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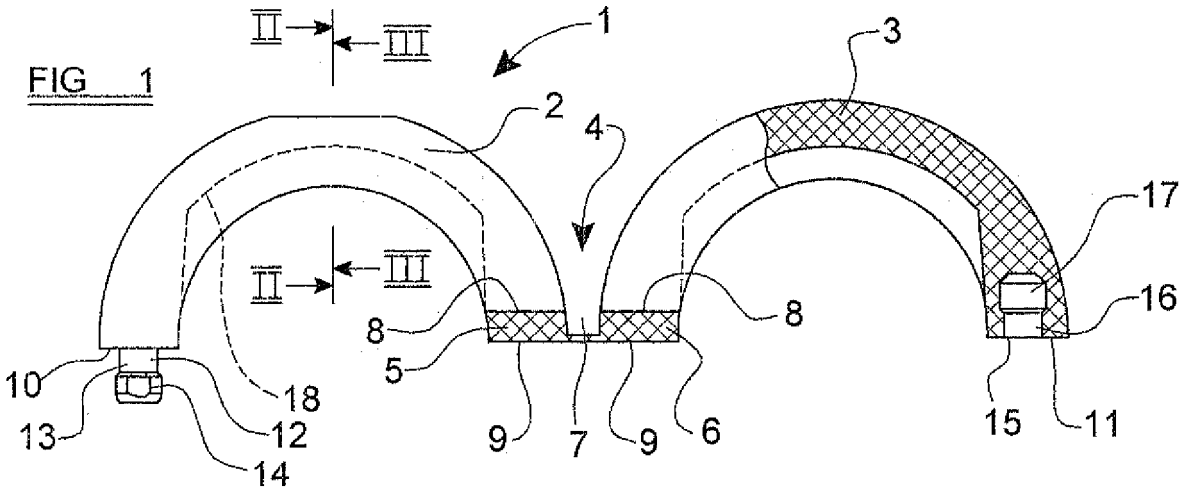
# (54) A document binding machine

(57) A document binding machine (21) is disclosed which is intended for use enclosing a spine-binder (1) on a stack of pre-punched paper sheets (20). The binding mechanism of the machine comprises a moveable binding comb having a plurality of spaced-apart vanes, each of which represents a binding member effective to bear against respective parts of the spine-binder and to close the finger elements (2,3) of the spine-binder into respective closed loops as the binding comb is moved towards a stack of papers (20) to form the bound document.

FIG 1

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## Description

**[0001]** The present invention relates to a document binding machine and, in particular, relates to a document binding machine which is intended for use in closing a spine-binder on a stack of sheets having a plurality of binding holes formed along one edge-region.

**[0002]** US 6,270,280 discloses a known form of spine-binder for securing a stack of sheets of paper or the like and which is particularly useful in the absence of a binding machine, being easily openable and closable by hand. Nevertheless, there can still be times when it is desirable to use a spine-binder of this general type with a binding machine, for example when a large number of documents must be bound up, in which case a binding machine can provide a more convenient and less time-consuming way of binding the documents.

**[0003]** It is an object of the present invention to provide an improved document binding machine for use in closing a spine-binder, preferably of the general type disclosed in US6,270,280, on a stack of sheets having a plurality of binding holes formed along one edge-region.

**[0004]** Accordingly, the present invention provides a document binding machine for use in closing a spine-binder on a stack of sheets having a plurality of binding holes formed along one edge-region, the spine-binder comprising a plurality of spaced-apart finger elements provided in pairs, the finger elements of each said pair being hingedly connected to one another at one end and connectable to one another at their opposite ends to form a closed loop, wherein the machine comprises: sheet receiving means configured to receive a stack of said sheets; spine receiving means configured to receive and retain an open spine-binder in a starting position in which each pair of finger elements is aligned with a respective said binding hole, the machine further comprising a binding mechanism comprising a plurality of spaced apart members, each said member being arranged for movement towards the sheet receiving means upon actuation of the binding mechanism, and having a tapering slot configured to receive and bear against a respective pair of finger elements and to close the finger elements into a respective said closed loop as the member is moved towards the sheet receiving means.

**[0005]** Preferably, said spine receiving means comprises a plurality of spaced-apart ribs configured to receive a respective pair of said finger elements between each neighbouring pair of ribs, and wherein each said member is arranged for movement between a respective pair of said neighbouring ribs.

**[0006]** Advantageously, said plurality of members are arranged for movement in synchronism.

**[0007]** Conveniently, said plurality of members take the form of vanes provided at spaced apart positions along an elongate moveable comb.

**[0008]** Preferably, the document binding machine is provided with indicia effective to provide a visual indication as to the instant position of the members.

**[0009]** Advantageously, the tapering slot of each member is stepped so as to define a plurality of slot-regions, each slot-region being configured to close the finger elements of a discrete size of spine-binder.

**[0010]** Conveniently, either the sheet receiving means or the spine receiving means is operable to selectively move the starting position of the spine binder relative to the position of the stack of sheets.

**[0011]** Preferably, the sheet receiving means is operable so as to selectively position the stack of sheets in a plurality of discrete positions, spaced from the starting position of the spine binder by different respective distances.

**[0012]** Advantageously, the number of said discrete positions in which the stack can be positioned is equal to the number of said slot-regions provided in the tapering slots.

**[0013]** Conveniently, the document binding machine further comprises sizing means effective to provide a visual indication as to the appropriate one of said discrete positions for a stack of sheets received in the sheet receiving means, depending upon the thickness of the stack.

**[0014]** Preferably, said sizing means comprises a plurality of steps against which the thickness of the stack of sheets can be gauged.

**[0015]** Advantageously, the sheet receiving means comprises a moveable actuating handle or tab which is selectively positionable in alignment with each said step in order to position the stack of sheets in a respective said discrete position.

**[0016]** So that the present invention may be more readily understood, and so that further features thereof may be appreciated, embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which, :-

FIGURE 1 is a cross-sectional view, from one end, of a spine-binder in a completely opened position;

FIGURE 2 is a cross-sectional view showing two neighbouring fingers of the spine-binder, taken along line II-II on Figure 1;

FIGURE 3 is a cross-sectional view taken through an individual finger along line III-III on Figure 1;

FIGURE 4 is a partial-cross-sectional view, from one end, of a closed spine-binder;

FIGURE 5 is a top plan view of a spine-binder as shown in Figure 1;

FIGURE 6 is an underneath plan view of the spine-binder illustrated in Figure 5;

FIGURE 7 is a perspective view of a stack of paper sheets held together as a bound document by the spine-binder illustrated in Figures 1 to 6;

FIGURE 8 is a perspective view of a document binding machine in accordance with the present invention which is intended for use in closing a spine-binder of the type illustrated in Figures 1 to 6, so as to bind up a document as illustrated in Figure 7;

FIGURE 9 is a view corresponding generally to that of Figure 8, but illustrating a cover of the binding machine in an open position so as to define a document receiving surface;

FIGURE 10 is a view corresponding generally to that of Figure 9, illustrating a stack of paper sheets in position on the machine ready for binding;

FIGURE 11 is an enlarged view of region A shown in Figure 10;

FIGURE 12 is a view corresponding generally to that of Figure 10, illustrating a spine-binder as shown in Figure 1, in its open position, being inserted into the binding machine;

FIGURE 13 is a view corresponding generally to that of Figure 12, but from a position located more centrally above the binding machine, showing the spine-binder in its starting-position in the binding machine in which it is spaced from a punched edge of the stack of papers;

FIGURE 14 is a view corresponding generally to that of Figure 9 but with an openable cover and a housing cover having been removed in order to expose the inner workings of the machine, and illustrating a spine-binder located in its starting position;

FIGURE 15 is a schematic illustration showing part of the binding mechanism in an initial position relative to the spine-binder;

FIGURE 16 is a view corresponding generally to that of Figure 15, but illustrating the component in an alternate position relative to the spine-binder; and

FIGURE 17 is a view corresponding generally to that of Figure 10, illustrating the binding mechanism at a stage during its actuation.

**[0017]** Referring now to the figures in more detail, Figure 1 shows a spine-binder 1 of a type particularly suited for use with the document binding machine of the present invention, the spine-binder 1 being shown in a completely open position. The spine-binder 1 comprises a plurality of spaced-apart finger elements provided in pairs. Figure 1 shows one pair of finger elements 2, 3, which are joined to one another by a frangible hinge 4. The hinge 4 comprises two hinge-parts 5, 6 which extend in the longitudinal direction (into the page as viewed in Figure 1). These hinge parts 5, 6 are joined to one another at joint 7 which is preferably made as thin as possible over the entire length of the spine-binder 1. Thus, the hinge part 5,6 and the joint 7 form the dorsal part of the spine-binder 1. The individual finger elements 2, 3 are mounted on rear surfaces 8 of the dorsal part, opposite to a base surface 9.

**[0018]** As the dorsal part hinges about the thin connecting joint 7, the finger elements 2,3 are advanced towards one another, and the front end surfaces 10, 11 of finger elements 2,3 come into contact with one another so that the finger elements 2,3 form a closed circle as illustrated in Figure 4, when the spine-binder 1 is closed.

**[0019]** The end surface 10 of each finger element 2 is provided with a spigot 12 which includes a substantially round shaft 13 and an enlarged head 14. The round shaft 13 can, of course also be made so as to be quadrangular, or take any other convenient form. Similarly, whilst the enlarged head 14 is shown to take the form of a flattened cylinder, it can take any conveniently modified form, providing the diameter of the enlarged head 14 is less than the width of the finger element 2.

**[0020]** As the finger elements 2,3 are brought together, the spigot 12 enters an opening or recess 15 on the free end 11 of the opposing finger element 3. The recess 15 includes an opening 16 which is complementary in shape to the shaft 13 of the spigot 12 and is provided in communication with an end region 17 which is configured to receive the enlarged head 14 of the spigot 12.

**[0021]** Figure 2 shows a sectional view of two neighbouring finger elements 2, 2', taken along line II-II in Figure 1. As shown in Figure 2, the finger elements are preferably "U"-shaped in cross-section, being hollowed out in their middle area by a recess 18.

**[0022]** Figure 4 shows a spine-binder 1 of the type illustrated in Figure 1, in its closed position, in which the first finger element 2 of each pair is moved towards the other finger element 3 of each pair, about the joint 7 of the hinge 4, such that the enlarged head 14 of the spigot 12 passes through the opening 16 and is received within the end region 17 of the recess 15. In this position, the two finger elements 2, 3 form a closed loop, with their respective front end surfaces 10, 11 being in tight abutment with one another.

**[0023]** Figure 7 illustrates a bound document which has been created using a spine-binder 1 of the general type described above, and which has been closed so that each pair of finger elements 2, 3 form a closed loop passing through a respective binding hole 19. As can be seen, the document also comprises a stack of paper sheets 20 which has been pre-formed with a plurality of said binding holes 19 provided in spaced-apart relation along one edge region of the stack.

**[0024]** Although a bound document such as that illustrated in Figure 7 can conveniently be created using just a stack of paper sheets 20 and the spine-binder 1 described above, by manually inserting the finger elements through the binding holes 19 and closing the spine-binder, the document binding machine of the present invention, which will be described in more detail below, is intended to provide an alternative means for closing the spine-binder in the manner shown in Figure 7.

**[0025]** Turning now to consider Figure 8, there is illustrated a document binding machine 21 which is shown in a closed configuration, so as to provide a relatively small unit convenient for storage. As can be seen, the binding machine 21 is provided with a pair of generally identical operating knobs 22 which are mounted at opposite ends of the binding machine, for co-rotation about an axis 23. As will be explained in more detail below, the operating knobs 22 form part of a binding mechanism, the other component parts of which are hidden behind a

housing cover 24.

**[0026]** The binding machine 21 also comprises an openable cover 25 which is pivotally mounted to the main part of the binding machine 21 via a pair of outwardly-directed mounting tabs 26 so as to be pivotally movable about an axis 27, the axis 27 being substantially parallel to the axis 23. As indicated above, Figure 8 shows the cover 25 in a closed position, but Figure 9 illustrates the cover 25 in an open position in which it has been rotated substantially 180° about the axis 27. In the open position illustrated in Figure 9, the cover 25 presents a generally planar upwardly-directed surface 28 which is coplanar with a similar upwardly-directed surface 29 provided on the housing 24 of the machine. As will be appreciated, in the open position illustrated in Figure 9, the planar surface 28 provided by the cover 25 thus forms an extension of the planar surface 29 carried by the housing 24, the two surfaces 28, 29 together serving as a support table for a stack of paper sheets 20 as illustrated in Figure 10. It is envisaged that during normal operation of the binding machine 21, it will be placed on a generally horizontal table or work surface and the surfaces 28, 29 are thus arranged so as to be inclined slightly with respect to the horizontal when the machine is placed on a horizontal table or work surface, thereby defining a support table which slopes downwardly towards the binding mechanism, the main part of which is located between the two operating knobs 22.

**[0027]** It should also be appreciated that when the cover 25 is closed, in the absence of the paper stack 20, then its planar surface 28 bears against and is supported by the planar surface 29 of the housing 24.

**[0028]** The housing 24 is preferably moulded from plastics material and is configured to incorporate a plurality of spaced-apart ribs, indicated generally at 30, which are provided across substantially the entire length of the support table at its lowermost edge. Each rib 30 comprises lower arm 31 which is upstanding from the planar surface 29 of the housing 24, and an upper arm 32 which extends upwardly, away from the respective lower arm 31, and which lies generally perpendicular to the lower arm 31. The entire array of upper arms 32 are thus arranged so as to extend generally perpendicularly relative to the plane of the support table defined by the surfaces 28, 29. As will be explained in more detail below, the housing 24 is provided with an opening between each pair of neighbouring upper arms 32, but no such openings are provided between the lower arms 31.

**[0029]** As already indicated, Figure 10 shows the binding machine 21 in an open configuration and with a stack of paper sheets 20 being supported on the table defined by the planar surfaces 28, 29 of the cover and housing. As can be seen, the stack of paper sheets has been pre-punched so as to have a plurality of spaced-apart binding holes 19 provided along its lowermost edge. The stack of paper 20 is shown in a position ready for binding with a spine-binder 1 as described above. As can be seen, the lowermost punched edge of the stack 20 sits over the lower rib arms 31 described above and is actually supported by the upper surfaces of the lower rib arms 31. However, it is important that the lowermost edge of the stack 20 is spaced from the upper rib arms 32 so that the spine-binder 1 can be inserted between the upper rib arms 32 and the paper stack 20. In order to ensure correct location of the paper stack 20 in this manner, a locating element 33 is provided at each end of the run of lower rib arms 31 (only one being visible in the figures). The locating element 33 can be seen in more detail in Figure 11 which represents an enlarged view of region A shown on Figure 10.

**[0030]** Each locating element 33 presents a generally planar surface 34 which is arranged generally perpendicular to the plane of the support table and which is arranged to bear against a respective end edge 35 of the paper stack 20, in the region of the punched binding holes 19. The planar surfaces of the two locating elements 33 are thus arranged to face one another and are preferably spaced-apart by a distance substantially equal to, or very slightly greater than the length of a standard-sized sheet of paper. For example, for a binding machine intended to be for use in binding A4-sized documents, it is envisaged that the locating elements 33 will be spaced-apart from one another by a distance of approximately 296 mm between their planar surfaces 34.

**[0031]** Each locating element 33 also comprises an inwardly-directed projection 36 which defines a small shoulder which is substantially orthogonal to the planar surface 34. The shoulder 37 is arranged to bear against the extreme end region of the side edge 38 of the stack 20 along which the binding holes 19 are formed. In the position illustrated in Figure 11, it will be noted that the locating element 33 is positioned relative to the ribs, such that the shoulder surface 37 is spaced forwardly relative to the upper rib arms 32, thus defining a space between the side edge 38 of the paper stack 20 and the upper rib arms 32. As will be explained in more detail below, this space is intended to receive a spine-binder 1 in the open configuration illustrated in Figure 1.

**[0032]** As will be appreciated, a document comprising a large number of pages will be relatively thick when compared to a document comprising only a small number of pages, and so it is convenient to use a larger spine-binder 1 to bind a thick document than to bind a relatively thin document. The binding machine 21 of the preferred embodiment is thus configured for use in closing spine-binders 1 of different sizes. The particular arrangement illustrated is configured to accept and close three different sizes of spine-binder 1, i.e. a large spine-binder for a relatively thick document, a medium-sized spine-binder for a normal thickness of document, and a small spine-binder for a relatively thin document.

**[0033]** In order to ensure that the spine-binder is properly positioned with respect to the relative binding holes 19 punched through the paper stack 20, it is necessary to position the side edge 38 and the associated binding holes 19 of the stack relative to the upper rib arms 32 in

dependence upon the size of the binding strip (and hence the thickness of the stack 20) to be used. In order to provide this function, the two locating elements 33 are mounted for translational movement, in a sliding manner, in a direction generally parallel to the end edge 35 of the stack 20, as indicated by arrow 39 on Figure 11. Figure 11 actually illustrates the locating element 33 in a "medium" position, and from this position it can either be moved closer to the upper rib arms 32 so as to adopt a "small" position, or it can be moved further away from the rib arms 32 so as to adopt a "large" position. As will be appreciated, when the locating elements 33 are moved from the "medium" position to the "small" position, then the side edge 38 of the paper stack 20 will also be allowed to move towards the upper rib arms 32, thereby reducing the space between the edge of the paper and rib arms. Similarly, if the locating elements 33 are moved from the "medium" position illustrated in Figure 11 so as to adopt their "large" positions in which they are spaced further from the upper rib arms 32, then the side edge 38 of the paper stack 20 will also be moved further away from the upper rib arms 32. The "small" position is convenient for closing a small spine-binder, the "medium" position is convenient for closing a medium-sized spine-binder, and the "large" position is convenient for closing a large spine-binder.

**[0034]** The locating elements 33 are each connected to a respective actuating handle or tab 40 which is moveable in a sliding manner within a respective elongate slot 41 provided through the housing cover 24. In a preferred arrangement, the locating elements 33 are formed integrally with their respective operating tabs 40 as a unitary element, preferably moulded from plastics material. This sort of arrangement is visible in Figure 14, where part of the housing cover 24 has been removed for the sake of clarity. It can be seen that the locating element 33 is connected with the operating tab 40 via a connecting web 42 which is normally hidden from view below the housing cover 24. It should therefore be appreciated that the operating tab 40 provides a convenient component which can be manually moved by an operator, in a sliding manner within the slot 41, so as to set the locating element 33 in a position which is effective to space the stack of papers 20 from the upper rib arms 32 by a distance appropriate to receive the proper size of spine-binder for the thickness of the stack 20.

**[0035]** In order to assist the user in gauging the thickness of the paper stack 20, and hence setting the correct position of the locating elements 33, the housing is provided with a series of steps 42, 43, 44 on respective sides of the support table, generally below the elongate slot 41. As shown in Figure 11, in the preferred embodiment which is configured to receive three different sizes of spine-binders 1, three such steps are provided, comprising a lower step 42, a mid step 43 and an upper step 44. The steps provide a convenient visual indication as to the relative thickness of the stack 20 which is placed on the support table adjacent the steps. Figure 11 shows a stack of papers 20 which has a thickness such that its uppermost sheet is generally level with the lower step 42. Paper stacks 20 having such a thickness, or being thinner than the stack illustrated in Figure 11 are appropriate to be bound by a small spine-binder 1, and so in order to configure the machine to receive a small spine-binder in the correct position relative to the paper stack, the user can conveniently move the operating tab 40 from the position illustrated in Figure 11 to a position in which it is located generally above the lower step 42, thereby moving the locating element 33 to its "small" setting. On the other hand, should the stack of papers 20 have a thickness such that its uppermost sheet sits at a level higher than the lower step 40 but substantially level with or lower than the mid step 43, then the "medium" setting would be more appropriate, in which case the user could conveniently move the operating tab 40 back into the position illustrated in Figure 11 in which it is positioned generally above the mid step 43. If the stack of papers is thicker than this, such that its uppermost sheet sits at a level higher than the mid step 43, but substantially level with or below the upper step 44, then the "large" setting would be more appropriate, in which case the user could conveniently move the operating tab 40 from the position illustrated in Figure 11 to a position in which it is aligned with the upper step 44, thereby moving the locating element 33 to its "large" position in which the side edge 38 of the paper stack 20 is spaced a maximum distance from the upper rib arms 32.

**[0036]** Although the two locating elements 33 can be set individually by moving each operating tab 40 in turn, it is envisaged that a preferred embodiment would be configured such that the two operating tabs 40 are interconnected by a connecting member or the like extending below the upper surface 29 of the housing 24, thereby meaning that the two move together.

**[0037]** It should therefore be appreciated that the moveable locating elements 33 form part of a convenient sheet receiving means which is operable so as to selectively position the stack of sheets 20 in one of a number of discrete positions, spaced appropriately from the spine-binder when it is inserted into the gap between the upper rib arms 32 and the side edge 38 of the paper stack.

**[0038]** Figure 12 illustrates the locating elements 33 set to their "medium" positions which is appropriate to bind a document of medium thickness using a medium sized spine-binder, and also show the spine-binder 1, in a generally open configuration as illustrated in Figure 1, being dropped into the gap between the upper rib arms 32 and the side edge 38 of the paper stack 20. As can be seen, the open spine-binder 1 is orientated such that the base surface 9 of the hinge part 5 and the end surfaces 10, 11 of the finger elements 2,3 point towards the paper stack 20.

**[0039]** Figure 13 illustrates the spine-binder 1 having been fully inserted into the machine so as to adopt a starting position. Here it can be seen that the rearmost arcuate parts of the finger elements 2,3 are each received

within a respective gap between neighbouring upper rib arms 32. The forward facing end region of the lower finger elements 3 are each received within a respective gap between neighbouring lower rib arms 31 formed on the upper surface 29 located below the paper, such that the end parts of the lower finger elements 3 rest on the upper surface 29, below the level of the lowermost sheet of paper in the stack 20. As can also be seen from Figure 13, the pre-punched binding holes 19 are arranged such that each lies immediately above a respective gap between neighbouring lower rib arms 31 and hence is aligned with a respective pair of finger elements 2, 3.

**[0040]** As can also be seen in Figure 13, each lower rib arm 31 is provided with a small upstanding retaining post 45 behind which the hinge part 5 of the spine-binder 1 is positioned. The retaining posts 45 thus serve to prevent lateral movement of the hinge part 5 of the spine-binder 1 when it is located in the starting position illustrated, but will not prevent any of the pairs of finger elements being moved to a closed position similar to that illustrated in Figure 4.

**[0041]** Turning now to consider Figure 14, in which part of the housing cover 24 has been removed, further details of the binding mechanism will be described. As can be seen, Figure 14 omits the ribs 30 and their respective lower and upper arms 31, 32 for the sake of clarity, but the spine-binder 1 is still shown in the starting position described above.

**[0042]** The two operating knobs 22 are each mounted, in a keyed manner, on opposite ends of an axle 46 which is mounted for rotation about the axis 23. The shaft 46 is supported, at journals 47 (only one illustrated in Figure 14) for rotation in a pair of bearings 48 (again only one illustrated in Figure 14), each of which is provided in a respective support plate 49. Adjacent each support plate 49, there is provided a respective pinion gear 50 which is mounted for rotation with the axle 46.

**[0043]** Each pinion gear 50 meshes with a stepped gear wheel 51 provided at respective ends of another axle 52 lying generally parallel to the first axle 46 and which is supported for rotation in bearings 53 provided in the support plates 49. The larger part of each stepped gear 51 meshes with a toothed rack 54, which underlies the ends of the first axle 46. It will therefore be appreciated that rotation of the operating knobs 22 is effective to move the racks 54 in a fore and aft direction.

**[0044]** Mounted between the two racks 54 (only one of which is visible in Figure 14), is an elongate binding comb 55 which comprises a plurality of spaced-apart, substantially planar binding members in the form of vanes 56. The binding comb 55 and its associated vanes 56 is thus mounted for translational movement, with the racks 54, below the level of the two axles 46, 52.

**[0045]** The profile of each binding member or vane 56 is illustrated in more detail in Figure 15 which shows a single vane, viewed from the end of the comb 55, in an orientation corresponding to the binding machine sitting on a horizontal table or work surface. As can be seen, each vane 56 is provided with a tapering slot 57 which is narrower at its closed end 58 than its open end 59, the open end 59 of the slot being provided at the end of the vane located closest to the spine-binder 1 when in its starting position. The slot 57 tapers in a generally symmetrical manner about an axis of symmetry 60 which makes an acute angle a with the horizontal. This acute angle a is equal to the angle of inclination of the support table defined by the surfaces 28, 29 when the binding machine 1 rests on a horizontal table or work surface.

**[0046]** As is also clearly visible in Figure 15, the tapering slot 57 has an internally stepped profile so as to define three distinct regions, namely a "small" region 61, a "medium" region 62 and a "large" region 63.

**[0047]** Each vane 56 is aligned with a respective gap between neighbouring upper rib arms 32. As indicated above, the housing cover 24 is provided with a series of openings, each being located in the gap between neighbouring upper rib arms 32, and as can be seen from Figure 13, the forwardmost part 64 of each vane 56 initially projects a short distance through a respective such opening so as to sit between respective neighbouring pairs of upper rib arms 32. Each vane 56 is thus aligned with a respective pair of finger elements 2, 3 of the open spine-binder 1 when the spine-binder 1 adopts the starting position illustrated in Figure 13.

**[0048]** In order to operate the binding machine 21, having loaded the paper stack 20 and the spine-binder 1 as described above, the operating knobs 22 are rotated, which is effective to move the binding comb 55 and its associated vanes 56 towards the spine-binder 1 and the stack of papers 20. This operation is illustrated in Figure 17, in which it can be seen that the vanes 56 have all been moved through their respective openings between the upper rib arms 32, towards the paper stack 20.

**[0049]** As the vanes 56 are moved towards the binding strip 1, from the position illustrated in Figure 15, it will be appreciated that their forwardmost ends 64 bear against respective pairs of finger elements 2,3 of the spine-binder 1. This serves to rotate the finger elements 2, 3 about the hinge 4 as the vane 56 continues to advance. As illustrated in Figure 16, the respective pairs of finger elements 2,3 become received within the tapering slots 57 of the vanes 56 and, by virtue of the tapering nature of the slots, the vanes 56 each serve to completely close a respective pair of finger elements 2,3 such that each spigot 12 is snappingly received within its corresponding recess 15, in the region of a respective binding comb 19 through the stack 20.

**[0050]** Upon snapping engagement of all the spigots 12 with their corresponding recesses 15, the binding comb 55 can be withdrawn via reverse actuation of the operating knobs 22, whereafter the bound document can simply be lifted out of the binding machine.

**[0051]** Having regard to Figure 16, it should be understood that the three different slot regions 61, 62, 63 are intended to close respective sizes of spine-binders 1. For example the medium slot region 62 is effective to close

a medium-sized spine-binder 1 as is illustrated. Similarly, the small slot region 61 will be effective to close a small spine-binder 1, whilst the large slot region 63 will be effective to close a large spine-binder 1. The slot regions 61, 62, 63 are arranged to close spine-binders 1 of sizes corresponding to the thickness of the stack 20 as gauged by the steps 42, 43, 44.

**[0052]** In the region of each operating knob 22, the housing 24 is provided with indicia 65 which is effective to provide a visual indication as to the position of the binding comb 55, and hence also its vanes 56, at any instant in time, in order to indicate to a user how much further the comb needs to be advanced towards the paper stack 20 in order to completely close the spine-binder 1. The indicia 65 comprises three spaced-apart windows or apertures 66 provided in the housing cover 24, through which can be seen a coloured part of the operating knobs 22. The arrangement is such that the colour which is visible through each window as indicative of the rotational position of the operating knobs 22, and hence the respective translational position of the binding comb 55.

**[0053]** When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

**[0054]** The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## Claims

1. A document binding machine for use in closing a spine-binder on a stack of sheets having a plurality of binding holes formed along one edge-region, the spine-binder comprising a plurality of spaced-apart finger elements provided in pairs, the finger elements of each said pair being hingedly connected to one another at one end and connectable to one another at their opposite ends to form a closed loop, wherein the machine comprises: sheet receiving means configured to receive a stack of said sheets; spine receiving means configured to receive and retain an open spine-binder in a starting position in which each pair of finger elements is aligned with a respective said binding hole, the machine further comprising a binding mechanism comprising a plurality of spaced apart members, each said member being arranged for movement towards the sheet receiving means upon actuation of the binding mechanism, and having a tapering slot configured to receive and bear against a respective pair of finger elements and to close the finger elements into a respective said closed loop as the member is moved towards the sheet receiving means.

2. A document binding machine according to claim 1, wherein said spine receiving means comprises a plurality of spaced-apart ribs configured to receive a respective pair of said finger elements between each neighbouring pair of ribs, and wherein each said member is arranged for movement between a respective pair of said neighbouring ribs.

3. A document binding machine according to claim 1 or claim 2, wherein said plurality of members are arranged for movement in synchronism.

4. A document binding machine according to claim 3, wherein said plurality of members take the form of vanes provided at spaced apart positions along an elongate moveable comb.

5. A document binding machine according to claim 3 or claim 4, provided with indicia effective to provide a visual indication as to the instant position of the members.

6. A document binding machine according to any preceding claim, wherein the tapering slot of each member is stepped so as to define a plurality of slot-regions, each slot-region being configured to close the finger elements of a discrete size of spine-binder.

7. A document binding machine according to any preceding claim, wherein either the sheet receiving means or the spine receiving means is operable to selectively move the starting position of the spine binder relative to the position of the stack of sheets.

8. A document binding machine according to claim 7, wherein the sheet receiving means is operable so as to selectively position the stack of sheets in a plurality of discrete positions, spaced from the starting position of the spine binder by different respective distances.

9. A document binding machine according to claim 8, including the features of claim 6, wherein the number of said discrete positions in which the stack can be positioned is equal to the number of said slot-regions provided in the tapering slots.

10. A document binding machine according to claim 7, 8 or 9, further comprising sizing means effective to provide a visual indication as to the appropriate one of said discrete positions for a stack of sheets received in the sheet receiving means, depending upon the thickness of the stack.

**11.** A document binding machine according to claim 10, wherein said sizing means comprises a plurality of steps against which the thickness of the stack of sheets can be gauged.

**12.** A document binding machine according to claim 11 including the features of claim 8 or 9, wherein the sheet receiving means comprises a moveable actuating handle or tab which is selectively positionable in alignment with each said step in order to position the stack of sheets in a respective said discrete position.

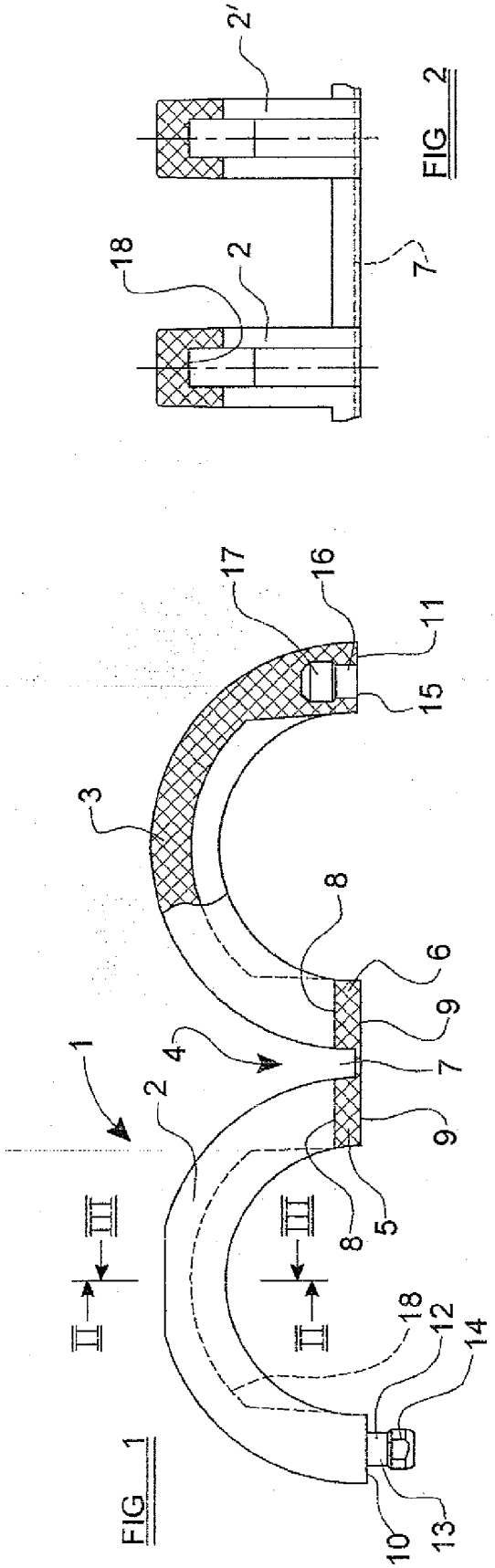



FIG 1




FIG 2

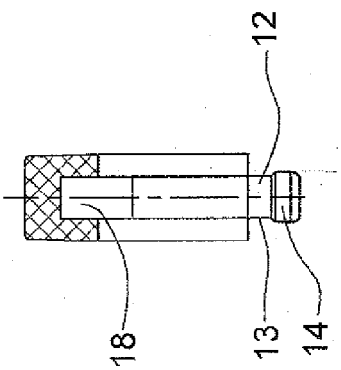



FIG 3

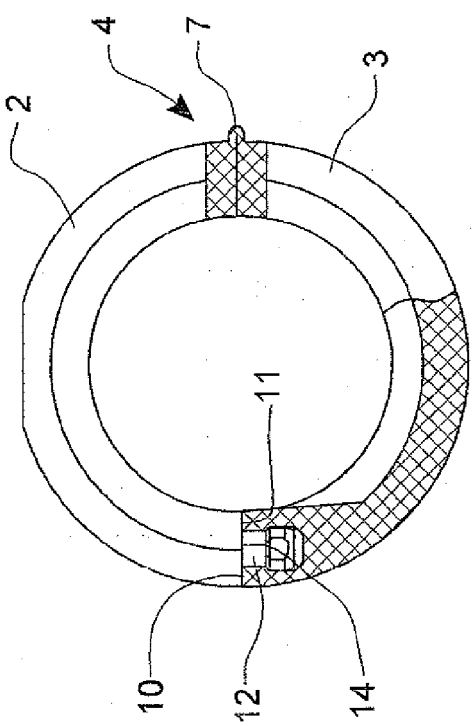



FIG 4

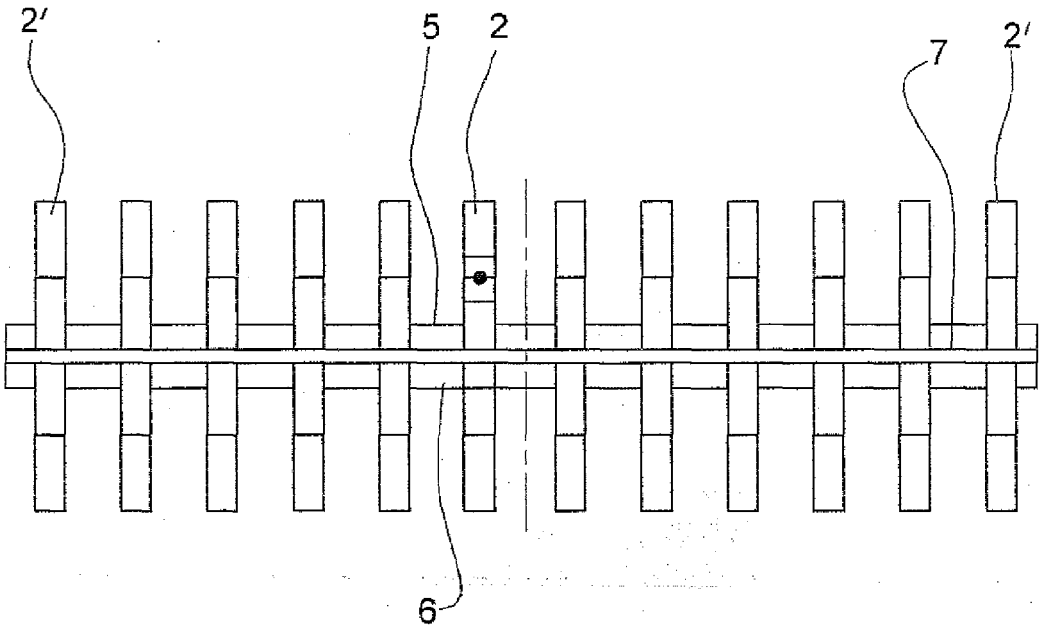



FIG 5

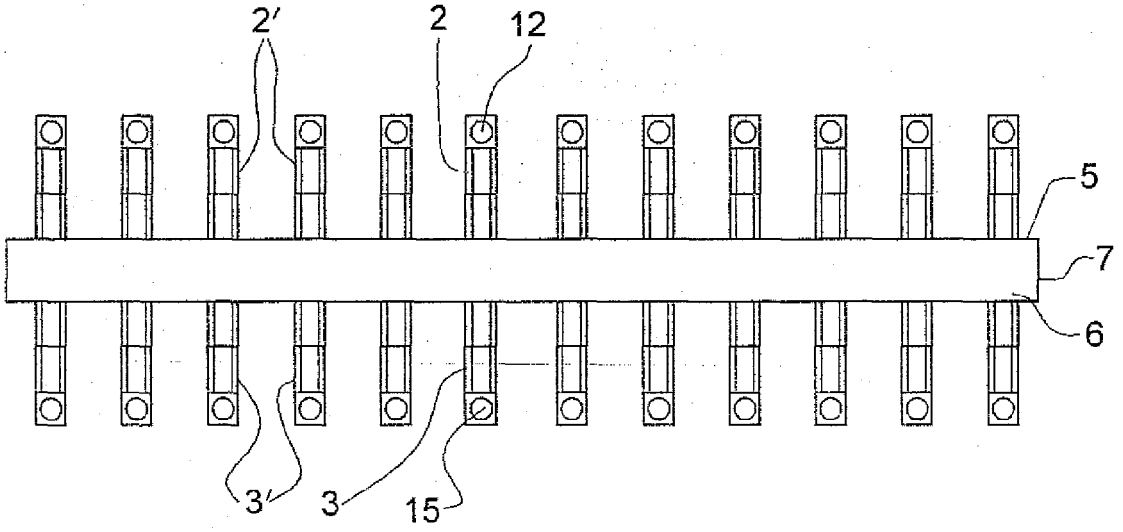



FIG 6

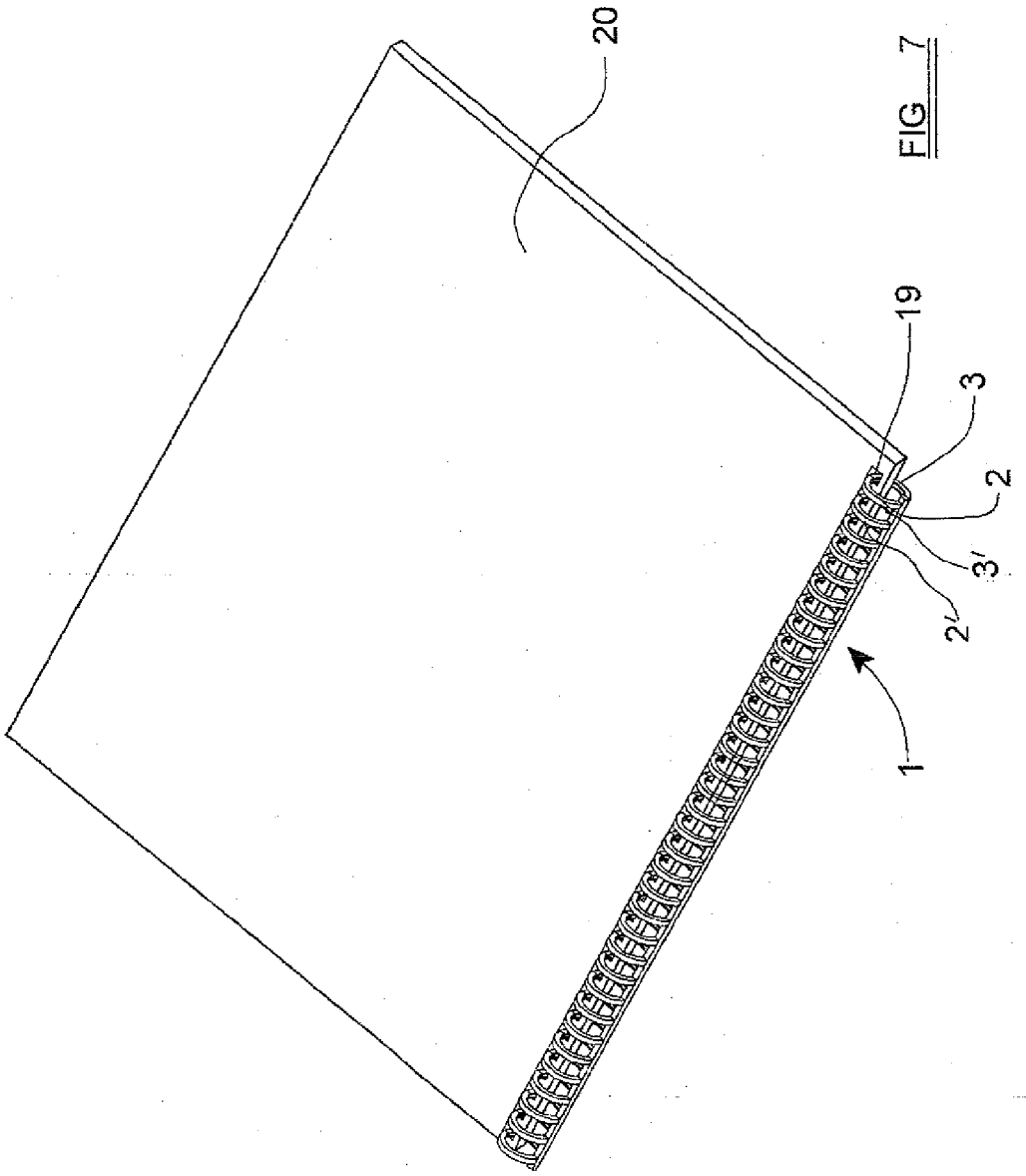



FIG 7

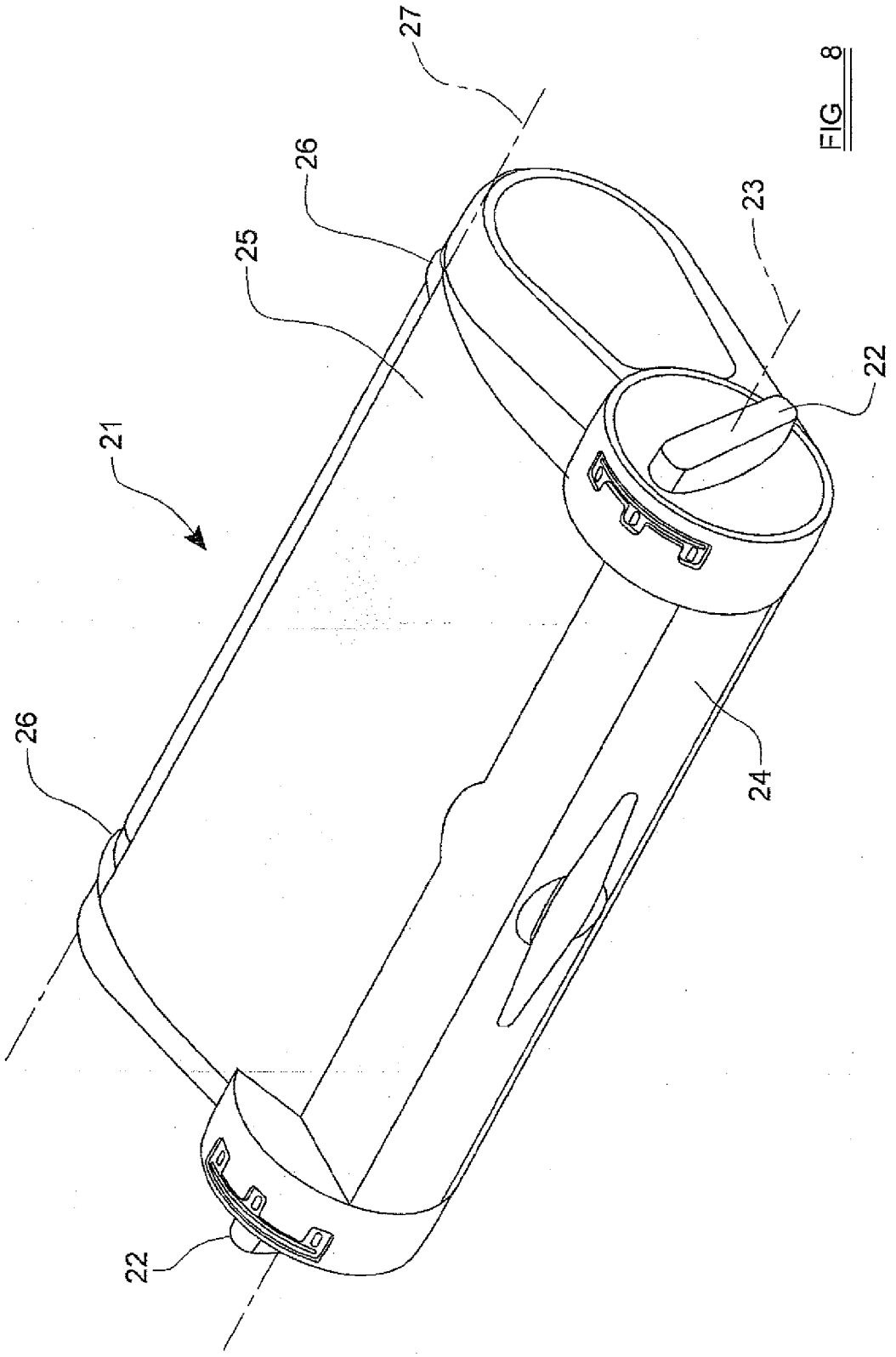



FIG 8

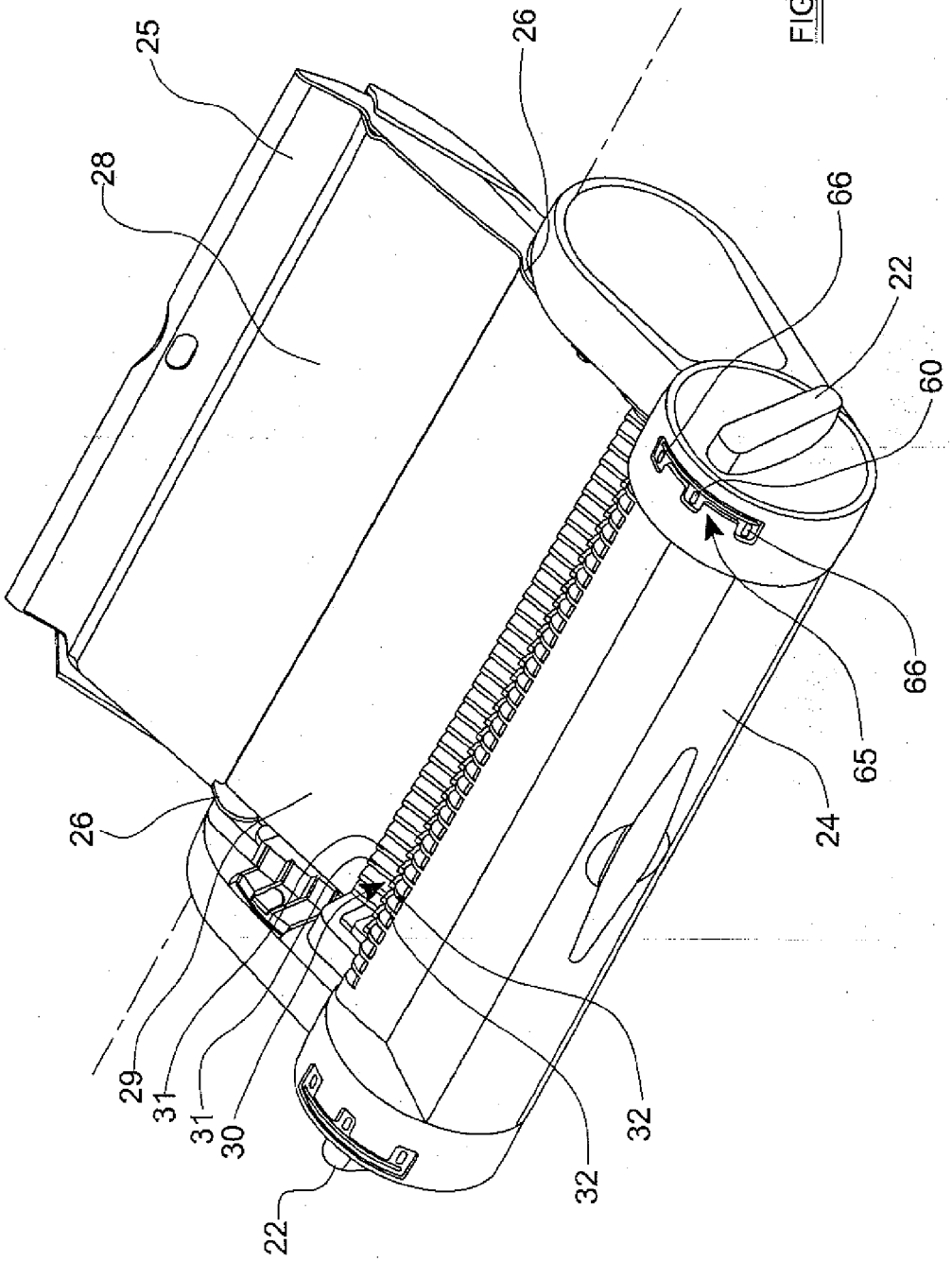



FIG 9

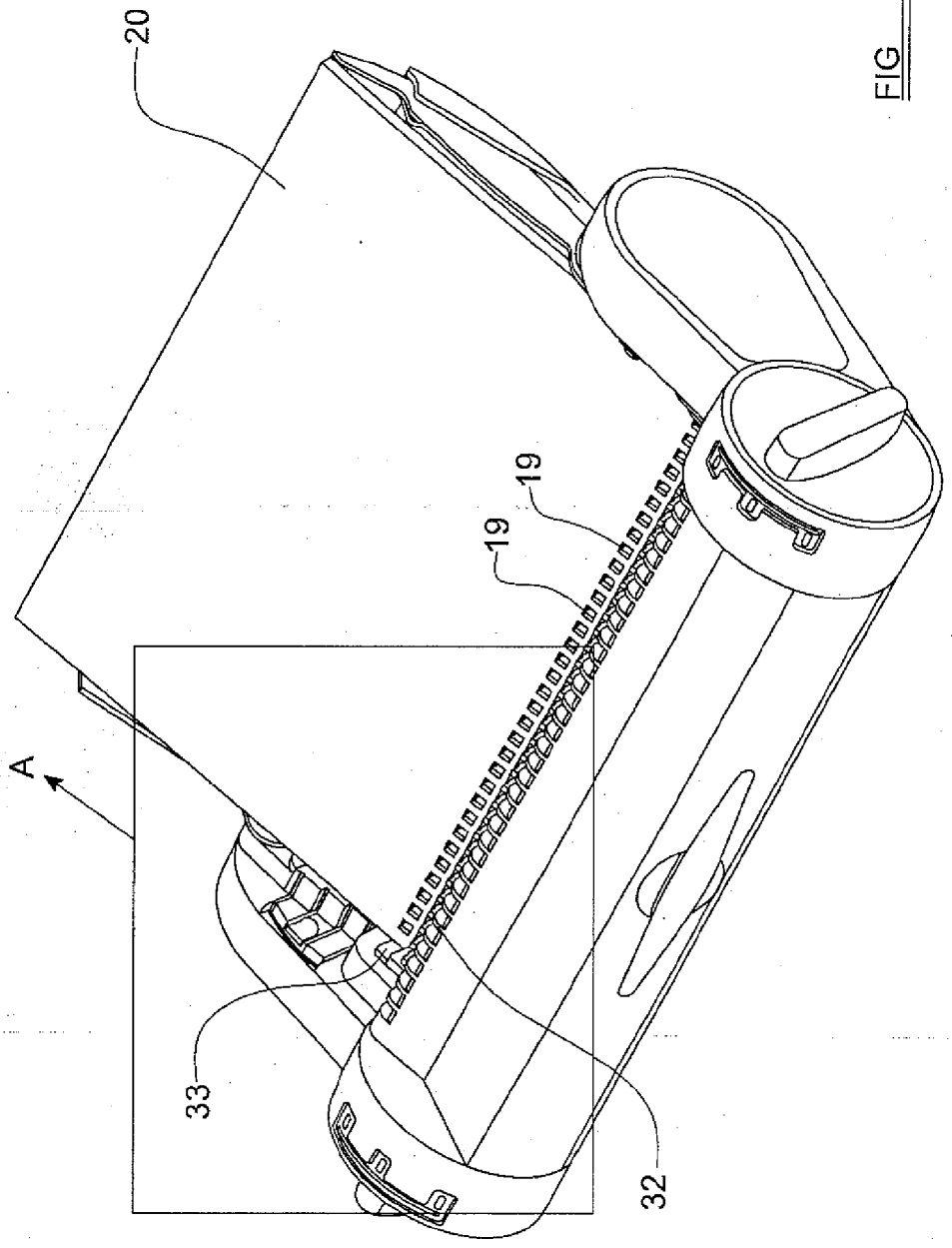



FIG 10

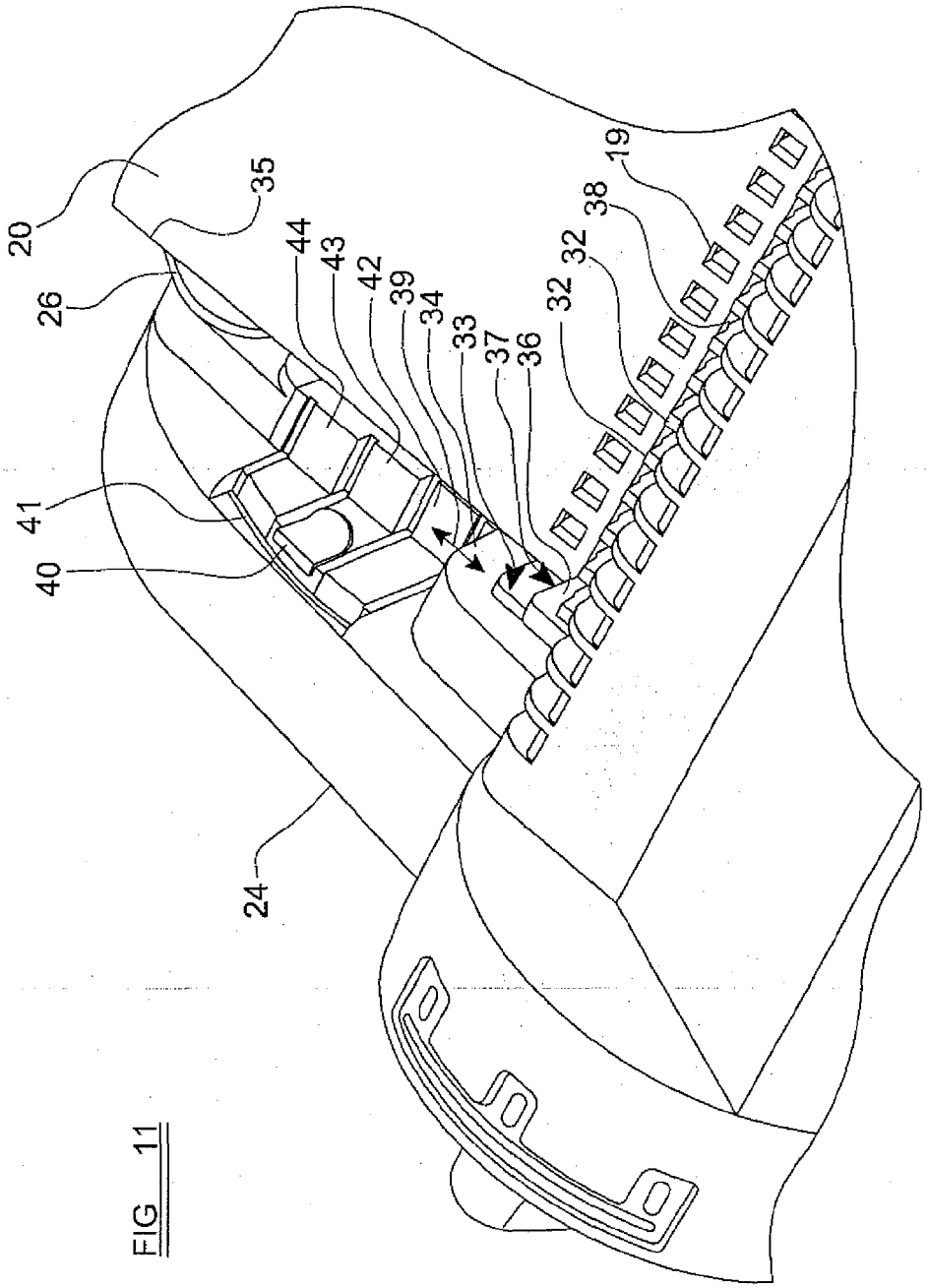



FIG 11

FIG 12

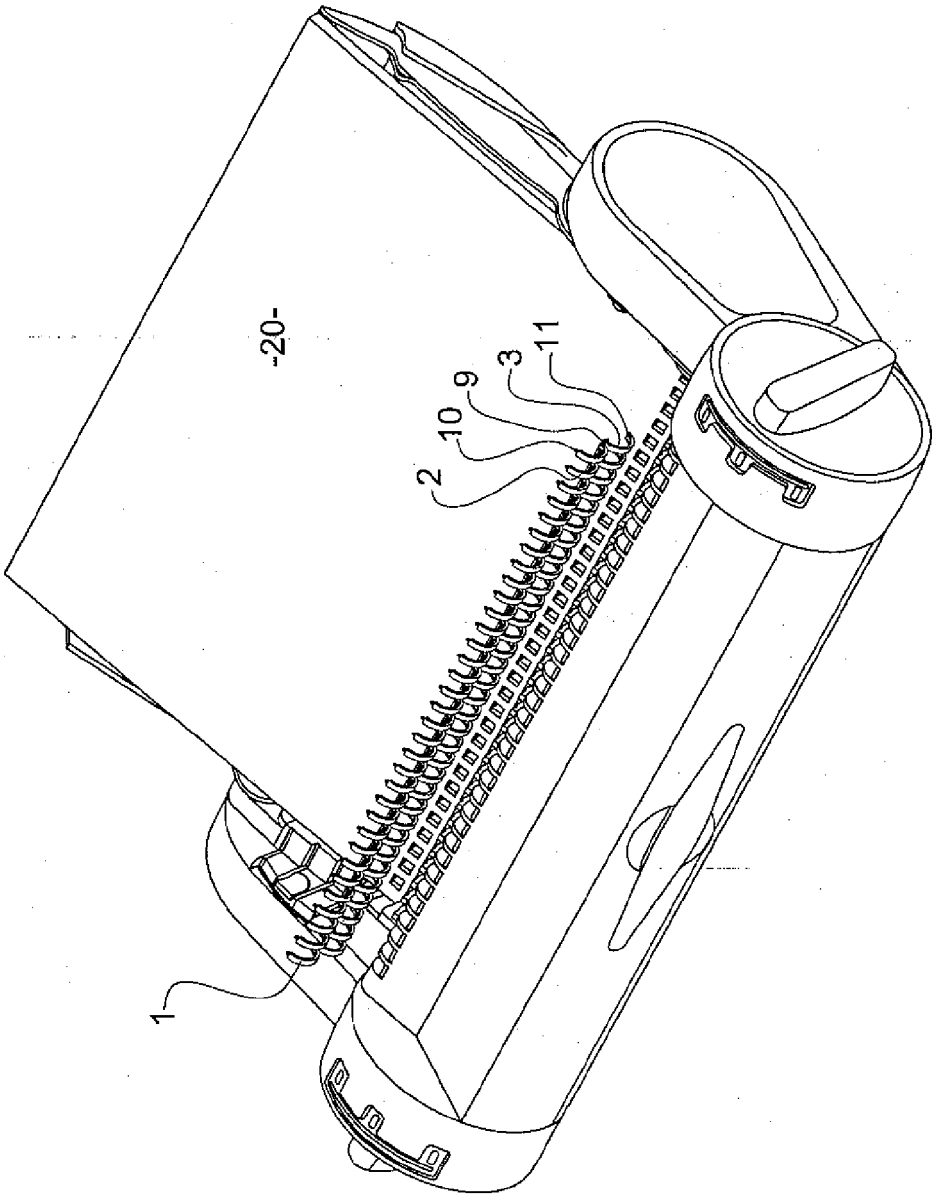
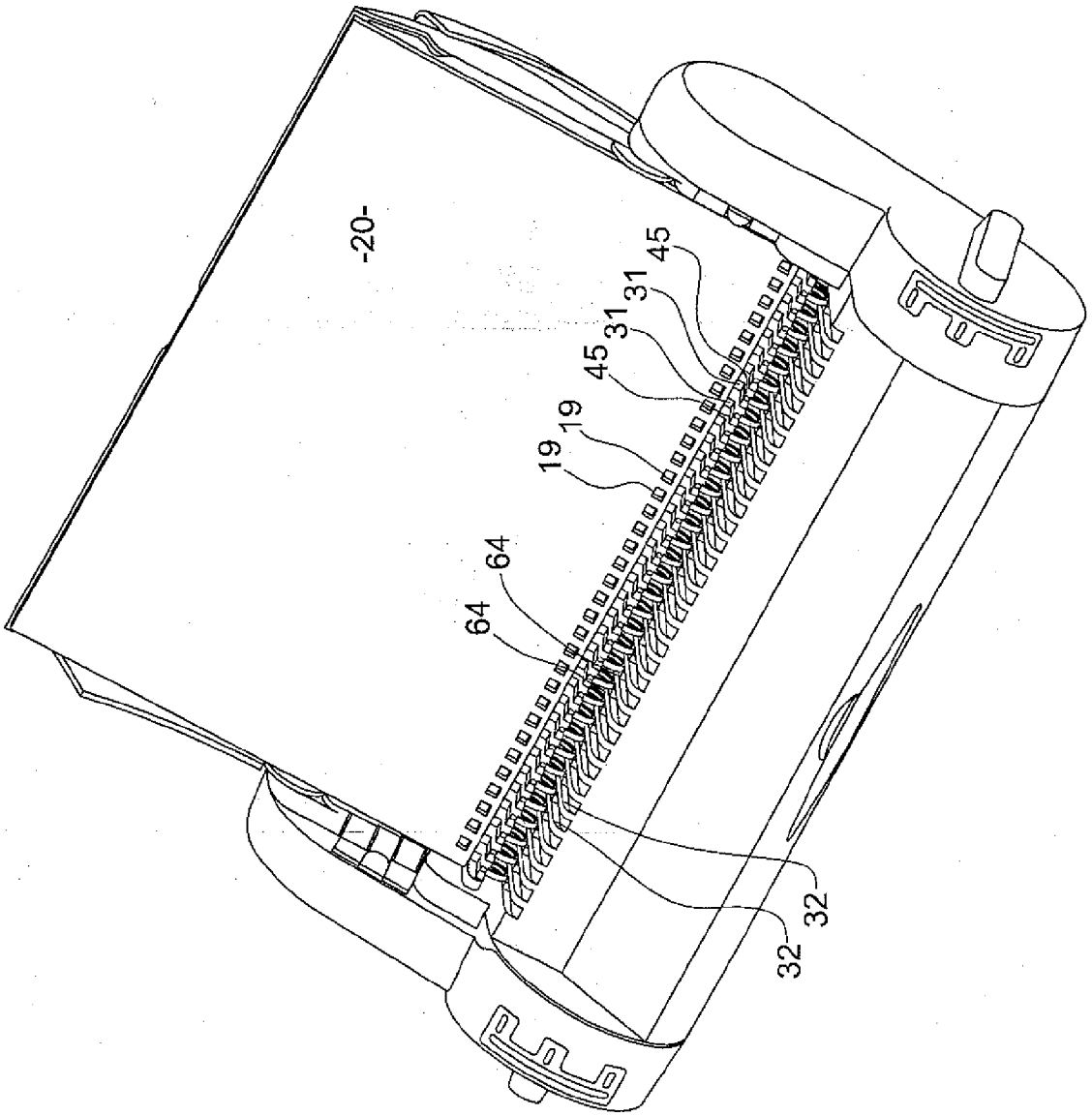


FIG 13



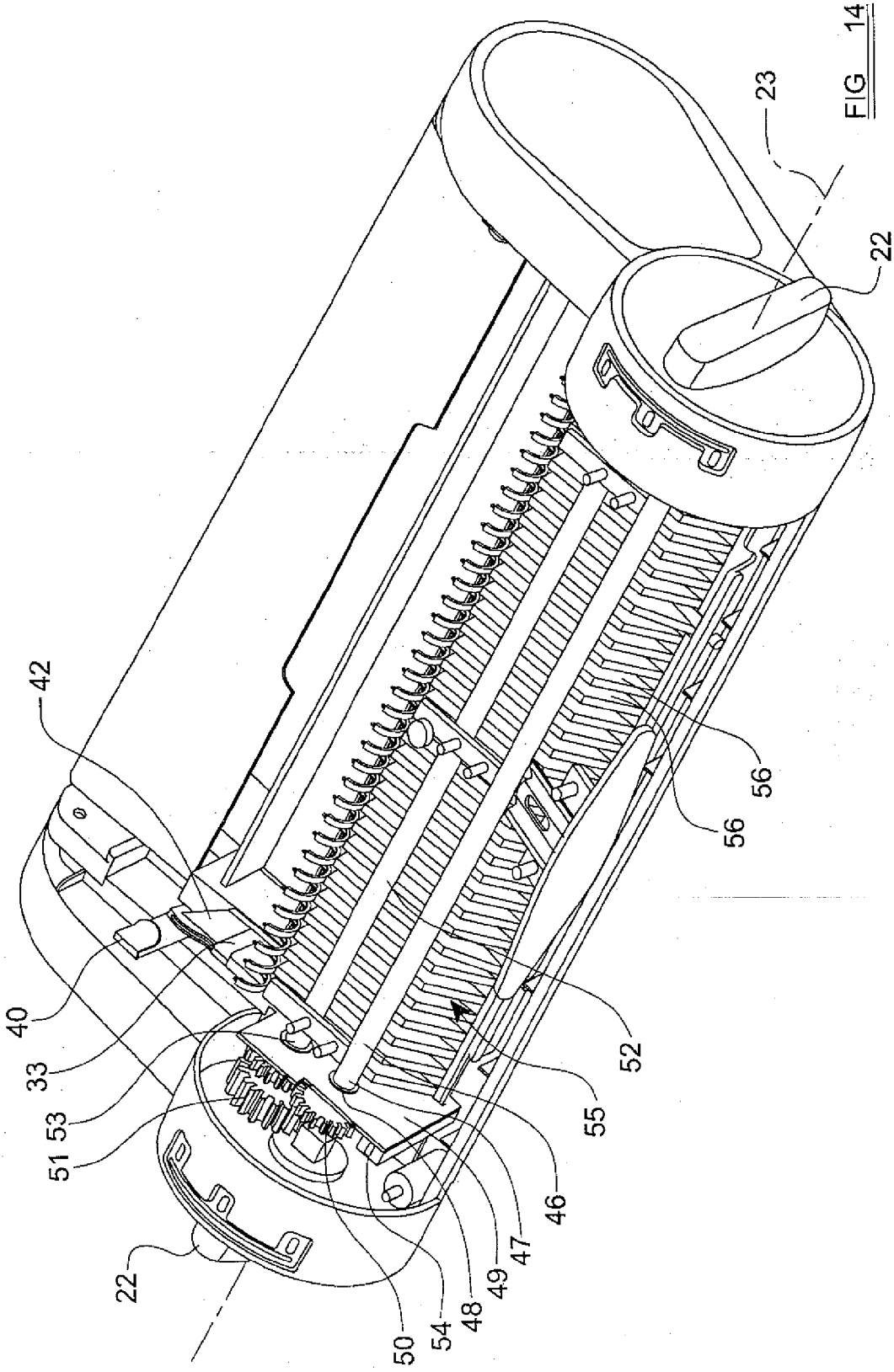



FIG 14

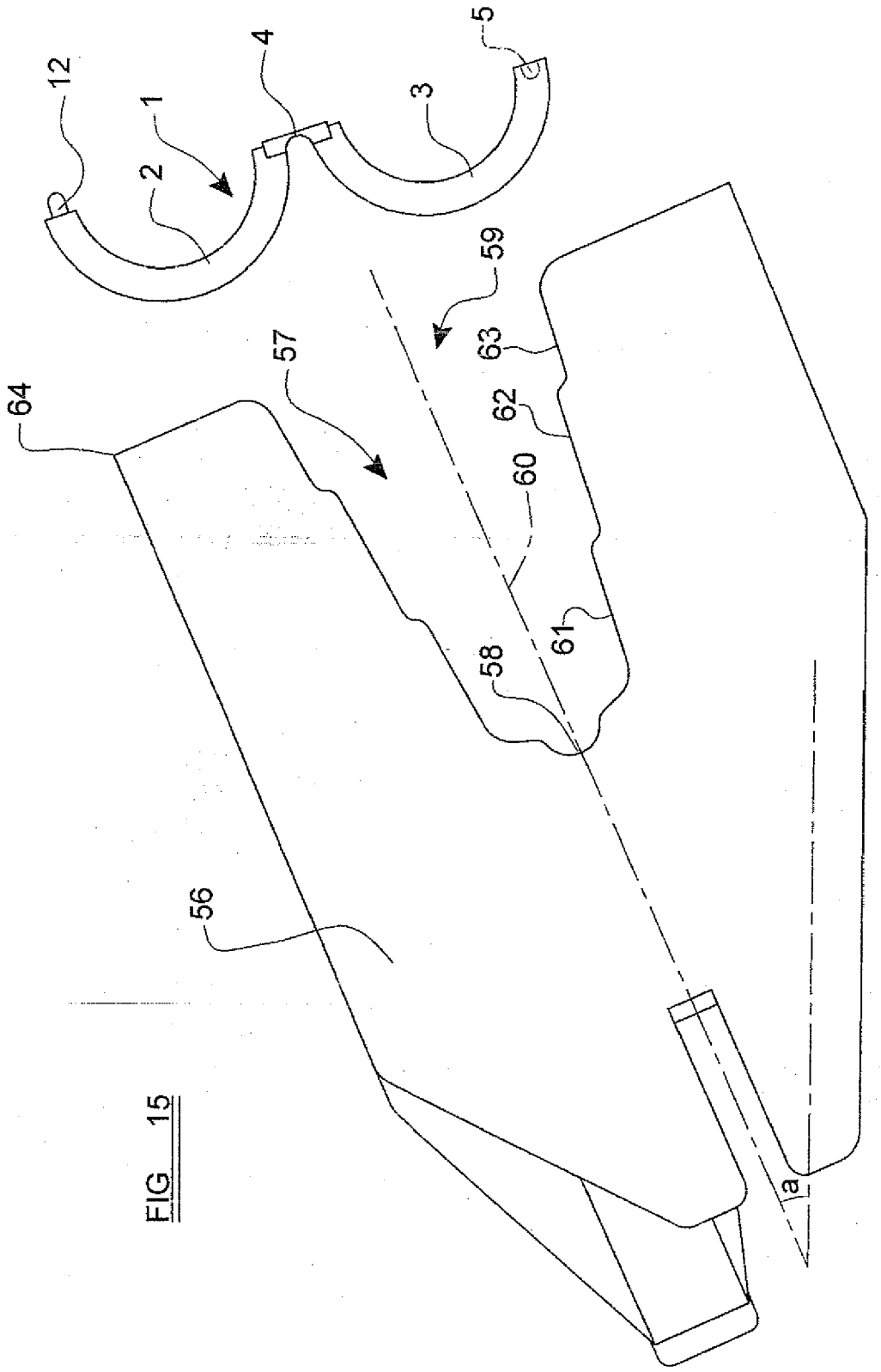



FIG 15

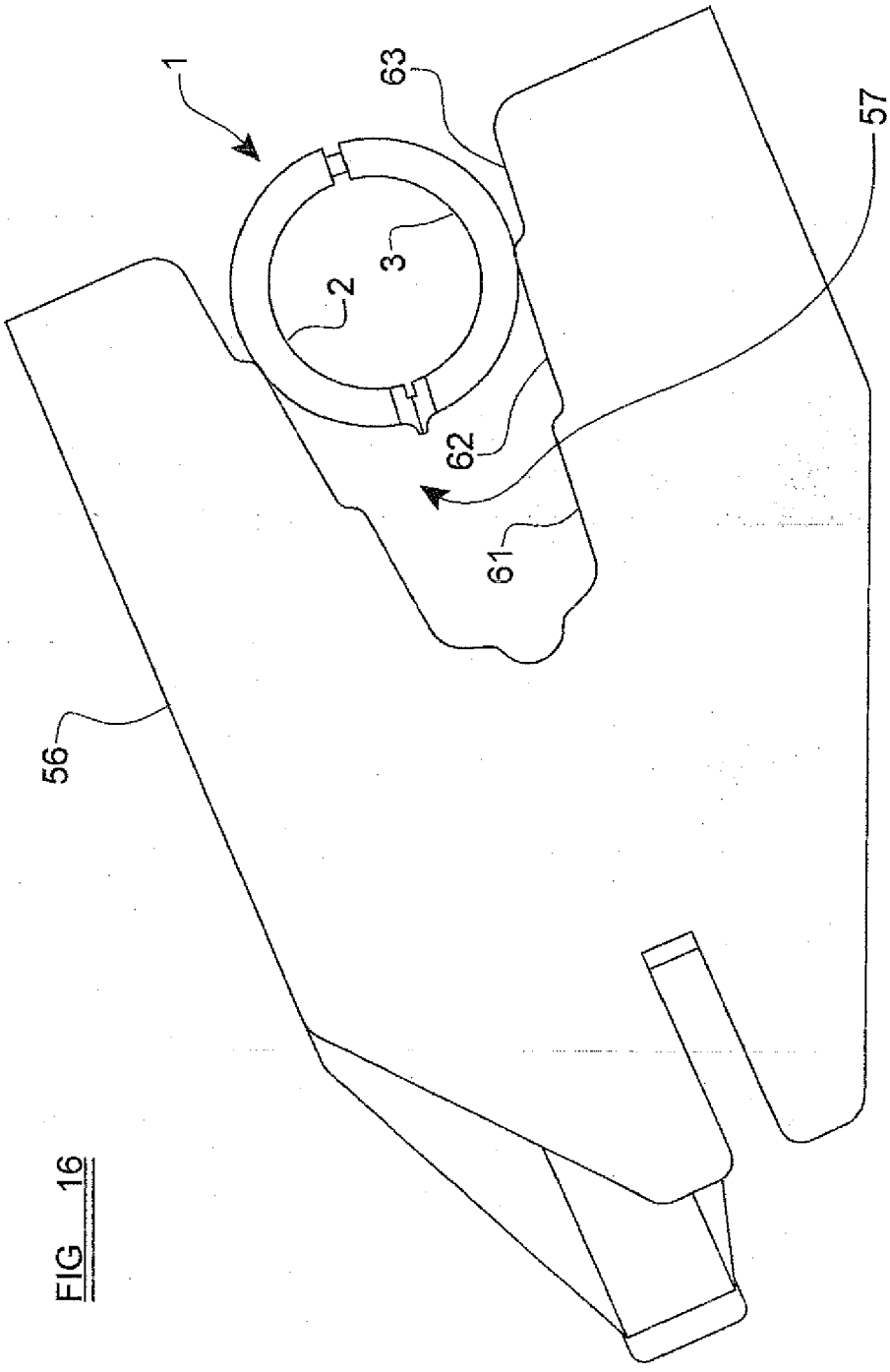



FIG 16

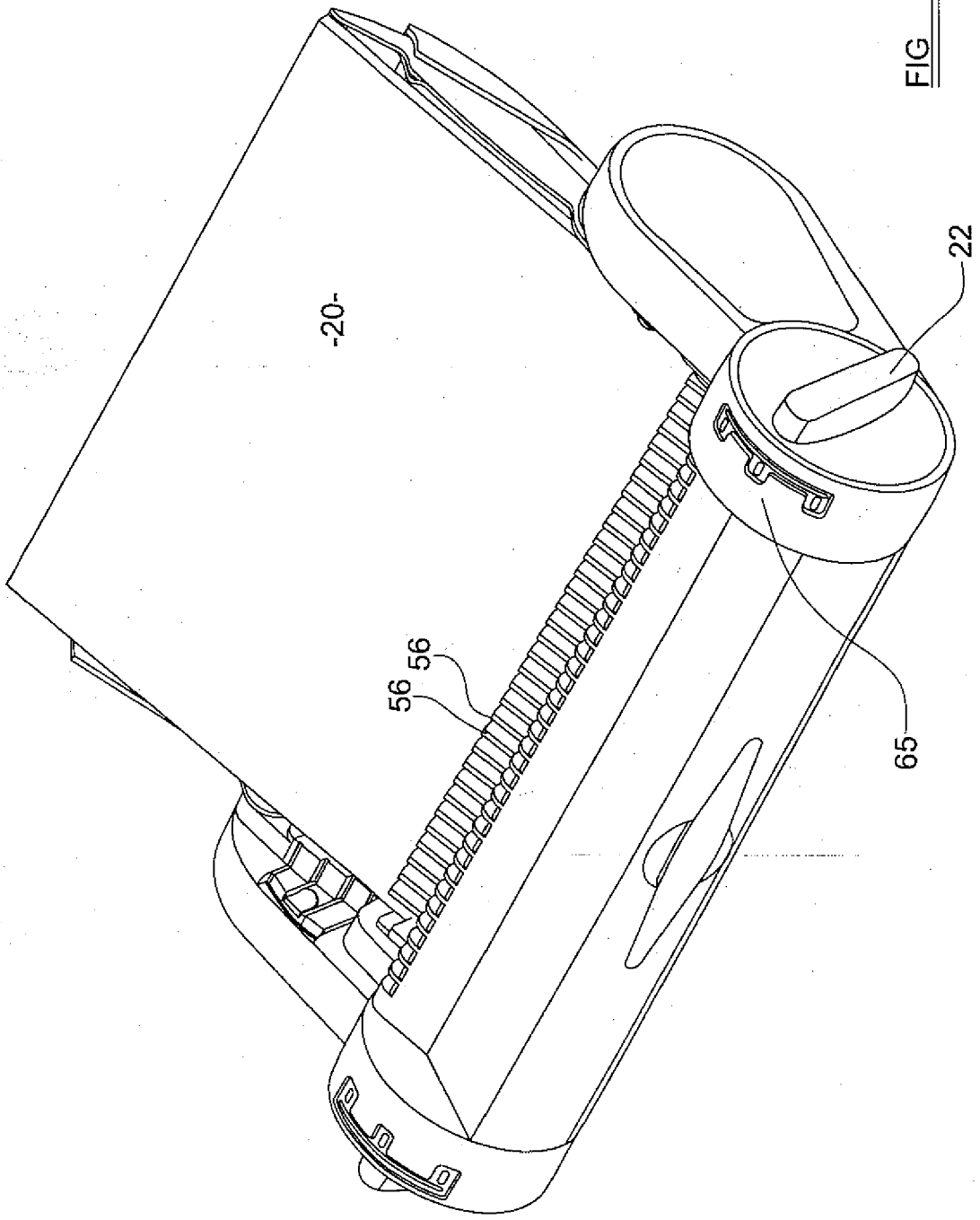



FIG 17

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Application Number
EP 08 16 9515

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
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| Munich | 11 March 2009 | Louvion, Bernard |

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