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(54) **Machine for counting and sorting coins.**

(57) The machine comprises in combination: a series of accurately sized holes (21) to fit the dimensions of the coins (M) that are to be sorted, the holes being arranged along a path on which the coins advance; and a member (15) that drives the coins along said path. The holes are arranged in order of size from the smallest hole to the largest hole in the direction of advance of the coins along said path. Upstream of each accurately

sized hole (21), with reference to the direction of advance of the coins along the path, is a sensor (35) for detecting the passage of the coins. A control unit (49) is also connected to the sensors and programmed to determine, on the basis of the signals emitted by the sensors, the number of coins that drop into each accurately sized hole on the basis of the difference between the number of coins detected by the sensors associated with the holes.

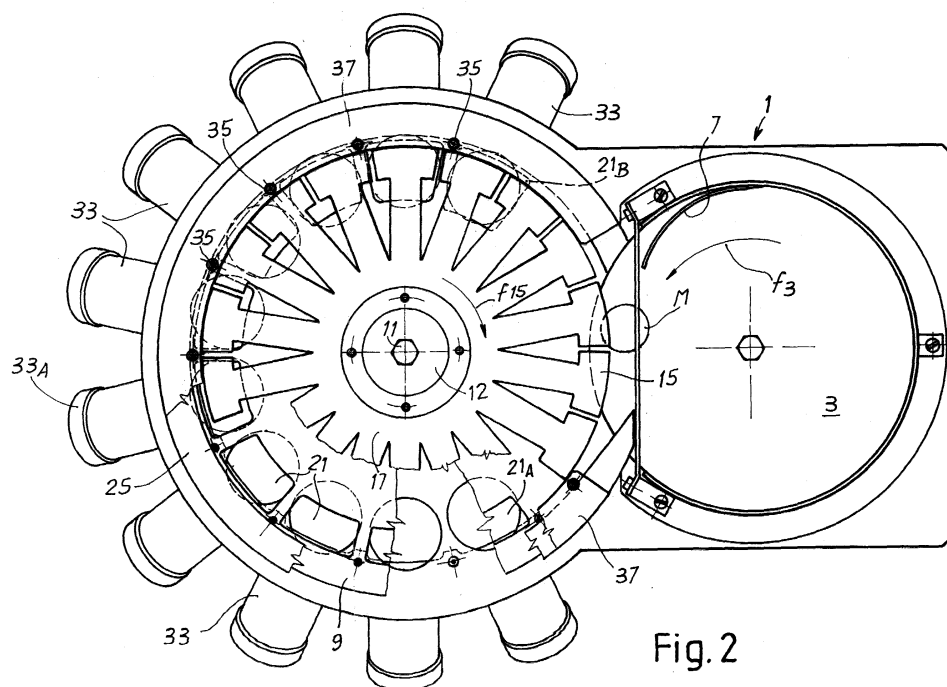


Fig. 2

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Description

[0001] The present invention relates to a machine for counting and sorting coins according to their value. Machines of this type are frequently used in banks and other organizations where it is necessary to sort large numbers of coins by value and simultaneously count them.

[0002] Equipment of this type, in which the coins are fed by a driving member along a separating path in which accurately sized holes are present for the coins to pass through, are already in existence. Coins that pass through the individual holes are counted downstream of the holes.

[0003] In an initial aspect, it is an object of the present invention to provide a machine for counting and sorting coins of the type mentioned above, that will be particularly reliable, inexpensive and fast.

[0004] This and other objects and advantages, which will become clear to those skilled in the art on reading the text which follows, are achieved in accordance with the invention by means of a machine that comprises in combination:

- a series of accurately sized holes to fit the dimensions of the coins that are to be sorted, the holes being arranged along a path on which the coins advance, in order of increasing size along the direction of advance of the coins;
- a member that drives the coins along the path of advance of said coins;
- upstream of each accurately sized hole, with reference to the direction of advance of the coins along the path, a sensor for detecting the passage of the coins; and
- a control unit connected to said sensors and programmed to determine, on the basis of the signals emitted by the sensors, the number of coins that drop into each accurately sized hole on the basis of the difference between the number of coins detected by the sensors associated with the holes.

[0005] More specifically, in a practical embodiment of the invention, the control unit determines the number of coins that drop into each accurately sized hole on the basis of subtraction of the number of coins detected by a sensor downstream from the number of coins detected by a sensor upstream of a particular hole.

[0006] To achieve a substantial reduction in the costs of manufacture and increase the reliability of the machine, in one embodiment of the invention the sensors are of optical type, although the possibility of using other types of sensors, such as capacitive sensors, microswitch sensors or the like, is not ruled out.

[0007] The path of advance of the coins can in principle be of any form, including linear for example. According to the preferred embodiment of the invention, however, the path is of circular type and the coin driving member is a discoid member.

[0008] The accurately sized holes may also include, at the end of the path of advance, a hole into which rejects can be discharged, that is to say coins that do not match the dimensions of the various accurately sized holes, in which case there is no need to provide a sensor downstream of the last hole. However, the possibility of also providing a sensor downstream of the last hole to count the coins that do not fit into any of the accurately sized holes, and which therefore represent rejects, is not ruled out. Another possibility is to determine the rejects by some other method, such as by some action upstream of the separating and counting path, that is upstream of the first accurately sized hole.

[0009] It is possible, too, to provide an accurately sized hole upstream of the holes corresponding to sizes of coins which the machine is intended to recognize and sort, and all coins smaller than the smallest size recognizable by the machine fall into this hole. In other words, rejects smaller than the smallest recognizable size and rejects larger than the largest recognizable size can be removed by means of respective holes upstream and downstream of the accurately sized counting and sorting holes.

[0010] The possibility of also providing, upstream of the accurately sized holes, an alloy-recognizing sensor or other sensor that removes rejects on the basis of other criteria than mere coin diameter, is not ruled out.

[0011] In another aspect, it is an object of the present invention to provide a coin counting and/or sorting machine in which the coin driving and separating members are subject to less wear.

[0012] This is achieved, in a different aspect of the invention, by means of a machine of the type comprising: a fixed discoid tray containing a plurality of holes that receive said coins on the basis of their size; and a rotating discoid coin driving member combined to said fixed discoid tray, movement of which causes movement of the coins around said fixed discoid tray. According to this further aspect of the invention, the rotating discoid member comprises a plurality of radiating laminations made of elastic material.

[0013] Further advantageous features and embodiments of the device according to the invention are set out in the attached dependent claims.

[0014] A clearer understanding of the invention will be gained from the description and attached drawing, the latter showing a non-restrictive example of an embodiment of the invention. More specifically, in the drawing:

Fig. 1 shows a section on a vertical plane through the machine according to the invention;

Fig. 2 shows a plan view with some parts removed on II-II as marked in Fig. 1;

Fig. 3 shows an enlargement of a portion of the plan view of Fig. 2;

Fig. 4 shows a local section on IV-IV as marked in Fig. 3;

Fig. 5 shows a local section on V-V as marked in

Fig. 3;

Fig. 6 shows a detail of Fig. 3 with certain details illustrating a special mode of operation of the machine; and

Fig. 7 shows a top-down view of a modified embodiment of the coin driving member.

[0015] The machine according to the invention comprises, in the example illustrated in the drawing, a supporting structure 1 containing a rotating feeder disk 3 in a coin loading area, which receives the coins to be counted and sorted, which can be poured onto the feeder disk 3 through a hopper (not shown). The rotating feeder disk 3 is turned by an electric motor 5 underneath it and rotates anticlockwise as indicated by the arrow f3. The rotating feeder disk 3 is a means of feeding the coins toward a counting and separating path as described later.

[0016] Around the rotating feeder disk 3 is a curved shaped plate 7 for containing the coins.

[0017] The machine also comprises a fixed discoid tray 9 with a central hole 9A through which passes a shaft 11 turned by a motor 13 located underneath it. Keyed to the shaft 11 is a hub 12 to which is fixed a discoid coin-driving member having the general reference 15 and having a lamination structure consisting of a plurality of laminations 17 made of spring steel for other elastic material and having an overall T shape, with a leg 17A and an end 17B. The latter is provided on its underside with a cushion 19 of material with a high coefficient of friction, e.g. rubber. The legs 17A of the laminations 17 can bend to accept coins underneath the cushions 19, the coins then being propelled by the laminations 17 when the latter are rotated integrally with the hub 12. The laminations 17 act essentially as leaf springs, pressing the coins down onto the fixed discoid tray 9. The discoid member 15 is turned clockwise by the motor 13, as indicated by arrow f15 in Fig. 3.

[0018] Around the edge of the discoid tray 9 are a series of accurately sized holes 21. As can be seen in particular in Fig. 2 and Fig. 3, the accurately sized holes 21 have a radial dimension R which increases from the first hole, denoted 21A, to the last hole denoted 21B. The accurately sized holes 21 are therefore arranged in such a way that their radial dimension increases from the first hole to the last in the direction in which the coins are fed, this being determined by the clockwise direction of rotation of the driving member 15.

[0019] The fixed discoid tray 9 includes a cut-out portion 9A in the area adjacent to the feeder disk 3, which forms a profile tangential to the circular edge of the latter. The profile is at least partly beveled. Consequently when the rotating feeder disk 3 turns anticlockwise and the discoid coin-driving member 15 turns clockwise, the coins M (see Fig. 2) are pushed by the rotating feeder disk 3 between the upper surface of the fixed discoid tray 9 and the lower surface of the cushions 19 of the laminations 17 forming the discoid member 15. The

coins are thus pushed by the combined effect of the friction of the cushions 19 and of the centrifugal force along a circular separating and counting path that passes over the accurately sized holes 21.

[0020] This path is defined circumferentially by a ring 25 (see in particular Figs 4 and 5), on top of which is another ring 27, for purposes described later. The edge of the ring 25 is slightly further out radially than the radially outermost edges of the accurately sized holes 21, so that each coin advancing along the feeder path and sliding against the inner edge of the ring 25 as it is pushed round by the laminations 17 drops into the first accurately sized hole 21 whose radial dimension R corresponds to the diameter of the coin (Fig. 5). The distance in a radial direction between the radially outer edge of the accurately sized holes 21 and the inner edge of the ring 25 forms an annular collar on which the coins are supported, preventing the coins from falling into holes not corresponding to their dimension because of mispositioning of the coins, which could become tilted owing to the pressure of the laminations 17.

[0021] The accurately sized holes 21 are therefore made to correspond in number and in dimensions to the various types of coin which it is wished to separate and sort by means of the machine described. The fixed discoid tray 9 may be interchangeable in order to adapt the machine to a variety of counting and separating requirements.

[0022] The last hole 21 B along the circular path followed by the coins can be a discharge hole for rejects, for which purpose it has a radial dimension R comfortably greater than any dimension of the objects which may be poured into the machine.

[0023] Underneath each accurately sized hole 21 is a discharge mouth 31 that receives the coins that drop into its accurately sized hole 21 and conveys them to a sloping tube 33 whose lower end 33A is shaped to allow attachment of e.g. a collecting bag (not shown) by means of a clip ring 34.

[0024] Arranged along the channel 29 are a plurality of optical sensors, generically denoted 35, each comprising an emitter and receiver, as indicated by one of them in the cross section shown in Fig. 4 where these elements are denoted 35E and 35R respectively. Also visible in the cross section shown in Fig. 4 and Fig. 5 are the printed circuits 37 and 39 on which the emitters and receivers forming the sensors 35 are mounted. Each emitter 35E is housed in a hole formed in the ring 27, which also carries on its top the associated electronic circuit. The receivers 35R are housed in through holes formed in the fixed discoid tray 9. Alternatively the fixed discoid tray 9 may have a smaller radial dimension and there may be a spacer ring outside of it, with the receivers arranged between the inner edge of the spacer ring and the outer edge of the fixed discoid tray. This simplifies substitution of the fixed discoid tray with the accurately sized holes, an operation that is necessary to adapt the machine to count and to separate different se-

ries of coins.

[0025] The emitter/receiver arrangement can be reversed. The housing of the two components of the optical sensors in the holes of the supporting structure makes it possible to protect them and prevents errors of detection due to ambient light.

[0026] As can be seen particularly in the plan views shown in Fig. 2 and Fig. 3, one sensor 35 is provided upstream of each of the accurately sized holes 21 along the circular path followed by the coins. With this arrangement it is possible to count the number of coins arriving at each accurately sized hole 21. On the basis of this information the machine is able to count how many coins fall into each accurately sized hole 21, in the manner described later.

[0027] Lastly, the machine is equipped with two covers 41 and 43 which respectively close the coin introduction area over the rotating feeder disk 3 and the counting and separating area above the discoid member 15. The covers 41 and 43 are hinged at 45 and 47 respectively, to the supporting structure 1 of the machine to allow access to the interior. In the plan view shown in Fig. 2 the covers 41 and 43 are omitted in order to keep the drawing clear. The cover 43 supports a control unit 49 mounted on the inside face of the cover and equipped with a display and programming and control keys (not shown) accessible from the outside of the cover 43.

[0028] The control unit 49 is connected to the sensors 35 and to the motors 5 and 13 to control the machine as described below.

[0029] When the coins have been unloaded onto the rotating feeder disk 3, the rotation of the latter and the rotation of the discoid member 15 carries the coins around the circular path bounded peripherally by the inner edge of the ring 25. The elasticity of the laminations 17 and the presence of the cushion 19 underneath each of the ends 17B of the laminations gives an effective grip and efficient driving of the coins around the circular path irrespective of the size and thickness of the coins, because each lamination 17 can flex independently of the adjacent laminations and, because of the cushion 19, exerts sufficient friction to propel the individual coins around the circular separating and counting path.

[0030] The first sensor along the path (denoted 35A in Fig. 3) detects the passage of all the coins. It therefore counts the total number of coins fed around the separating path. Only coins of smaller diameters fall into the first accurately sized hole 21A, while the remaining coins also pass under the second sensor 35. The latter therefore detects the passage of a number of coins equal to the number detected by the first sensor 35A minus the number of coins that fell into the first accurately sized hole 21A. The central control unit 49 receives the signals of two consecutive sensors and from the difference between the numbers of signals emitted by the first and second sensors 35 calculates by subtraction the number of coins that have fallen into the ac-

curately sized hole 21A located between these sensors.

[0031] The number of coins that fall into each of the accurately sized holes 21 located around the separating and counting path is determined in the same way by subtraction of the signals emitted by the sensors upstream and downstream of the hole.

[0032] In the example illustrated the last accurately sized hole is designed to accept rejects, that is coins whose dimensions are not among those the machine is capable of recognizing and counting. The radial dimension of this hole is determined so as to enable it to accept whatever object is larger than those that have been able to fit into the previous accurately sized holes. There is therefore no need for a sensor downstream of the last accurately sized hole 21 because the number of coins that drop into the penultimate accurately sized hole (corresponding to the largest of the possible dimensions of coin that the machine is capable of recognizing and counting) is determined by the control unit 49 by the difference between the signals received from the sensors upstream and those downstream of the penultimate hole, whereas it is unnecessary to determine the number of rejects that fall into the last accurately sized hole 21. This number can however be worked out from the total number of coins read by the first sensor 35A and subtracting from this the sum of the coins that have fallen into the accurately sized holes 21 upstream of the last hole.

[0033] The control unit 49 can also be programed to carry out a series of checks and operating tests. For example, arrangements may be made for it to temporarily reverse the direction of rotation of the rotating feeder disk 3 if, after initiating the rotation in the correct direction of operation (arrow f3), the first sensor 35A does not detect any coins passing. In this way, if the non-appearance of the coins is due to a blockage of the coins in the machine, the temporary reversal of the direction of rotation will unblock them. If after one or two attempted reversals of the motion the first sensor has still not detected the passage of any coins, the control unit will stop the machine, interpreting this condition as an absence of coins to be counted and sorted. This mode of operation is made possible in a simple way by the presence of two separate drives 5, 13 for the rotating feeder disk 3 on the one hand and for the discoid member 15 on the other. This makes it possible to arrest and reverse the rotary motion of the feeder disk 3 without arresting or reversing the motion of the member 15, which continues to advance the coins around the separating and counting path.

[0034] The machine described thus far is used to sort and count coins of different dimensions tipped loose onto the rotating feeder disk 3. The same machine, suitably improved, can also be used to sort coins of the same size into groups each containing a predeterminable number of coins. It is thus possible, for example, to pour in a certain quantity of coins of varying dimensions and have them sorted out into the various containers con-

nected to the tubes 33. Then, by modifying the mode of operation of the machine via a simple keyboard command, it is possible to pour onto the rotating feeder disk 3 all the coins from a single container (all identical coins, therefore) in order to sort them into groups each containing a predetermined quantity of coins (the individual groups being the same or different).

[0035] For this purpose the machine is fitted with an intercepting member, e.g. in the form of a pin 51 standing at right angles to the plane of the fixed discoid tray 9 and visible in particular in the plan view of Fig. 6, but omitted from the other figures for the sake of clarity. The pin 51 is operated by an electromagnetic actuator indicated schematically at 51 and located underneath the fixed discoid tray 9. As Fig. 6 also shows, the first sensor 35A is displaced, compared with the first accurately sized hole 21, further upstream and roughly in line with the pin 51.

[0036] When it is wished to count coins all of the same size (value) in order to sort them into groups containing a predeterminable number of coins, the machine operates as follows: the coins are poured onto the rotating feeder disk 3, which begins to feed them to the fixed discoid tray 9 underneath the feeder member 15. The latter pushes the coins around the separating and counting path and causes them all to pass under the sensor 35A. When this sensor has counted the number of coins corresponding to the number previously entered into the central control unit 49, the latter emits a signal to activate the actuator 53, which raises the pin 51. The pin therefore intercepts the flow of coins in the following way: the last coin "observed" by the sensor 35A is allowed to pass because it has already intersected the area of action of the pin 51. When this coin (indicated at M1 in Fig. 6) has passed, the pin 51 is released and emerges above the surface of the fixed discoid tray 9, thereby preventing the next coin (indicated at M2) from passing. The pin is retracted only after the coin M1 has dropped into the accurately sized hole 21 corresponding to its diameter. To guarantee this, the pin 51 may simply be withdrawn after the discoid driving member 15 has made a complete revolution. Alternatively the signals of the sensors 35 subsequent to the first sensor may be used to verify that the coin has dropped into its appropriate hole. When the pin 51 retracts below the upper surface of the fixed discoid tray 9, the flow of coins recommences in order for the next group to be counted.

[0037] During the period in which the pin 51 is intercepting the flow of coins, the rotating feeder disk 3 is preferably stationary. This is made simple by the fact that two separate drives 5, 13 are provided.

[0038] Fig. 7 shows a modified embodiment of the discoid driving member 15. In this embodiment the discoid member 15 differs from the previous member in that the cushions 19 are replaced by a single cushion or strip of endless annular form. The ends 17B of the individual laminations 17 are thus connected to each other by a strip of relatively soft and flexible material.

[0039] In both versions the cushions or the strip 19 can be made from various materials, such as plastic, rubber, fabric, felt or nonwoven. They can also be made in the form of brushes or the like. The only important point is that the material from which they are made must have a sufficient coefficient of friction and sufficient softness to grip the coins and push them along.

[0040] As can be seen in Figs 2 and 7 in particular, the laminations 17 are made from a single plate of e.g. spring steel and are connected in the central area, from where they radiate out, and where the sheet forming the laminations is connected to the central hub.

[0041] Conventional coin-counting machines drive the coins by means of discoid members made from a single piece or disk of metal, with a compliant lining on its lower surface. This creates serious problems which are overcome by the configuration of the discoid driving member 15 of the present invention. Indeed, the coins which the machine is to count are usually of variable thickness. When, as in conventional machines, the discoid member is made as a solid disk, the different thicknesses of the coins are compensated for only by the compliance of the underlying rubber or other such lining.

[0042] As a consequence of this the force exerted on thicker coins is extremely high, while that on thinner coins is not very great, and may even be insufficient to propel the coins along. The thickest coins are pressed down with such force against the surface of the underlying discoid tray as to create a large amount of friction and hence rapid wear of the tray. Furthermore, the coins might not be pushed correctly in the centrifugal direction because of the retention effect of the compressive force.

[0043] The need to be able to adapt to variable thicknesses of coins and the impossibility of deforming the overlying metal discoid member that is made as a single block also results, in conventional machines, in rapid wear of the rubber lining of the discoid coin-driving member, which makes frequent replacements necessary.

[0044] In addition, the large pressure on the thicker coins increases the force of friction and hence the resistive torque exerted on the discoid driving member. This increases the power consumption of the machine.

[0045] All these problems are overcome by the machine according to the invention, in as much as the discoid driving member is produced in the form of laminations, each of which can bend independently of the adjacent laminations. This occurs to a greater extent in the first embodiment described, where the cushions 19 are separated from each other, but also occurs in the second embodiment in which the cushion 19 is a single annular strip, as the latter is still made from a compliant material and permits independent flexing of the various laminations.

[0046] It shall be understood that the discoid member 15 constructed in this way can be used on any machine for counting and/or sorting coins where it is necessary to have a driving member of discoid shape, irrespective of the other characteristics of the machine and therefore

even when the separating and counting system is different from that described here.

[0047] In the same way it should be understood that the coin counting and separating system based on the difference between signals detected by the individual sensors as described above can also be used in a machine that does not have this particular discoid driving member. On the contrary, as mentioned earlier, the coin separating and counting path need not even be circular.

[0048] It will be understood that the drawing shows only a possible embodiment of the invention, which can be varied in its shapes and arrangements without thereby departing from the scope of the concept on which the invention is based. The presence of any reference numbers in the appended claims is purely for the purpose of facilitating the reading thereof in the light of the foregoing description and of the accompanying drawings, but does not limit its scope of protection.

Claims

1. A machine for counting and sorting coins, comprising in combination: a series of accurately sized holes (21) to fit the dimensions of the coins (M) that are to be sorted, the holes being arranged along a path on which the coins advance; and a member (15) that drives the coins along said path;

characterized in that

- said holes are arranged in order of size from the smallest hole to the largest hole in the direction of advance of the coins along said path;
- upstream of each accurately sized hole (21), with reference to the direction of advance of the coins along said path, is a sensor (35) for detecting the passage of the coins;
- and a control unit (49) is connected to said sensors and programmed to determine, on the basis of the signals emitted by the sensors, the number of coins that drop into each accurately sized hole on the basis of the difference between the number of coins detected by the sensors associated with the holes.

2. Machine according to claim 1, **characterized in that** said control unit determines the number of coins that drop into each accurately sized hole on the basis of subtraction of the number of coins detected by a sensor upstream and a sensor downstream of the particular accurately sized hole.

3. Machine according to claim 1 or 2, **characterized in that** said sensors are optical sensors.

4. Machine according to claim 1 or 2 or 3, **characterized in that** said path of advance of the coins is a circular path and in which said driving member is a

discoid member.

5. Machine according to one or more of the preceding claims,

characterized in that downstream of the last accurately sized hole (21) for the separation of the coins is a hole for collecting rejects of larger dimension than the maximum dimension of coins selectable by the machine.

6. Machine according to one or more of the preceding claims,

characterized in that upstream of the first accurately sized hole (21A) for the separation of the coins is a smaller hole for collecting rejects of smaller dimension than the minimum dimension of coins selectable by the machine.

7. Machine according to one or more of the preceding claims,

characterized in that it also includes a sensor downstream of the last hole of said series of accurately sized holes.

8. Machine according to one or more of the preceding claims,

characterized in that it comprises an intercepting member (51) located at a point along said path of advance of the coins upstream of the accurately sized holes (21) and operated by an actuator (53) which in turn is controlled by said control unit in order to intercept on command the flow of coins along said path.

9. Machine according to one or more of the preceding claims,

characterized in that it comprises a means (3) for feeding the coins toward said driving member (15) and two independent drives (5, 13), one for said feeder means (3) and one for said driving member (15) respectively.

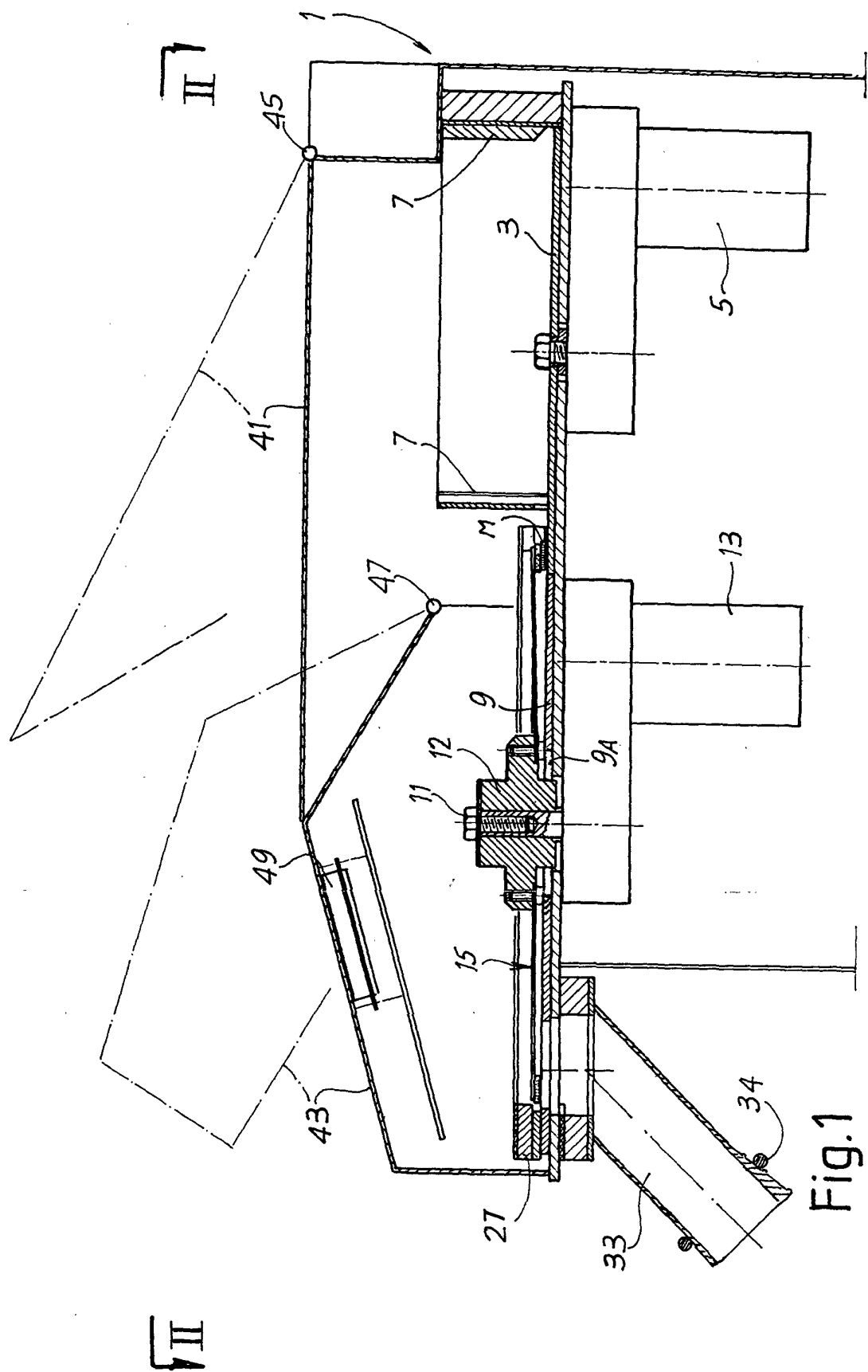
10. Machine according to at least claim 4, **characterized in that** it comprises:

- a fixed discoid tray (9) coaxial with said driving member (15), in the vicinity of the perimeter of which tray are said accurately sized holes (21) and
- an annular edge running around the perimeter of said fixed discoid tray (9), along which said sensors (35) are located.

11. Machine according to one or more of the preceding claims,

characterized in that it comprises a rotating feeder disk (3) for feeding the coins into said path of advance.

12. Machine according to claim 11, **characterized in that** said control unit is programed to temporarily reverse the motion of the rotating feeder disk (3) if the sensor (35A) upstream of the first accurately sized hole (21) does not detect the passage of coins after a predeterminable time interval from when the machine is started. 5
13. Machine according to at least claim 8, **characterized in that** said control unit (49) is programmed to actuate said intercepting member (51) after the first sensor (35) has counted a predeterminable number of coins, in order to temporarily obstruct the feeding of the coins along said path of advance. 10
14. Machine according to claims 9 and 13, **characterized in that** said control unit is programmed to stop said coin feeder means when the flow of coins is temporarily obstructed by said intercepting member (51). 15 20
15. A machine for counting and separating coins, comprising:
- a fixed discoid tray (9) containing a plurality of holes (21) that receive said coins on the basis of their size; 25
 - a rotating discoid coin-driving member (15) combined with said fixed discoid tray, movement of which causes movement of the coins around said fixed discoid tray; 30
- characterized in that** said rotating discoid member comprises a plurality of radiating laminations (17) made of elastic material. 35
16. Machine according to claim 15, **characterized in that** each of said laminations (17) possesses, on at least a portion of its surface nearest the fixed discoid tray, a cushion (19) of material with a high coefficient of friction. 40
17. Machine according to claim 16, **characterized in that** said cushion (19) is annular in shape and is attached to a plurality of said laminations. 45
18. Machine according to claim 16, **characterized in that** each lamination (17) possesses a cushion (19) that is separate from the cushions of the adjacent laminations. 50
19. Machine according to one or more of claims 15-18, **characterized in that** said laminations (17) comprise a leg (17A) and a terminal end (17B) of larger tangential dimensions than said leg. 55
20. Machine according to claims 17 and 19 or 18 and 19,
- characterized in that** said cushion or cushions (19) are attached to said terminal ends (17B).
21. Machine according to one or more of claims 15 to 20 **characterized in that** said laminations (17) are made of spring steel.
22. Machine according to one or more of claims 15 to 21, **characterized in that** said laminations are made from a single stamped metal plate and are joined by an integral portion of said plate in the central area of said rotating discoid member.



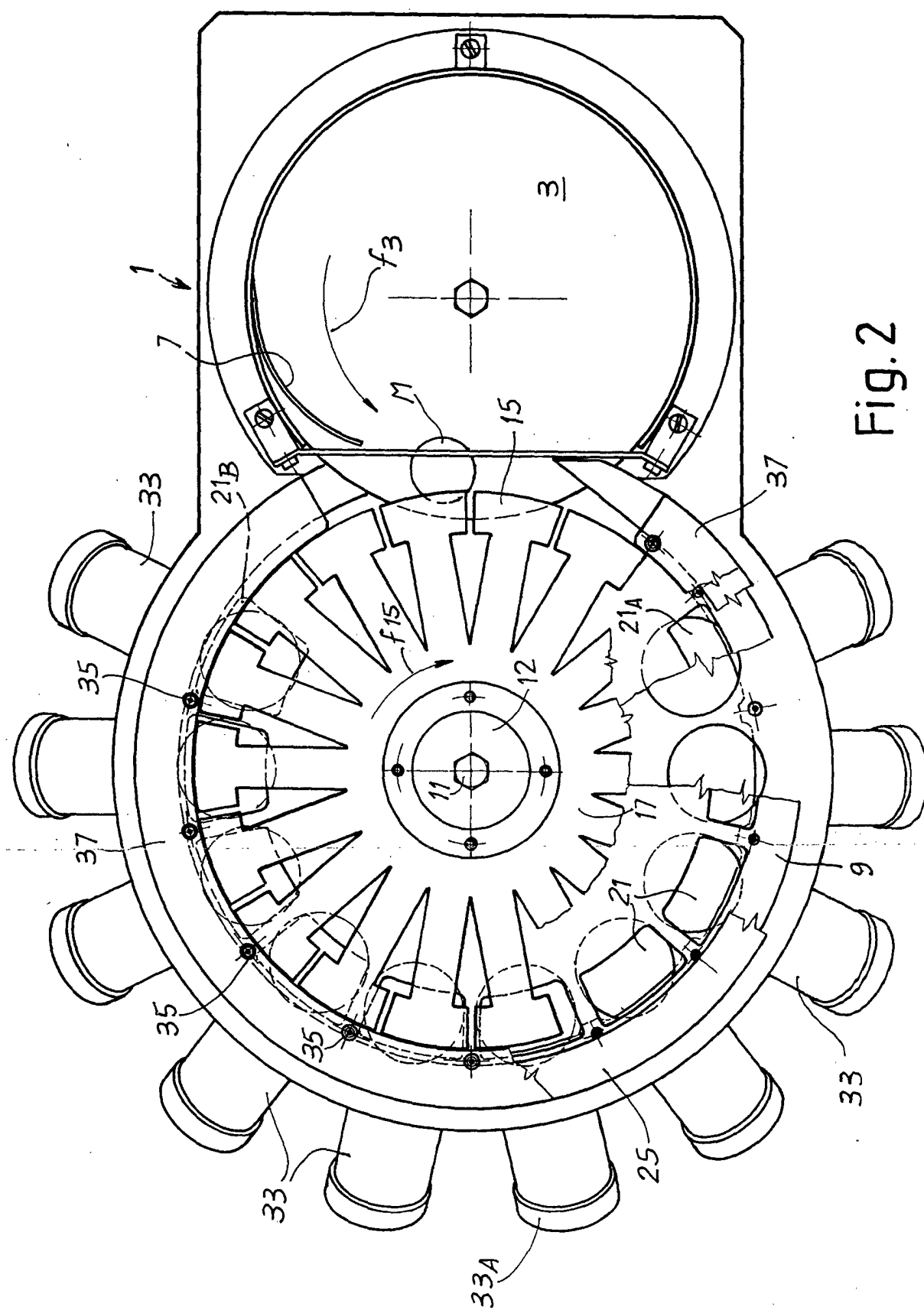
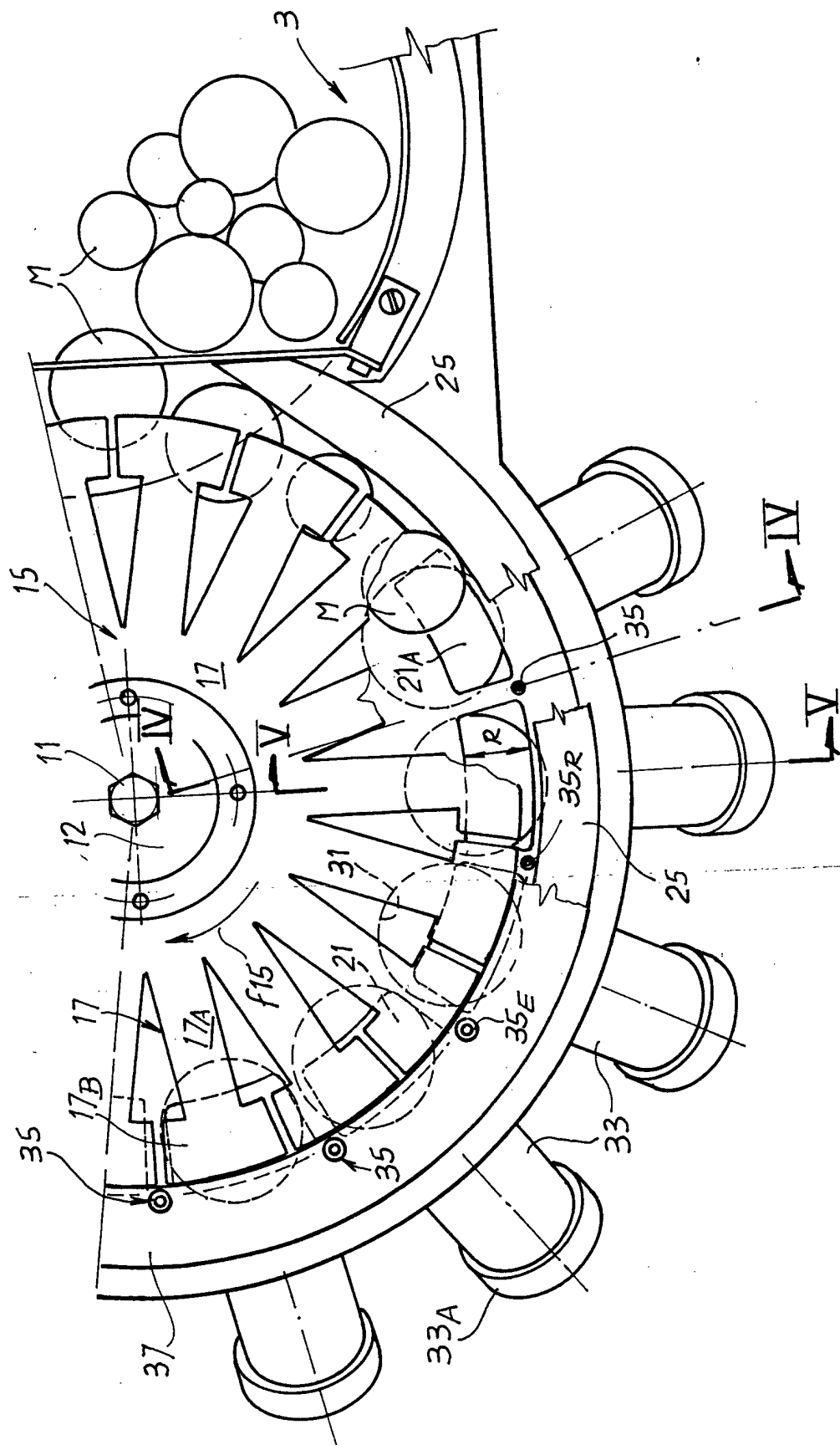


Fig. 2

Fig. 3



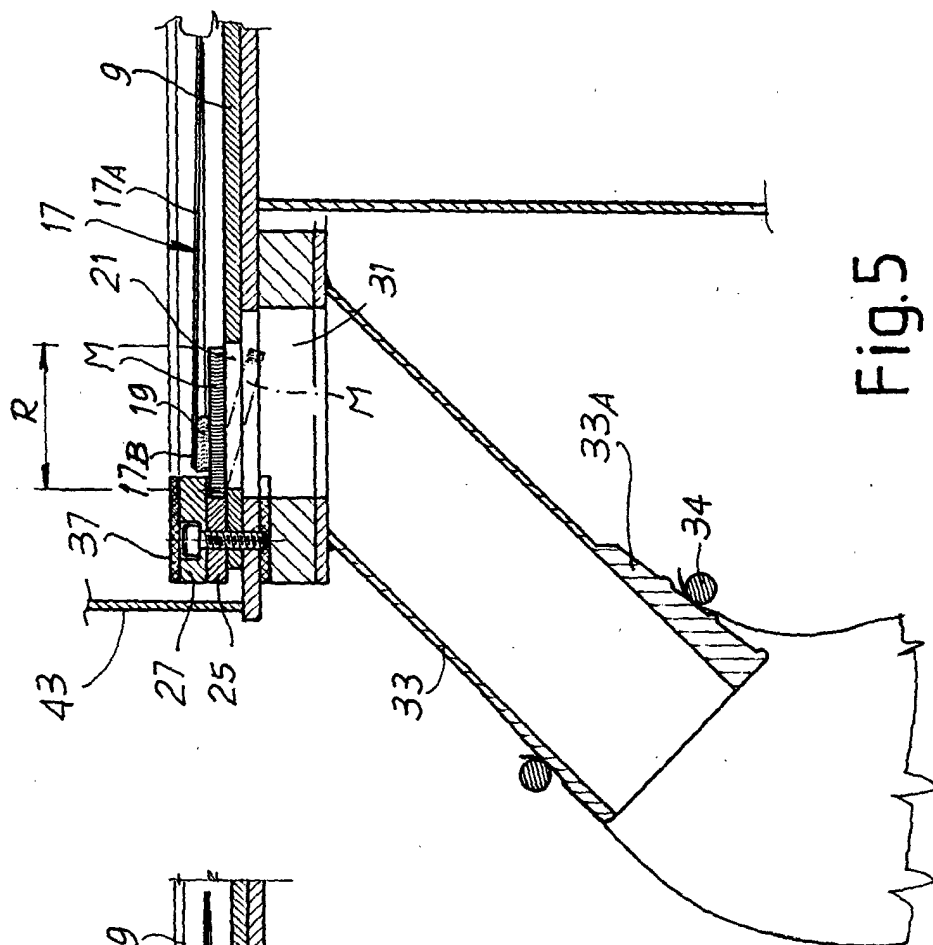


Fig. 5

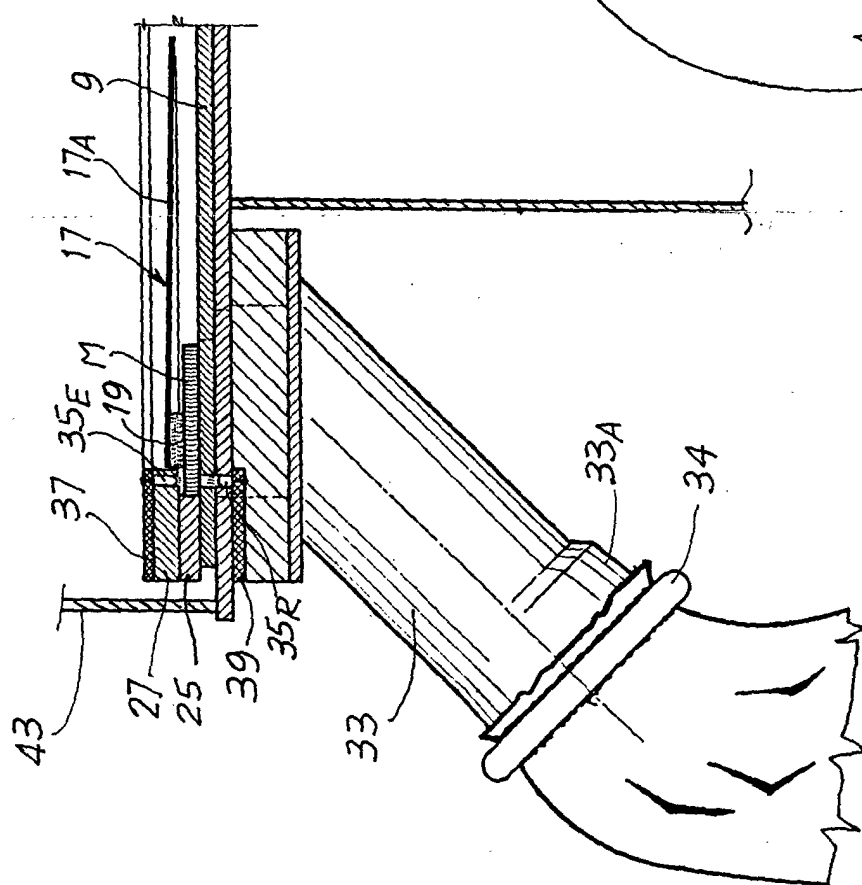
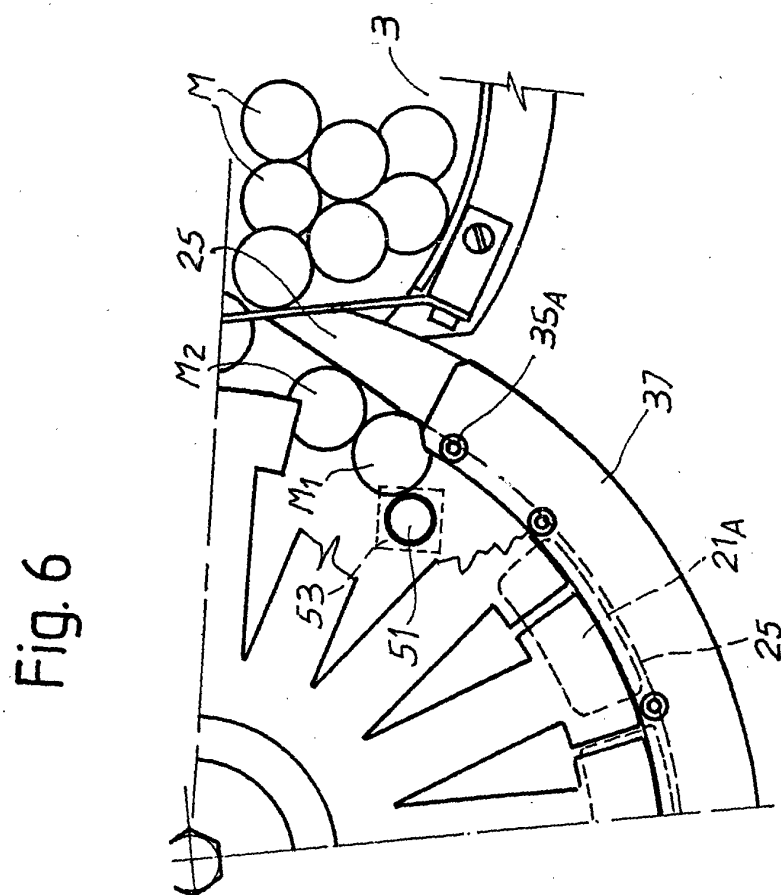
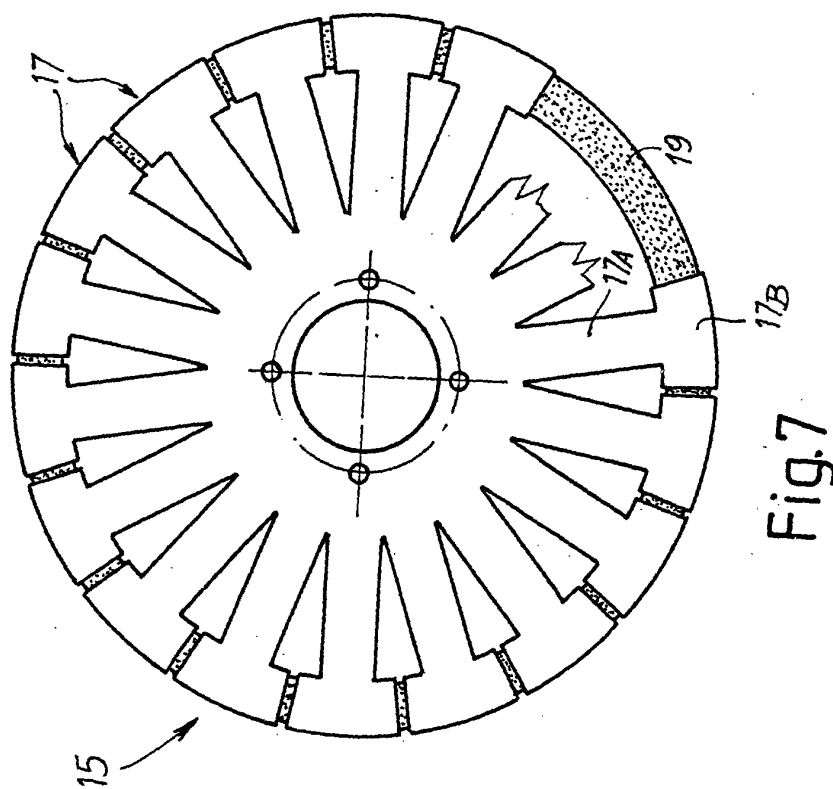


Fig. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0432

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.7)
X	US 3 785 386 A (KOFISKY H) 15 January 1974 (1974-01-15)	1-3	G07D3/06 G07D3/16
Y	* abstract *	4-6,8-14	
A	* column 1, line 63 - column 2, line 29 * * claim 1 * * figure 1 *	7	

X	US 5 525 104 A (ADAMS THOMAS P ET AL) 11 June 1996 (1996-06-11)	15,16,18	
Y	* abstract *	4-6,10	
A	* column 2, line 22 - line 64 * * column 3, line 12 - line 14 * * column 5, line 42 - line 47 * * column 8, line 30 - line 67 * * figures 1-4,13-16 *	1-3,7,8, 10-14, 17,19-22	

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