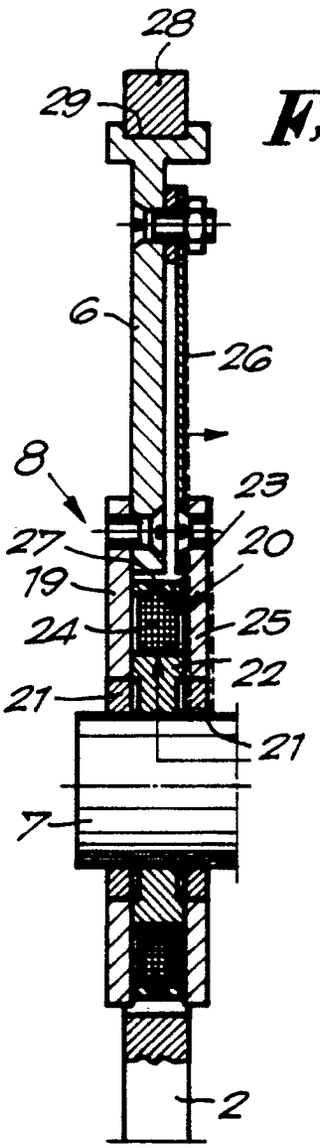


Fig. 4

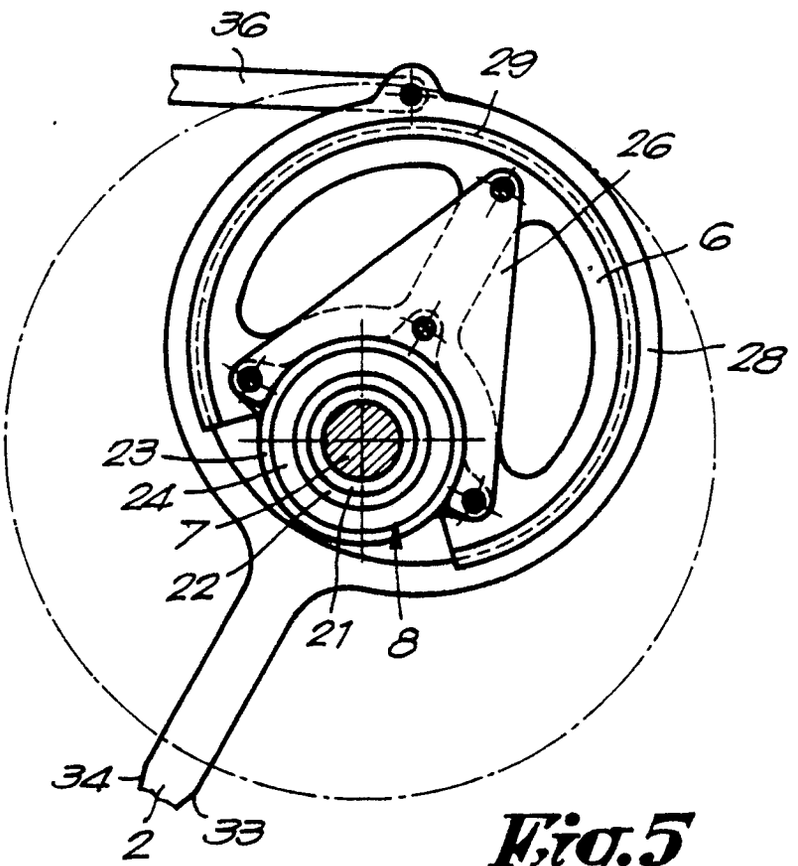


Fig. 5

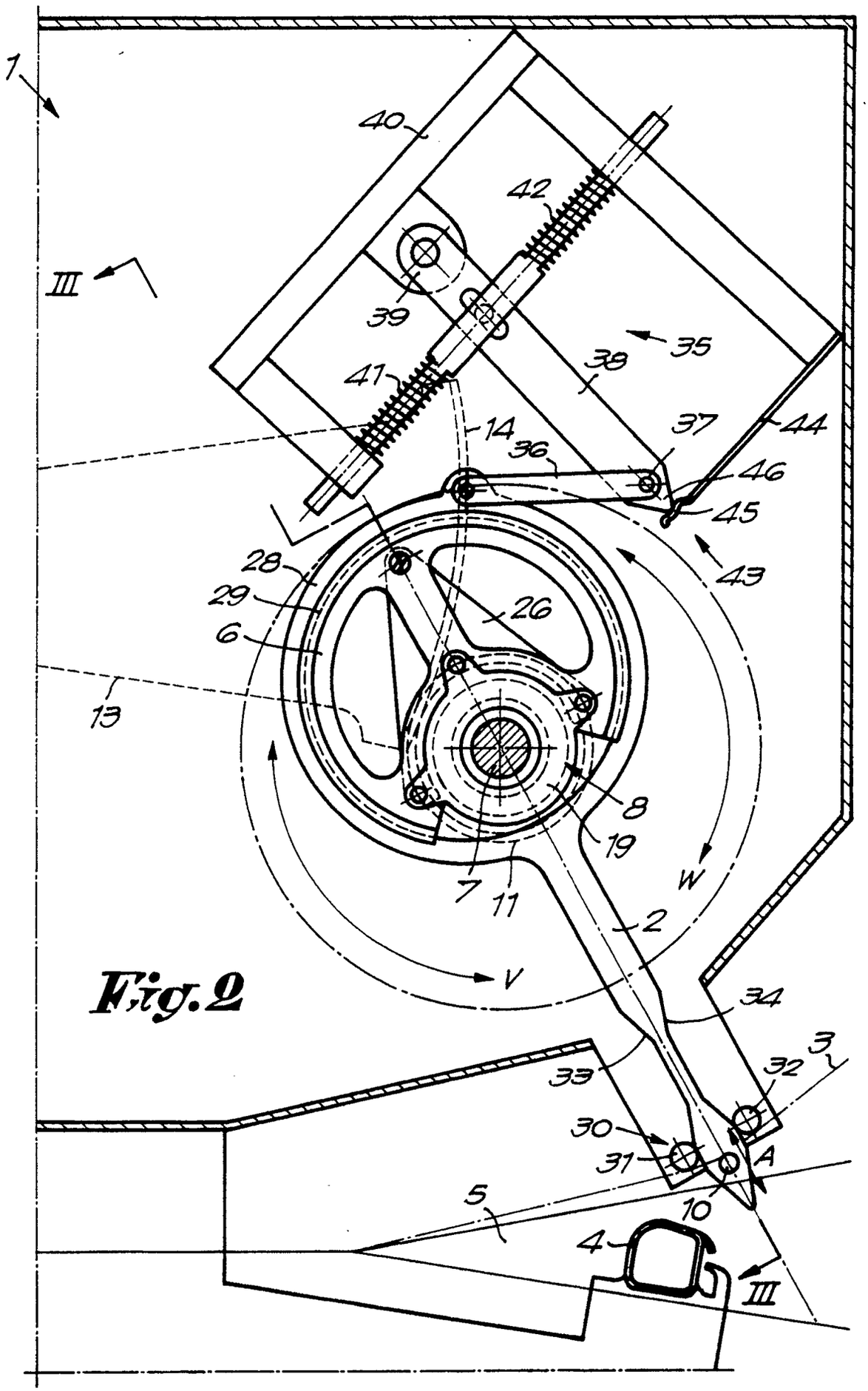

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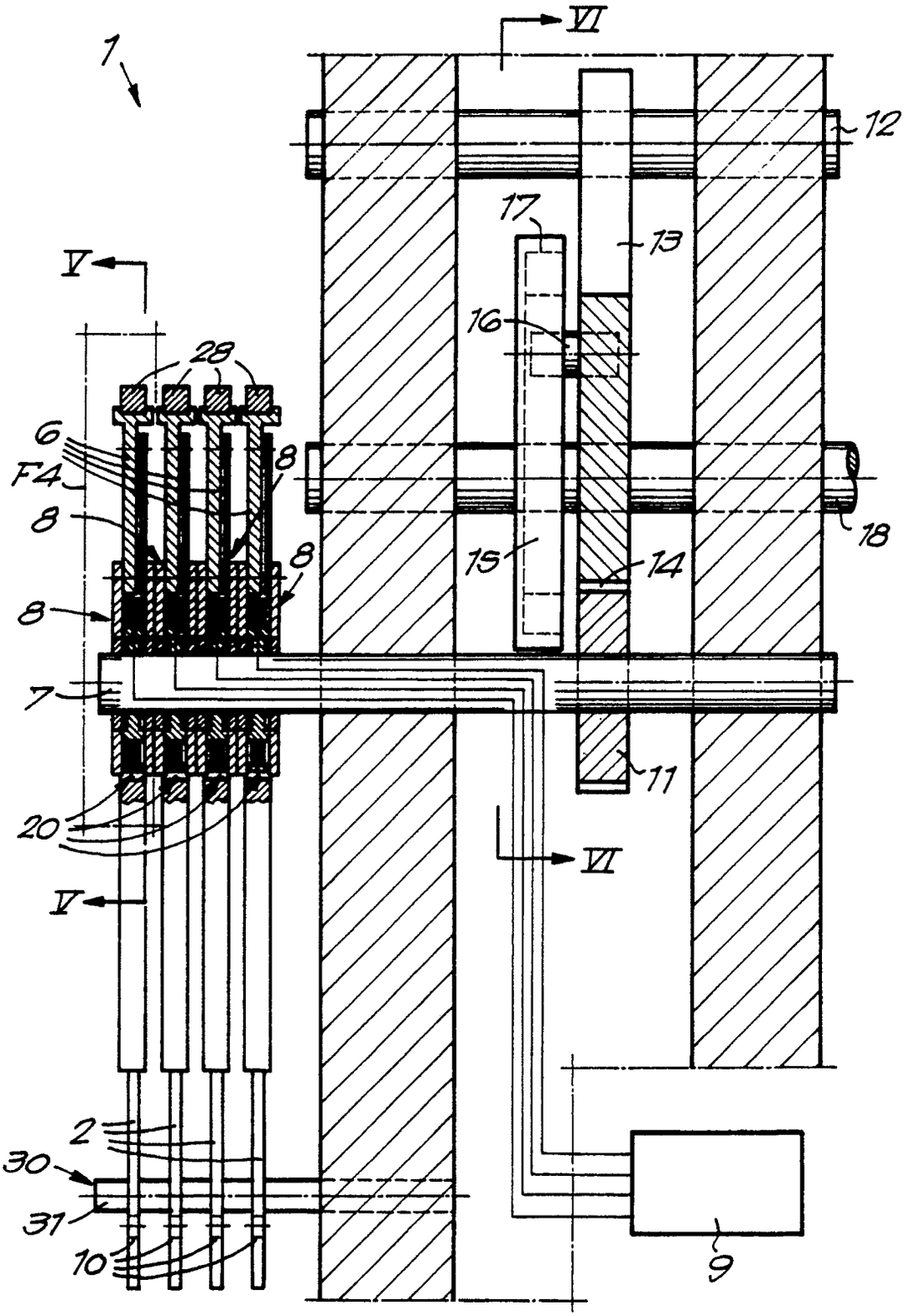
Fig. 2

Fig. 3



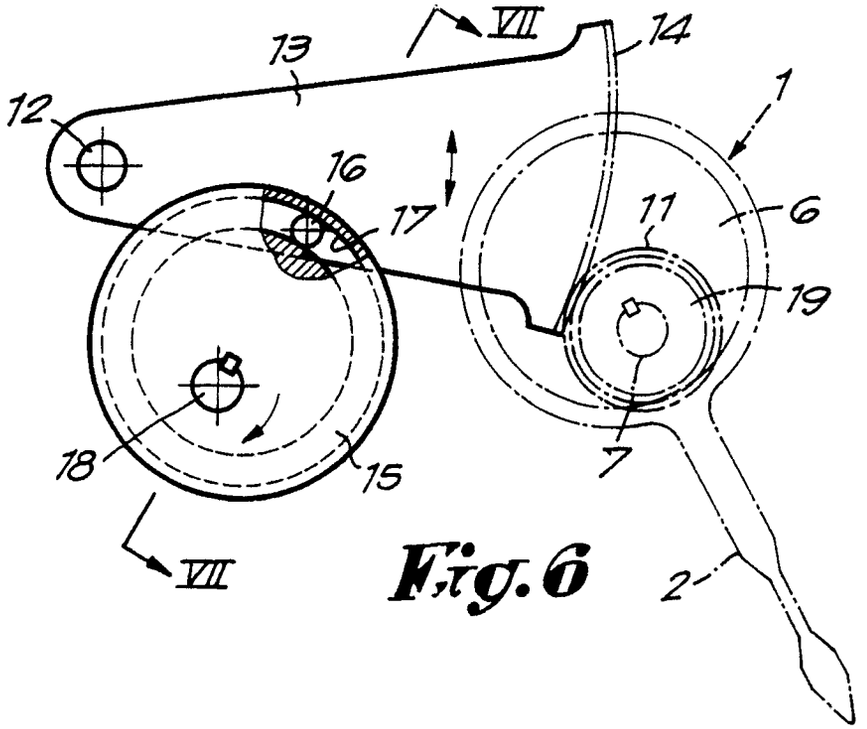


Fig.6

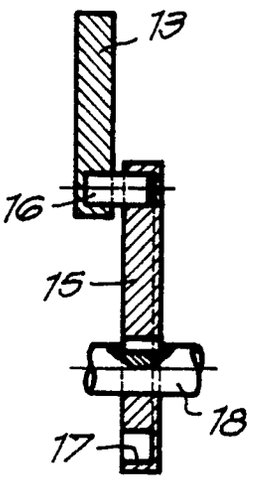


Fig.7

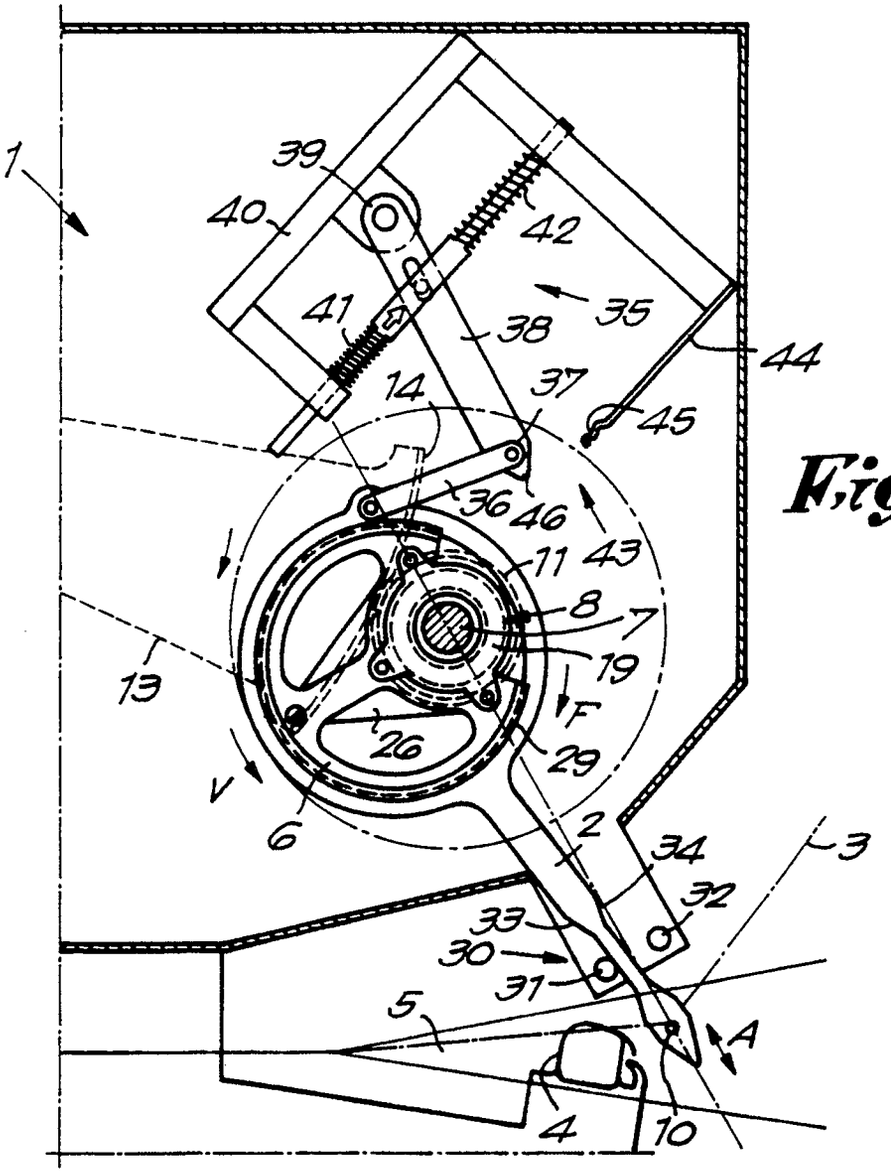


Fig.8

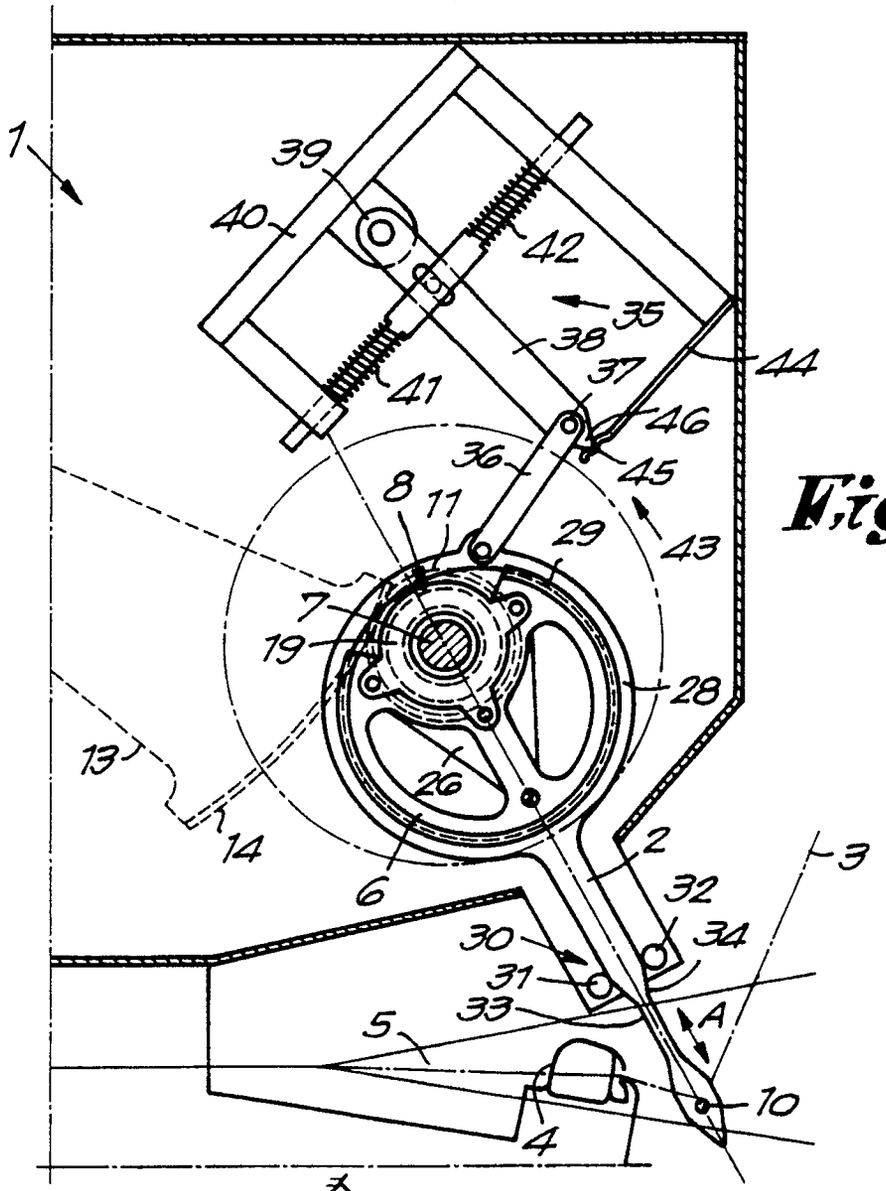

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Fig.9

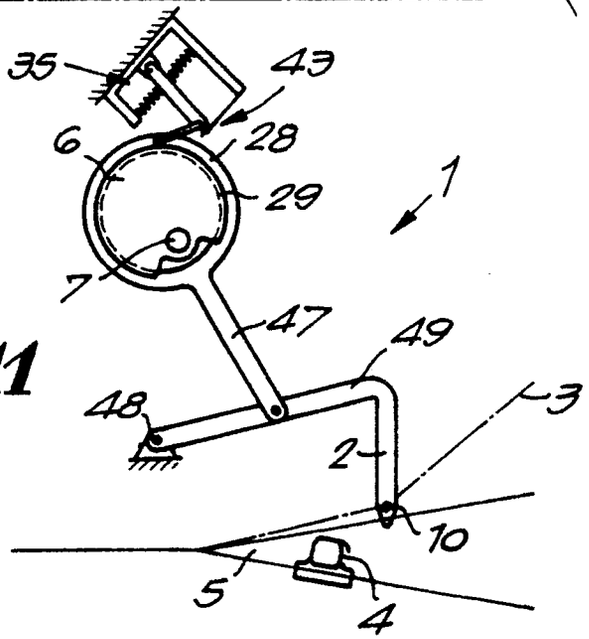
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Fig.11

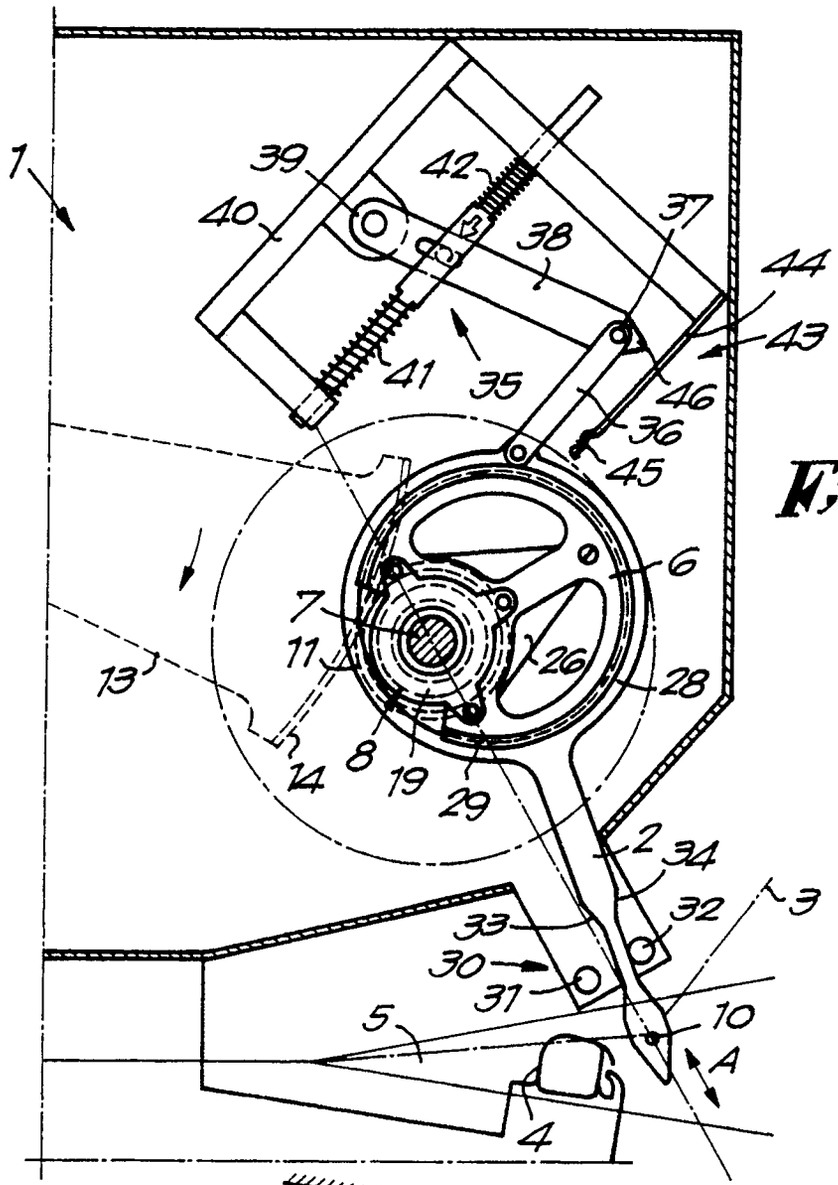
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Fig. 10

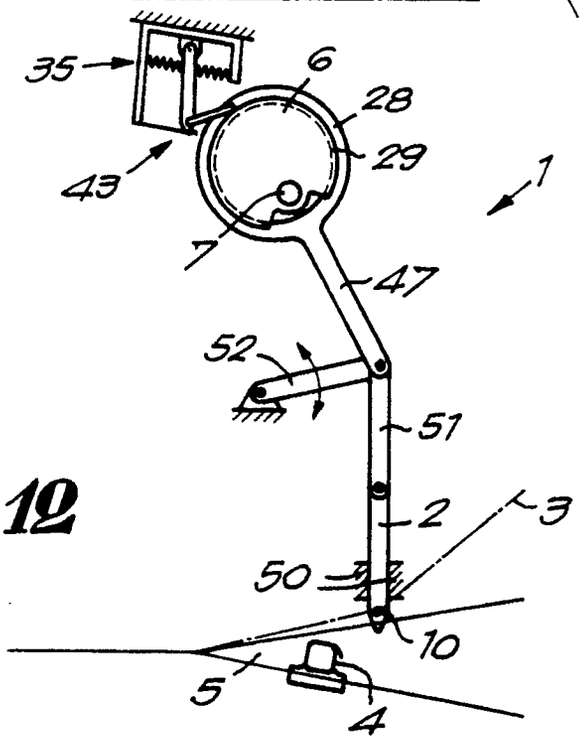
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Fig. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 20 0822

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	CH-A-450315 (RUTI) * the whole document *	1, 2, 6, 11, 12	D03D47/38
A	GB-A-2099863 (SAURER)		
A,D	EP-A-0290788 (PICANOL)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 JULY 1990	BOUTELEGIER C.H.H.

CATEGORY OF CITED DOCUMENTS

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E : earlier patent document, but published on, or after the filing date
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