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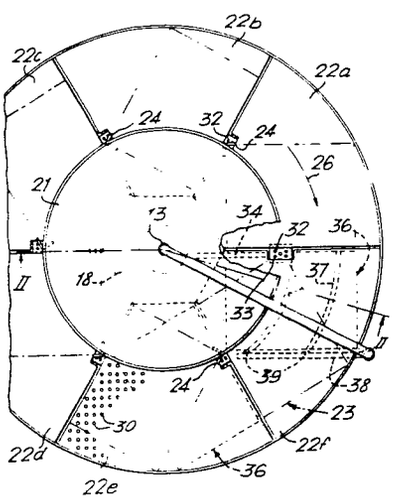
(54) Rotary collating machines and method of collating sheet material.

(57) A rotary collating machine, and method of collating, utilises the principle of peeling individual sheets of paper, card or like material from the bottom of a number of stacks of sheets (23) arranged around a flat segmented table (22a to 22f) which supports the stacks by air pressure issuing through holes (30). Perforated suction wheels (32) equispaced around the table between the segments draw down a corner of each bottom sheet as the wheels rotate beneath the stacks. The withdrawn sheets are held by suction on the wheels (32), guided down through slots between the table segments (22a to 22f), inverted as they are peeled away, and deposited in catching trays (36) beneath the table to build up collated sets which can be removed by a stripper bar (38).



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ROTARY COLLATING MACHINES AND METHOD OF COLLATING SHEET MATERIAL

DESCRIPTION

This invention relates to rotary collating machines in which single sheets are taken from each of a plurality of stacks of sheets of paper, card or like material, and these extracted sheets are collated into complete sets for subsequent handling. The invention is also concerned with methods of collating such sheet material.

Many different types of collating machine are known. However, it is the conventional practice in such machines, whether operating on mechanical, pneumatic or hydraulic principles, to take the individual sheets from the top of each stack of sheets, usually by a lifting or sliding movement. Many of these conventional machines have considerable drawbacks. It is common for example for such collating machines to be extremely bulky and to occupy a large floor area. Those machines which are operated under pneumatic or hydraulic control require the use of complex hydraulic and/or pneumatic circuits incorporating valves and control mechanisms which are expensive, require regular maintenance and can give rise to breakdowns. Another problem which arises with many of the conventional collating machines is that they are unable to handle large-size sheets, and this imposes severe limitations on their ability to handle a large range of paper sizes. Furthermore, the conventional technique of gripping a sheet along the length of one edge requires relatively complex gripping mechanisms.

It is an object of the present invention to provide an improved approach to solving the problems

associated with the collating of sheets of paper, card or like material.

It is another object of the invention to provide a method of collating, and a machine for collating, using a rotational principle, in which the individual sheets do not have to be gripped as by fingers from above and below.

It is a further object of the invention to provide a machine which uses suction to separate and hold the individual sheets as they are withdrawn from the stacks.

In accordance with the present invention there is provided a method of collating sets of individual sheets from a plurality of stacks of sheets of paper, card or like material, in which the respective stacks are arranged spaced around the centre of a circle, characterised in that relative rotational movement is initiated between the stacks and a peeling mechanism, and the bottom sheets of the respective stacks are peeled away and deposited as a collated set.

Preferably each sheet is inverted as it is peeled away from the underside of the stack.

Also in accordance with the present invention there is provided a rotary collating machine comprising support means for a plurality of stacks of sheets of paper, card or like material spaced at intervals around a circle centred on the axis of rotation of the machine, characterised by peeling means arranged to peel the bottom sheet from each stack as relative rotational movement takes place between the stacks and the peeling means, thereby to produce collated sets comprising one sheet from each of said stacks.

Preferably the rotary collating machine is arranged so that the stacks of sheets remain stationary and the peeling action is effected from beneath the

stacks, preferably with the stacks of sheets positioned in relation to the peeling means so that the peeling away of each bottom sheet is initiated at a corner of the sheet.

Preferably the peeling means comprises a plurality of perforated suction rollers equal in number to said stacks and equispaced around the circumference of the machine, the interior of each roller being connected to a source of suction, and each suction roller being arranged to pass beneath the stacks and to draw down the corner of a sheet as it reaches a stack.

According to a preferred embodiment of the invention, the machine comprises a table having an upper surface on which the stacks of sheets rest, the table having perforations in its upper surface to enable pressurised air to be passed through said perforated surface to provide an upward pressure beneath the stacks to reduce friction between the stacks and said upper table surface as they rotate relative to each other.

The machine of the present invention is extremely simple in construction, has a minimum of moving parts, and provides a reliable sheet feed cycle.

One feature of the rotary collating machine of the present invention is that the mechanical principles on which it is based permit a construction of machine in which a number of rotary units are stacked one above the other in a vertical tower arrangement. For example, each rotary unit may be designed to accept six stacks of paper sheets arranged around a circle, with a number of such rotary units being assembled in a vertical array and with all the operation and control mechanisms arranged in and around a central column which extends up through the separate units.

This multiple machine provides great practical advantages. It takes up an extremely small amount of

floor space because of the vertical stacking principle on which it is based; the construction is simplified because all the controls can be built in and around the base of the column; and maintenance is made simple by virtue of the modular system, in that the column of modules or rotary units can readily be assembled, dismantled, and increased or decreased in numbers with individual modules being readily replaceable in the event of replacement becoming necessary. It is simply necessary to remove the modules above the faulty unit, replace the faulty unit and then reassemble the modules on the central column.

The rotary collating machine of the present invention is able to handle extremely large sheets of paper, is able to handle both flimsy sheets and sheets of card with equal ease, is extremely simple in construction and operation, is relatively inexpensive to produce and avoids the need for any complex hydraulic and/or pneumatic circuitry.

In order that the invention may be fully understood, a number of embodiments of rotary collating machine in accordance with the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a top plan view of a first embodiment of rotary collating machine in accordance with the invention;

Fig. 2 is a schematic side elevation, partly in section, of the machine of Fig. 1, the sectional view being generally along the line II-II of Fig. 1, but with other components added;

Figs. 3a to 3f constitute a schematic sequence diagram illustrating how the bottom sheet of a stack is peeled away from the bottom of a stack in a collating machine in accordance with the present invention; and,

Fig. 4 is a top plan view of a second embodiment of rotary collating machine in accordance with the invention.

In each of the illustrated embodiments only those features of the rotary collating machine are shown which are essential to an understanding of the principles underlying the present invention. Much of the frame structure has been omitted from the drawings for the sake of clarity. Additionally, only one of the plurality of stations around the rotary machine is shown in detail in Figs. 1 and 3 of the drawings, it being understood that each of the plurality of stations around the circumference of the machine will be identical.

Reference is made first to the machine shown in Figs. 1 and 2, in conjunction with the sequence diagram shown in Figs. 3a to 3f. The machine comprises a rigid central column 10 within a casing 11. An air pump 12 is mounted within the casing and communicates with a vertically upwardly extending pipe 13 which extends through substantially the whole height of the machine. Within the casing there is a horizontal support plate 14. This plate carries an annular thrust bearing 15 around the central pipe 13. A hollow cylindrical shaft 16 extends upwards coaxially about the pipe 13. The shaft 16 is rotatably driven from a power source (not shown) by way of a pulley wheel 17 for example. A pair of rigid annular plates, consisting of an upper plate 18 and a lower plate 19, are bolted together in fixed spaced relationship, with the lower plate 19 being secured to the shaft 16 so that the plates 18, 19 are rotatable therewith. Mounted above the upper plate 18 is a cap 20 which is rotatable with the plate and which encloses air venting passageways, as will be described later. At the top of the machine there is provided a rigid horizontal circular top plate 21. The air pipe 13 extends up through the centre of the top plate 21

and is taken radially to a position outside the periphery of the moving parts of the machine where it extends into a downpipe.

Between the upper and lower plates 18, 19 are clamped six wedge-shaped table elements 22a, 22b, ... 22f. These elements each extend substantially radially of the centre of the machine and can be moulded from plastics material for example. Althcugh the illustrated collating machine is based upon a six-stack arrangement, the machine could alternatively be based upon a four-stack array, an eight-stack array, or any other suitable number. The number of wedge-shaped table elements is in each case equal to the number of stacks of sheets from which the individual sheets are to be withdrawn for collation into sets. The stacks of sheets are arranged upon the table elements 22a ... 22f in the manner illustrated in Fig. 1, with each stack turned through 60° as compared with the preceding stack around the circle, and with each stack having one corner projecting as a leading corner. One stack of sheets is indicated generally at 23 in Fig. 1 and its leading corner is shown located within a vertically extending angle-piece 24 which is suspended from the top plate 21 by means of a bolt 25. The direction of rotation of the table elements 22a to 22f and of the central plates 18, 19 and their related components is clockwise as viewed in Fig. 1, as indicated by the arrow 26. Preferably, the size of the sheets which form the stack 23 and the radial dimension of the table constituted by the table elements 22a to 22f is such that with the stacks positioned in their correct attitude on the table the sheets extend across substantially the full radial width of the table outwardly of the central plates 18 and 19. However, the machine is capable of handling larger size sheets which do overlap the outside of the table to some extent.

Viewed in cross-section, each of the wedge-shaped table elements 22a to 22f comprises a horizontal upper web 27, a downwardly and outwardly sloping lower web 28, connected by a circumferential web 29. The upper web 27 of each of the table segments is provided with perforations 30, as can be seen most clearly in Fig.2, in order to enable air under pressure to be forced through the perforations 30 in an upward direction. In this way the rotatable table constitutes an airbed so that the stacks of paper laid upon the table will be subjected to this upward pressure of air to reduce the friction between the stationary stacks of sheets and the rotating table. One can therefore regard a stack of sheets placed upon the table 22a to 22f as being "fluidised" by this air pressure from the perforations 30. Preferably, a sperical ball (not shown) is associated with each of the perforations 30 to act as individual valves.

The radial leading face of each of the wedge-shaped table elements 22a to 22f, considering the direction of rotation 26, is concave as indicated at 31 in Fig. 3a. These leading faces 31 are smoothly concave across the full radial width of each table element. The trailing face of each of the wedge-shaped table elements 22a to 22f is matchingly convex over the greater part of the radial width of the table. However, recessed into the trailing face of each table element is a suction wheel 32. Each suction wheel 32, of which there are six equally spaced around the circumference of the table, is a free-running wheel of frusto-conical shape and provided with surface perforations 33, as shown most clearly in Fig. 2. Each suction wheel 32 is mounted to be freely rotatable on bearings carried on a tube 34 which extends axially of the suction wheel towards the centre of the machine in order to be able to exhaust air drawn in through the holes 33. As can be seen most clearly from Fig. 2, the

peripheral surface of the suction wheel 32 is preferably slightly proud of the top surface of the upper web 27 of the table elements. Thus, the convex trailing face of each wedge-shaped table element at its inner and outer portions is effectively continued across the intermediate recess by the curved peripheral surface of the suction wheel 32. This therefore defines a curved, constant-width channel from the upper surface of the air bed to the lower surface of the air bed across the full radial width of the table, this channel being indicated at 35 in Fig. 3a. The width of this channel, i.e. the distance between the curved surface of the suction wheel and the leading face 31 of the table element, and also the width of the gap between two adjacent table elements at the surface of the table, may be approximately 0.5 cm.

Beneath the table composed of the segments 22a to 22f are six catching trays indicated generally at 36, with the trays being associated with the respective stacks 23. The disposition of the catching trays 36 relative to the stacks 23 is shown most clearly in Fig. 1. Viewed in plan, one of the stacks 23 and its associated catching tray 36 define a rectangle in outline when the tray has just cleared the back edge of the stack. As will be explained in greater detail later, the bottom sheet of the stack 23 of sheets is peeled away and inverted, and is finally deposited in its catching tray 36 when the tray occupies the position shown in broken outline in Fig. 1. The catching trays 36 are suspended at the centre from the underside of the lower plate 19. The trays 36 slope downwards outwardly of the central axis of the machine, substantially parallel to the bottom web 28 of the table segments 22a to 22f. Each of the catching trays 36 is provided with a pair of arcuate grooves 37 which are shown in Fig. 2 and also by broken lines in Fig. 1. These arcuate grooves 37 are centred on the central axis of the

machine and are provided in order to enable the collated sets of sheets in the trays to be stripped out of the trays into a receiver. A stripper bar 38 is provided at one fixed location and is mounted so as to be stationary as the machine rotates past it. This stripper bar 38 extends parallel to the catching trays and between the trays and the underside of the table. A pair of fingers 39 project down from the stripper bar and are positioned relative to the trays so that the fingers traverse the arcuate grooves 37 as the trays move beneath the stripper. This causes the collated sets of sheets in the trays to be entrained from the trays and deposited into a receiver (not shown).

The operation of the machine to collate sets of sheets from the respective stacks 23 will now be described, with particular reference to the sequence diagram shown in Fig. 3. Initially, the six stations around the table or air bed 22a to 22f are loaded with stacks of sheets 23 with the leading corner of each stack being retained accurately in place by the angle-piece 24. Also associated with each stack 23 is a backplate 40 (Fig. 3a) which is not shown in Fig. 1 for reasons of clarity. Behind each backplate 40, and positioned on the circle traversed by the suction wheel 32, is a friction pad 41 which serves to maintain the rotation of the suction wheel 32 as it passes this point. Associated with the leading corner of each stack 23 there is provided a separator device 42 fitted to the bottom of the angle-piece 24 and designed to hold back all the sheets in the stack other than the lowermost sheet as this lowermost sheet is peeled away by the suction wheel. Also shown in Fig. 3 is a blade element 43 provided at the bottom edge of the leading face 31 of each table segment. This blade 43 projects forwardly beneath the suction wheel and serves to direct the downwardly moving sheets in the correct direction as they

leave the suction wheel. Blade 43 may be a continuous blade extending across the full radial width of the table segments, or may comprise a number of fingers spaced at intervals across this radial width. The opposite edge at the bottom of the trailing face of each table segment in the region into which the suction wheel is recessed is provided with a doctor blade 44 which serves to assist the removal of the leading edge of a sheet from the surface of the suction wheel 32 as it passes down through the channel 35.

In operation, under the control of appropriate electrical/electronic means, housed within the casing 11, the rotatable table 22a to 22f is rotated in the direction of the arrows 26 beneath the stationary stacks 23 which are fluidised by the upward force of compressed air forced through the perforations 30. This compressed air is passed up through the central pipe 13, out through ports in the pipe wall, and radially out into the table segments. At the same time, suction is created within the upper part of the central pipe 13 to cause air to be drawn in through the holes 33 in the suction wheels 32 and to be taken through the tubes 34 and through valved passageways within the central cap 20 into the suction pipe. By providing a valve seal 45 within the air pipe 13 one can use the same pipe both for the supply of compressed air and for the suction of indrawn air. As a suction wheel 32 reaches the point where its apex is positioned beneath the leading corner of a stack of sheets (Fig. 3a), the suction exerted by the wheel draws the corner of the lowermost sheet down into contact with the wheel where it is held by the suction action. As the table continues to rotate beneath the stack (Figs. 3b, 3c, and 3d), the lowermost sheet is peeled away from the underneath of the stack and is guided down between the suction wheel and the leading face 31 of the oncoming table segment. As the sheet moves down through

the channel 35 so it is inverted and finally deposited in the associated catching tray 36 (Fig. 3a). Fig. 3f shows how the friction pad 41 maintains the rotation of the suction wheel 32, at which stage the next suction wheel will be about to attract the leading corner of the next sheet in the stack. Due to the geometry of the arrangement the sheets peeled from the bottom of the stacks are accelerated into the receiving trays. By the time each tray 36 reaches the position immediately in front of the stationary stripper bar 38 it will have gathered up one sheet from each of the stacks around the table to form a collated set. Then, as the tray moves past beneath the stripper the collated set will be displaced from the tray and guided into a receiver.

The inversion of the individual sheets as they are peeled away from beneath the stacks has particular advantages when collating certain types of sheet, for example serially numbered sheets. By this means one can ensure that the collated sets are appropriately numbered from the top downwards when they are taken from the receiver.

However, in certain circumstances, it may be feasible to adopt a slightly modified peeling action in which the peeled sheets are not inverted but are deposited in the catching tray with the same sheet surface facing upwards as in the stack. Fig. 4 shows one such arrangement in accordance with the invention. In this embodiment of rotary collating machine there is provided a static frame 50 which comprises four rigid arms 51a, 51b, 51c, 5-d, each in the form of a thin vertical plate. The four arms are rigidly fixed to each other where they converge at the centre to define a square central channel 52 with one arm extending outwardly from each corner. One arm 51a is longer than the others and extends outwardly to form part of or to be secured to a rigid vertical support which forms

part of the static frame. Beneath the static frame is a circular rotatable plate 53. In the illustrated embodiment the plate 53 is hollow and comprises upper and lower elements with a chamber defined between them. The upper plate element is perforated at 54 in order to enable air under pressure to be ejected through the perforations in an upward direction, as in the first embodiment. In use, stacks of sheets are placed on the plate 53 at two or more of the four stations defined by the static frame 50. Each station for the stack of sheets is defined by two of the arms 51a, 51b, 51c, 51d with the stack of sheets being pushed into the corner defined between a pair of adjacent arms, and with appropriate retaining means 55 being used to keep the stack of sheets held firmly into the corner. With four stations the individual stacks of sheets are therefore offset at 90° to each other sequentially around the circumference of the unit.

Four catching trays 56 are positioned beneath the rotatable plate 14, only two of the trays being shown in Fig. 4. Each catching tray is L-shaped in plan and slopes downwardly from the centre of the unit towards the perimeter. The number of trays 56 is equal to the number of stacking stations and they are similarly set at 90° to each other in sequence around the unit.

The rotatable plate 14 is provided with four substantially radially extending slots 57 set 90° apart around the circumference of the unit. The plate 53 is rotatable in a clockwise direction as shown by the arrows 58 so that each slot 57 has a front edge 57a and a rear edge 57b. At least a part of the rear edge 57b of each slot is bevelled at an angle of attack of about 45° in order to provide a tapered edge for the purpose of peeling the bottom sheet of paper from a stack.

Around the centre of the unit is an annular plate 59 positioned beneath the rotatable plate 53 and mounted

in a fixed position. The plate 59 carries four suction members 60 which are therefore mounted in a fixed position, with one sucker positioned in the angle between each pair of frame arms 51a, 51b, 51c, 51d. In this way each sucker 60 is located directly on the path of the corner of the stack of sheets which is resting on the plate 53. Each suction member 60 is capable of pivotal movement between an active position in which it is pivoted upwards into contact with the underside of the bottom sheet of a stack, and an inactive position in which it is pivoted down out of contact with the stack of sheets. This pivotal movement of each suction member 60 can be controlled either mechanically from a cam mechanism (not shown) or electrically. In operation, as the front edge 57a of a slot 57 reaches a rotational position substantially as illustrated in Fig. 4, the suction member 60 which is then beneath that slot is actuated to be pivoted upwards into contact with the underside of the corner of the bottom sheet of the stack. The suction member 60 is then immediately pivoted downwards, while the suction force is maintained, so that the corner of the bottom sheet is oulled down with it through the slot 57. With continued rotation of the plate 53, the tapered rear edge of the slot 57 moves under the stack of sheets and in so doing shears or peels away the bottom sheet which is projecting down through the slot. The suction effect of the suction member 60 is still maintained at this stage so that the corner of the peeled sheet is still held by the suction cup and the sheet therefore lies beneath the underside of the rotatable plate 53. When this particular slot has rotated further to an angular position where it is about to clear the stack of sheets at that particular station, the suction which is still maintained at the leading corner of the bottom sheet by the suction member 60 is released in synchronism with the completion of the

peeling action and the sheet then drops into the catching tray 56.

In considering the design of the slot 57, it may not be necessary for the whole length of the rear edge 57b to be tapered. It may be sufficient for just a relatively short section of the rear edge of the slot adjacent to the centre of the plate 53 to be tapered to a sharp edge, with the remaining length of the rear edge being merely smoothed or rounded to provide a suitable guide for the peeled sheets over which it passes. Fig. 4 shows such an arrangement where it is only a short section of the rear edge of the slot which is sharply tapered and which is angled to meet the corner of the bottom sheet of each stack at an angle of 45^{o}. This results in an effective peeling action at the corner. As in the first embodiment described above, by initiating the peeling action at the corner of each sheet instead of along an edge, one achieves a much more reliable and controllable peeling action.

The machine shown in Fig. 4 can be further modified by replacing the suction members 60 with suction wheels similar to those shown in the first embodiment and illustrated in Figs. 1 and 2. In this case, the freely rotatable suction wheels would be mounted in fixed positions beneath the rotating plate and would draw the individual sheets down through the slot and pass them on, without inversion, into a stacking tray.

Although the rotary collating machines described above have been described merely as a means of collating individual sheets from respective stacks, it is possible also to use the machines as sheet inserters, using folded sheets which can be interleaved one with another using the peeling action described above.

Also, although just one rotary unit or module has been described in the case of each of these embodiments

of machine, it would be possible to stack a number of such modules one above another and to drive these in common from a central column which would house all the necessary electrical and pneumatic supplies. In the case where one wishes to collate sheets from more than the number of stacks available on a single table, using a multiple unit tower of modules, appropriate additional handling means would be provided to combine collated sets of sheets from the individual stacking trays in an appropriate order and sequence to produce the required sets.

CLAIMS:

1. A method of collating sets of individual sheets from a plurality of stacks of sheets of paper, card or like material, in which the respective stacks are arranged spaced around the centre of a circle, characterised in that relative rotational movement is initiated between the stacks and a peeling mechanism, and the bottom sheets of the respective stacks are peeled away and deposited as a collated set.

2. A method as claimed in claim 1, characterised in that each sheet is inverted as it is peeled away from the underside of the stack.

3. A rotary collating machine comprising support means for a plurality of stacks of sheets of paper, card or like material spaced at intervals around a circle centred on the axis of rotation of the machine, characterised by peeling means arranged to peel the bottom sheet from each stack as relative rotational movement takes place between the stacks and the peeling means, thereby to produce collated sets comprising one sheet from each of said stacks.

4. A machine as claimed in claim 3, characterised in that the stacks of sheets are held stationary and the peeling means passes beneath the stacks.

5. A machine as claimed in claim 3 or 4, characterised in that the peeling means is arranged to invert each sheet as it is peeled from a stack.

6. A machine as claimed in any of claims 3 to 5, characterised in that the stacks of sheets are arranged to be positioned in relation to the peeling means so that the peeling away of each bottom sheet is initiated at a corner of the sheet.

7. A machine as claimed in claim 6, characterised in that the peeling means comprises a plurality of

perforated suction rollers equal in number to said stacks and equispaced around the circumference of the machine, the interior of each roller being connected to a source of suction, and each suction roller being arranged to pass beneath the stacks and to draw down the corner of a sheet as it reaches a stack.

8. A machine as claimed in claim 7, characterised in that each suction roller is frusto-conical and is freely rotatable about its longitudinal axis and is connected to said source of suction by a tube extending axially of the roller towards the axis of rotation of the machine.

9. A machine as claimed in any of claims 3 to 8, characterised by a table having an upper surface on which the stacks of sheets rest, the table having perforations in its upper surface to enable pressurised air to be passed through said perforated surface to provide an upward pressure beneath the stacks to reduce friction between the stacks and said upper table surfaces as they rotate relative to each other.

10. A machine as claimed in any of claims 3 to 9, characterised in that the stacks of sheets rest on a table provided with a plurality of generally radially extending slots through which the sheets are guided as they are peeled from the stacks.

11. A machine as claimed in claim 10, characterised in that the table comprises a plurality of segments equal in number to said stacks, with said slots between adjacent table segments, the leading face of each table segment being concave, and the trailing face of each table segment being correspondingly convex along the greater part of its length but being recessed at a portion intermediate its ends to receive the peeling means.

12. A machine as claimed in any of claims 3 to 11, characterised by a plurality of catching trays equal in number to said stacks, the trays being rotatable relative to the stacks and being positioned beneath the stacks to

receive the sheets as they are peeled from the stacks, and stationary stripper means arranged to sweep collated sets of sheets from the trays at one predetermined angular position around the circumference of the machine.

13. A machine as claimed in claims 7 and 9, characterised in that the pressurised air supply for the table and the suction exhaust for the suction rollers use a common air pipe extending along the axis of rotation of the machine, the air pipe being provided with appropriate ports and with valve and sealing means.

FIG.1.

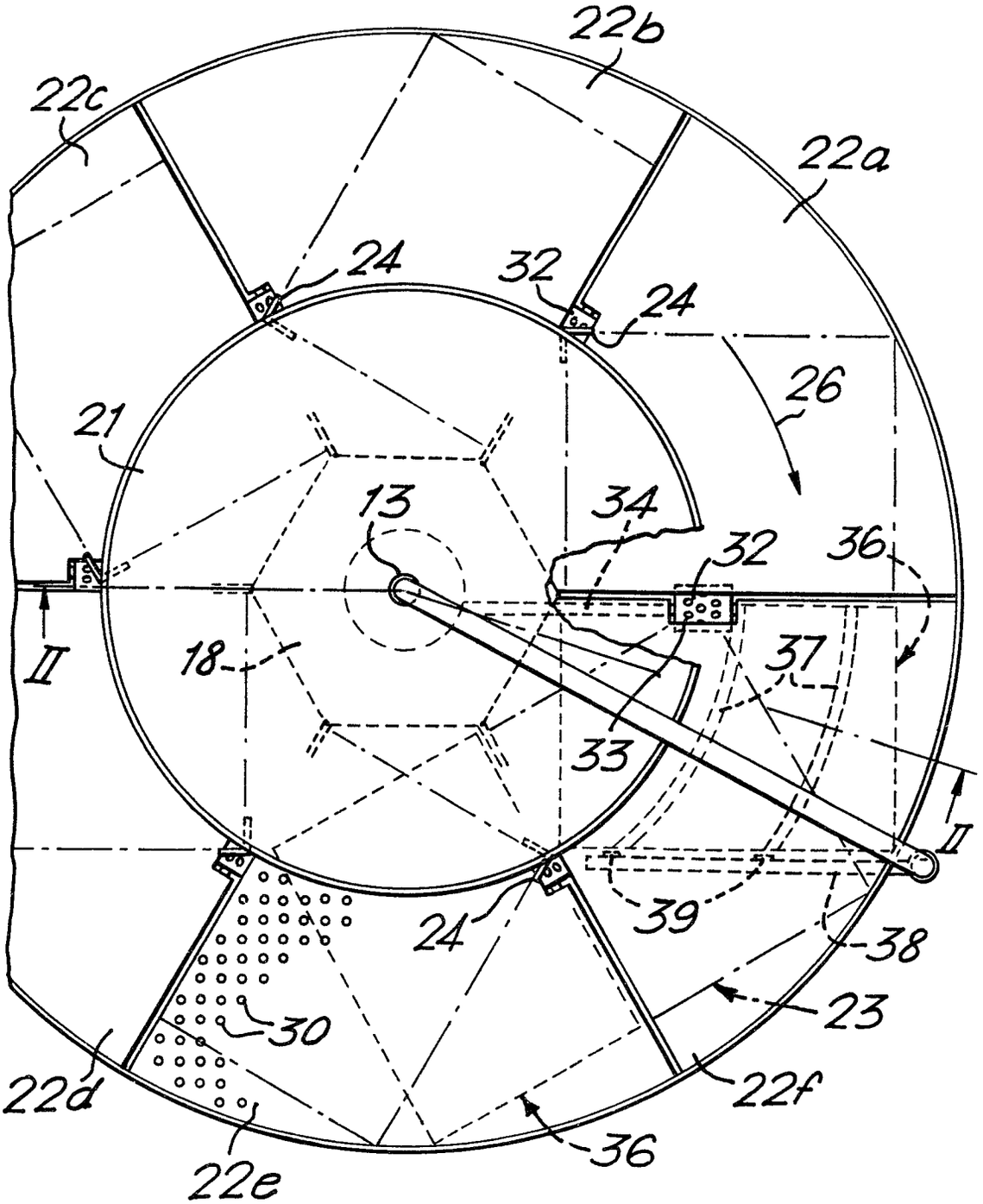
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FIG.2.

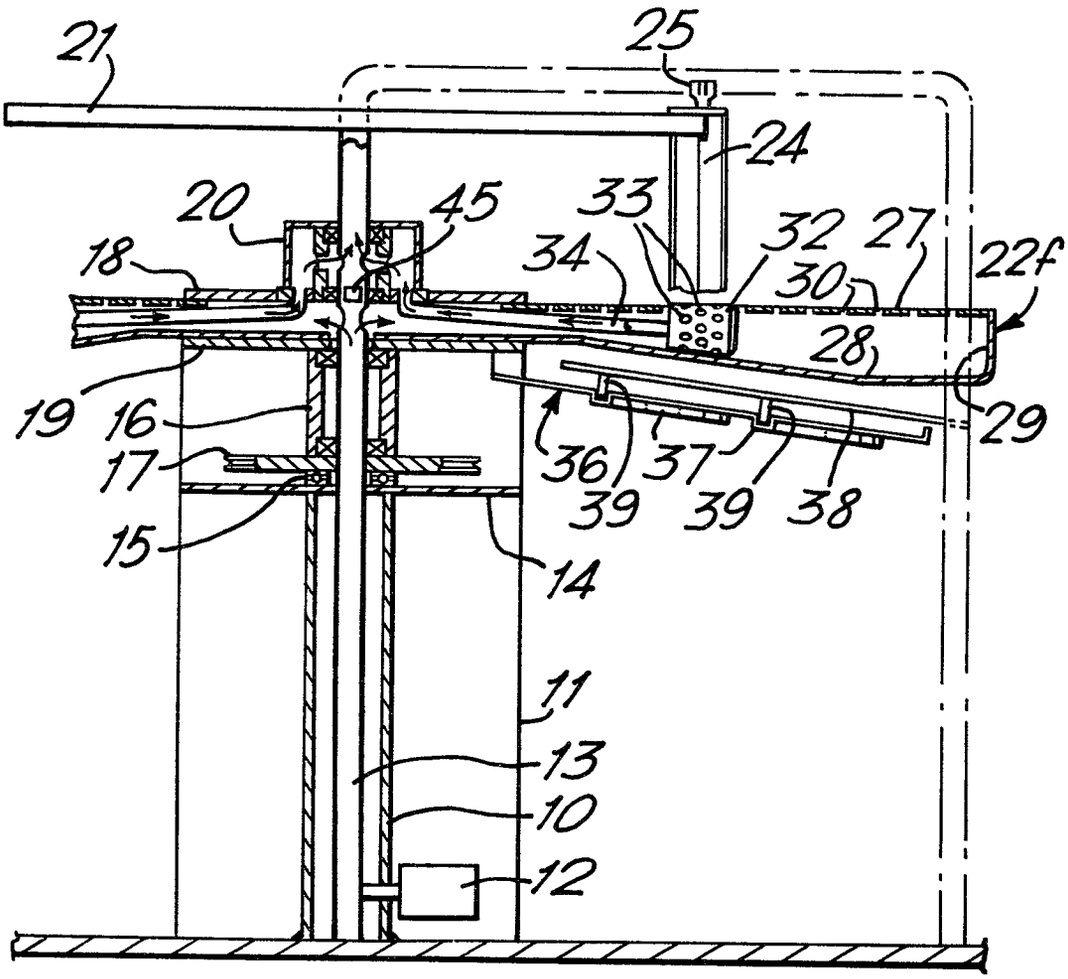
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FIG.3a.

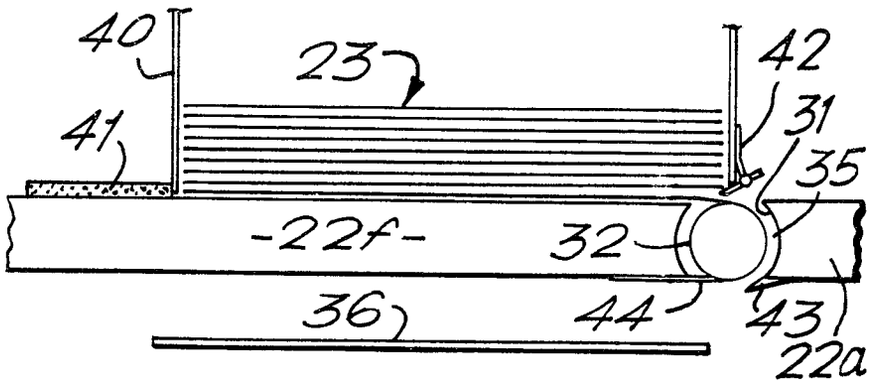


FIG.3b.

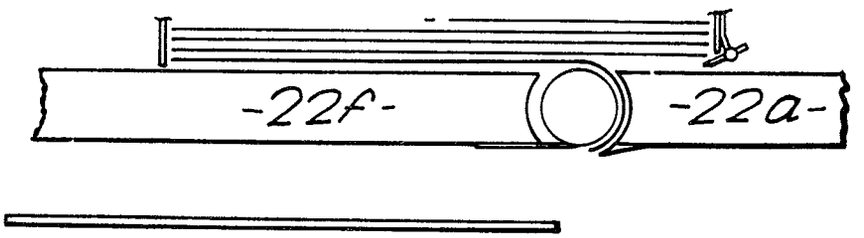


FIG.3c.

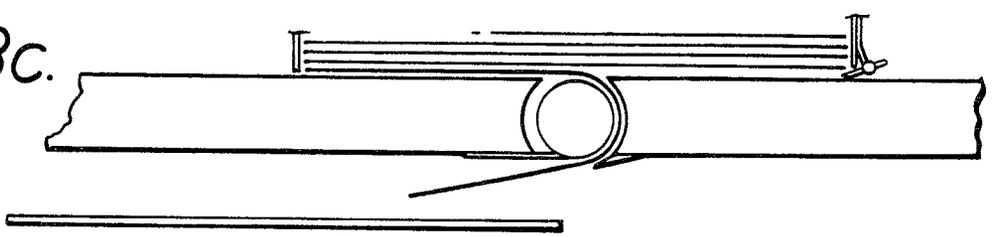


FIG.3d.

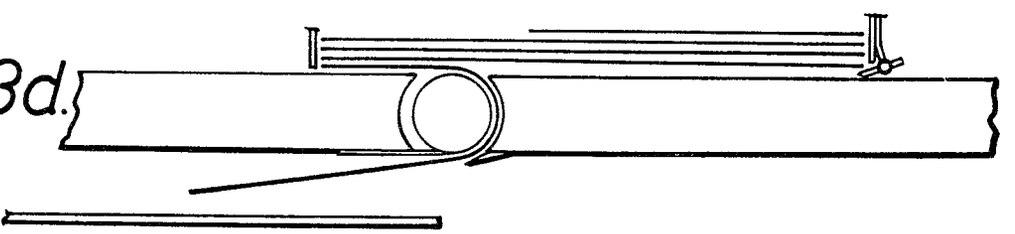
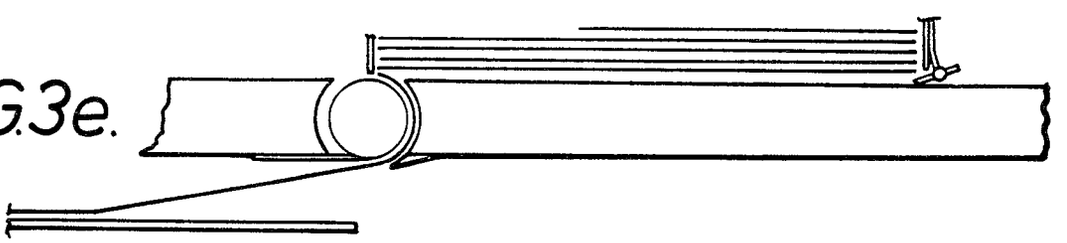


FIG.3e.



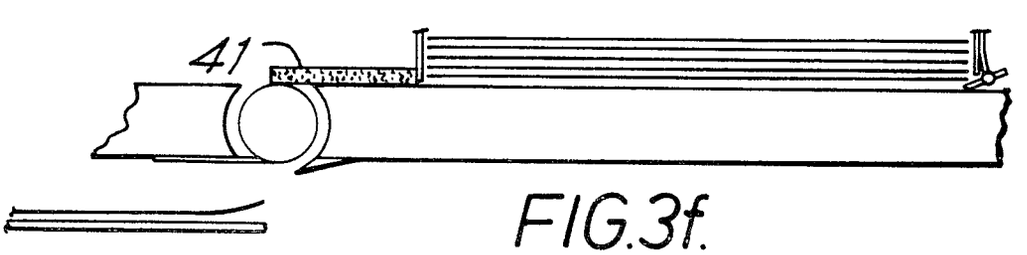


FIG.3f.

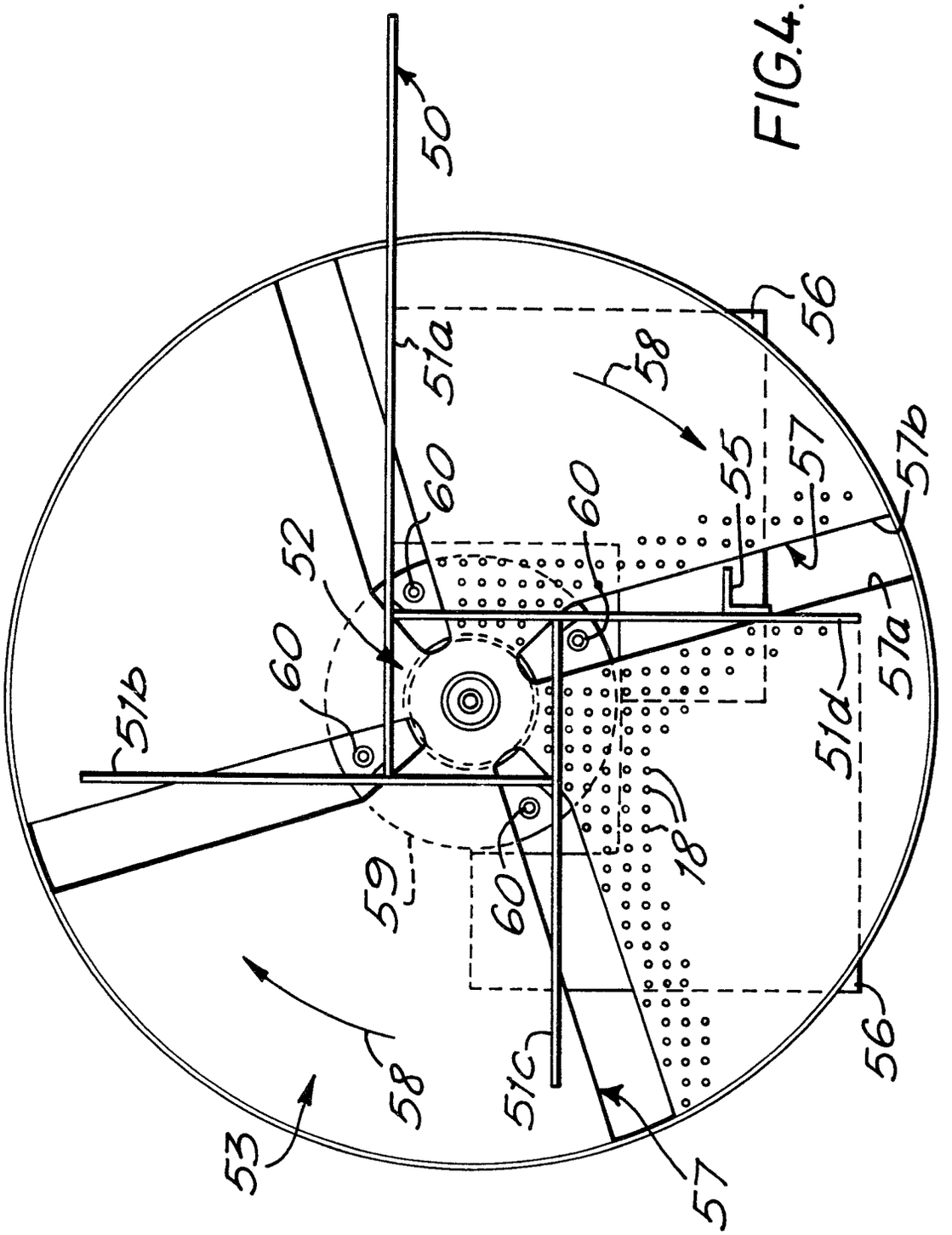

50
51a
56
58
55
57
57b
60
52
60
60
51b
57a
51d
18
59
60
58
51c
53
57
56

FIG.4.

European Patent Office

EUROPEAN SEARCH REPORT

0031717
Application number
EP 80 30 4701

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	DE - A - 2 757 187 (RAHDENER MASCHINENFABRIK AUGUST KOLBUS) * Whole document *	1,3,4, 6-12
X	FR - A - 1 088 708 (BENOIT) * Whole document *	1-3,5
X	FR - A - 1 005 012 (CAUDRON & PERLBARG) * Whole document *	1,3,4, 10,12
	XEROX DISCLOSURE JOURNAL, vol. 4, no. 2, March/April 1979, page 207 Stamford, U.S.A. R. GENTHNER: "Friction/retard feeder with vacuum feed wheel" * Whole document *	9
	US - A - 4 014 537 (STANGE) * Whole document *	9

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 65 H 39/045
3/44
3/10

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 65 H

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17-03-1981	MEULEMANS

EPO Form 1503.1 06.78