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(54) Device for cardboard in continuous form

(57) A guiding device for continuous cardboard form, suitable to arrange in fanfold configuration a continuous strip of cardboard (C) subdivided in sectors (S), that is suitable to form a stack (10) formed by the succession of said sectors (S) alternatively disposed fan folded, device (2) characterized in that it comprises a guiding device formed by a prismatic body (2) with square section, having the side (L) of value substantially correspondent to the value (LS) of the longitudinal development of said sectors, so as to engage with its edges (21) corresponding pre-bending lines (33s, 33i) which subdivide the sectors (S).

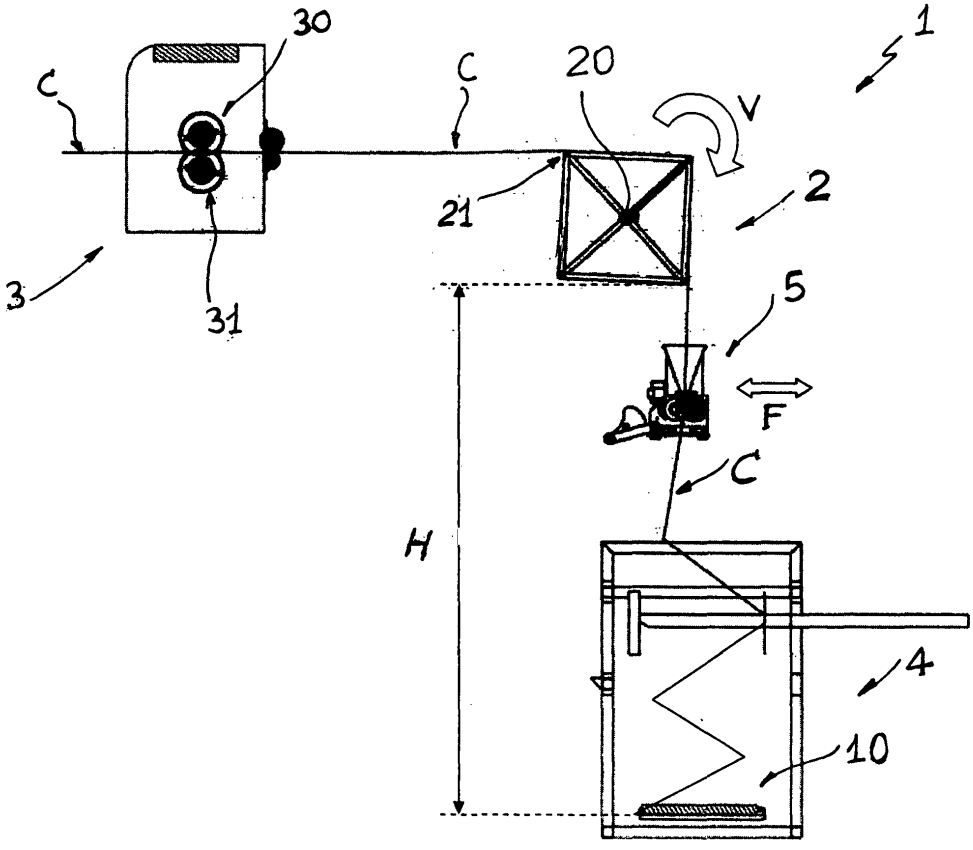

Fig. 1

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Description

[0001] The present invention relates to a guiding device for cardboard in continuous form.

[0002] The cardboard, in particular the corrugated cardboard, when it is in the shape of continuous web, that is in the configuration called also "continuous form" is folded like a fan in the configuration called "fan fold". In practice, the cardboard has a configuration similar to the continuous paper forms used for continuous feed printers; in this configuration, the cardboard forms a continuous strip formed by a sequence of portions (called "sectors" in technical jargon) separated by bending lines and folded alternatively one on the other, forming a zig-zag stack, like those schematically represented in the figures attached and marked with numerical reference 10.

[0003] In order to obtain the stack of the fan fold cardboard, the continuous cardboard strip follows an operating path passing through a couple of pressing rollers of an apparatus called "creasing device". The rollers of the creasing device are disposed parallel each other, with the axes disposed orthogonal in respect to the direction of feeding of the cardboard, direction that corresponds to the longitudinal development of the cardboard strip.

[0004] The two rollers are in mutual contact by means of its cylindrical surfaces, which are provided with complementary grooves/protrusions (called "creasing elements") which are angularly distanced on the rollers so as to determine the formation of cross lines of pre-bending on the cardboard.

[0005] The cardboard strip at the exit of the creasing machine is thus provided with two series of pre-bending lines, one for each face of the cardboard, the distance between two subsequent lines of each face corresponding to the double of the longitudinal development of the said "sector". In other words, the value of the distance between the line of bending of a face and the line immediately successive of the opposite face corresponds to the length of the sector.

[0006] Subsequently, the cardboard passes through a curved frame which determines the curving of the same cardboard so as to form folds in correspondence of the lines of pre-bending previously executed. A disadvantage of known guiding apparatuses is that the same apparatuses determine a damaging of the cardboard which, passing through the guide frame, is ground and, therefore, qualitatively inferior.

[0007] Scope of the present invention is to provide a guiding device for cardboard suitable to arrange the continuous web of cardboard in a fanfold configuration, said device being
characterized by a encumbrance remarkably limited, by a correct treatment of the cardboard and by an extreme constructive simplicity.

[0008] This result has been achieved according to the invention thanks to the idea of producing a device having the features described in claim 1. Other features relate to the dependant claims.

[0009] Among the advantages of the present invention: the device has an encumbrance extremely limited, with a development -both in use and not in use - which is only a little greater in respect to the dimensions of the sectors of the web of cardboard to be treated; the device treats the cardboard with a constant speed, without not correct tractions or slacks of tension; the device does not damage the cardboard, guaranteeing therefore an high quality of the product; the device can be provided with suitable means of treatment of the cardboard for obtaining the correct disposition of the same; the device has an extremely simple structure, with relatively low costs of manufacturing and with a very reduced maintenance.

[0010] These and other advantages and characteristics of the invention will be best understood by anyone skilled in the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein:

- Fig.1 is a schematic side view of a possible embodiment of a plant provided with a device according to the invention; some particulars are represented only partially or omitted;
- Fig.2 is a schematic side view showing the interaction between a creasing machine, disposed upstream of the device of the present invention, and the cardboard during the treatment;
- Fig.3 is a schematic side view of the device;
- Figg.4A, 48, 4C, 4D and 4E represent the device during a possible operational cycle for guiding a strip of cardboard.

As above mentioned, a device 2 according to the invention is usable in a plant for the treatment of a continuous cardboard web.

[0011] In particular, the device 2 is disposed downstream of a creasing machine 3 and upstream of a collecting station 4 in which the cardboard is fanfolded.

[0012] The cardboard web C, coming from a relevant manufacturing plant disposed upstream, or unwound from a relative reel, passes through the two rollers 30 and 31 of the creasing machine 3.

[0013] In the enclosed drawing the plant is represented from the zone of creasing machine 3 in downstream direction.

[0014] The creasing machine 3 is well known. As shown in Fig.2 (in which the elements are not in scale), the upper roller 30 is provided with a cavity or female element 301 and with a protrusion or male element 302. The two elements 301 and 302 are arranged diametrically opposite and placed so as to the female element 301 of the upper roller 30 corresponds to a male element 312 of the inferior roller 31, and as to the male element 302 of the upper roller 30 corresponds to a female element 311 of the inferior roller 31.

[0015] The angular distance between the two ele-

ments of each roller corresponds to the socalled "sector" S of the continuous form C of the cardboard. In practice, the passage of the cardboard web C through the creasing machine 3 determines the formation on the same web of a series of transversal pre-bending lines 33. The lines 33 are arranged alternatively on the two faces of the cardboard strip C and delimit the sectors S. In particular, with reference to the orientation of Fig.2, for each "step" of the cardboard form, the latter has a pre-bending line 33s disposed upwardly, alternated to a pre-bending line 33i disposed inferiorly. Said pre-bending lines, in a known way, allow the fan folding of the continuous cardboard form.

[0016] Downstream of the creasing machine is disposed the device 2 of the present invention. The device 2 has a substantially prismatic shape, with square section. The device 2 rotates, moved by relevant motor means (not shown), around its longitudinal axis 20, which is disposed horizontally and orthogonally in respect to the feeding direction of the continuous cardboard web C. The value of the length of the side L of the square which defines the section of the device 2 corresponds, substantially, to the value of the step of the continuous form, that is the length of the longitudinal development LS of the sector S. The width of the prismatic body of the device 2, that is its dimension parallel to the axis, corresponds to the width of the cardboard strip in working.

[0017] During the use of the plant, the cardboard strip C, which comes out from the creasing machine 3, is engaged (manually or automatically by means of means not shown) with the device 1, so that the lines of pre-bending formed on the cardboard coincide with the edges 21 of device 2.

[0018] The rotation of the device 2 (indicated with the arrow V in Fig.1) conveys the cardboard web C downstream. The supporting condition of the pre-bending line on the edge of device 2 determines the bending of the cardboard form C in correspondence of the relevant sectors S.

[0019] In the example of Fig.1, the device 2 is disposed at a quote H which is relatively high in respect to the station of final collection 4. In this case, in order to improve the modalities of collection of the continuous cardboard form in the station 4, the plant is provided with a further guiding device 5, called "positioning device" or "distributor" in technical jargon. In practice, the cardboard web C passes through the positioning device 5 in its operative path and it is alternatively moved by the positioning device in the direction indicated by the double arrow F. With reference to Fig.1, in which the final path of the cardboard web is vertical, the distributor or positioning device 5 is moved alternatively in horizontal direction (left-right), in correspondence of the bending (right or left) that the form C has to assume.

[0020] It is important to emphasize the extreme compactness of the device 2, which has an encumbrance limited to the rotation of a prism having a square section, in which the side has a length corresponding to the length of the sector S of the form to be treated. Experimental studies have highlighted that such square section, if confronted with many other sections, provides an optimal relationship between the encumbrance of the device and the form to be treated. In Fig.3 it is shown that the maximum encumbrance is represented by the value E, which corresponds to the diagonal of the square that defines the section of device 2.

[0021] The use of the positioning device 5 is not obligatory; in fact, if the distance between the device 2 and the collection station below is not high, it is possible to use only the guiding device 2 (without the positioning device 5). The device 2 can be suitably provided with means for holding the cardboard web. In Figs.4A-E is shown that such means can interact with the cardboard, allowing the correct bending in the collection station placed below. The means for holding the cardboard can advantageously be formed by suction devices 23, connected to relevant suction plants, so as to be independent for each face of the device 2. During the functioning of the device 2, the suction devices 23 are activated in order to maintain, when necessary, the cardboard adherent to the device 2.

[0022] In Fig.4A is represented a first phase of a possible operational cycle. In this configuration the continuous cardboard form C is wrapped on three sides of the device 2, since in correspondence of the inferior face of the device 2 the suction is activated. In this way, the pre-bending line 33s is conducted in the left zone of the stack in formation. In the successive phase, shown in Fig.4B, the suction devices 23 of the face disposed downwards (and on the left in the design) are not activated: in this way the sector S which is leaving the device 2 hangs downwards thanks to the gravity force, and after it is disposed on the stack 10 in formation (see Figs. 4C and 4D, in which it is represented only partially in order to simplify the design). In the phase 4E a new cycle begins, with a positioning which is analogous to the positioning shown in Fig.4A.

[0023] Advantageously, the motor means of the device 2 are driven in rotation with not constant speed: this allows to move the cardboard form C with continuity. In fact, since the perimeter of the square which defines the section of device 2 has a different development regarding to the circular trajectory T of the edges 21, the device slows down and, respectively, accelerates the rotation of the device 2 each quarter of turn.

[0024] Some of the moving, command and control means of the described and shown elements are of the known type for the technicians of the automation and, therefore, they have not been described in detail for sake of simplicity.

[0025] Moreover, changes may be made to the form, dimensions, component part locations, and type of materials employed in the embodiment described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. Guiding device for continuous cardboard form, suitable to arrange in fanfold configuration a continuous strip of cardboard (C) subdivided in sectors (S), that is suitable to form a stack (10) formed by the succession of said sectors (S) alternatively disposed fan folded, device (2) **characterized in that** it comprises a guiding device formed by a prismatic body (2) with square section, having the side (L) of a value substantially correspondent to the value (LS) of the longitudinal development of said sectors, so as to engage with its edges (21) corresponding pre-bending lines (33s, 33i) which subdivide the sectors (S).

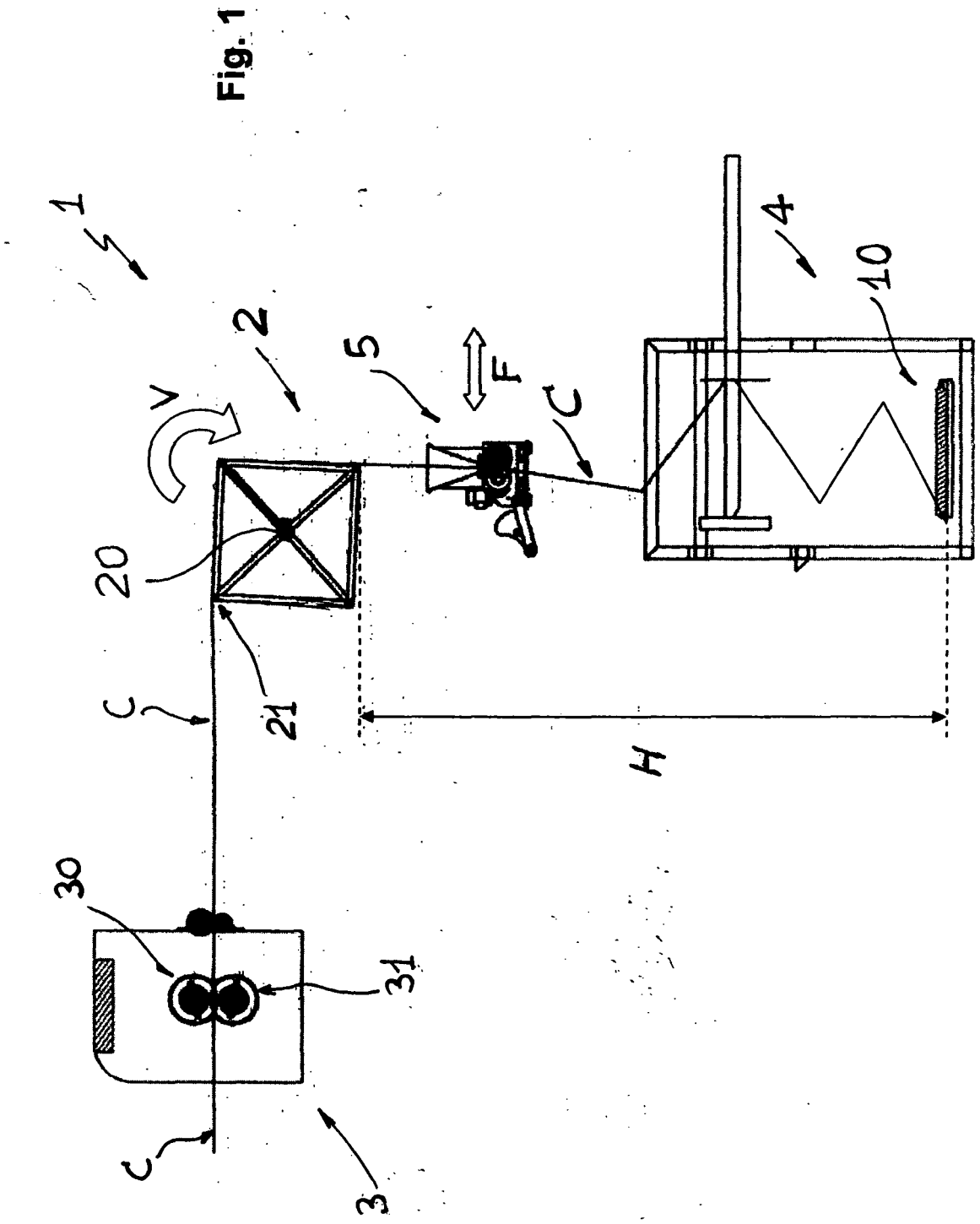
2. Device according to claim 1, **characterized in that** it is provided with holding means of the cardboard (C) comprising a series of suction devices (23), arranged in correspondence of the faces of said prismatic body and suitable to be selectively activated in order to hold the cardboard in contact with the device (2).

3. Device according to claim 1, **characterized in that** it comprises motor means suitable to move in rotation said prismatic body (2) around its axis with variable speed in function of the state of the feed of the cardboard strip (C).

4. Device according to claim 3, **characterized in that** said motor means alternate at each quarter of turn an acceleration and a deceleration.

5. Device according to claim 1, **characterized in that** it comprises a positioning device (5).

Fig. 1



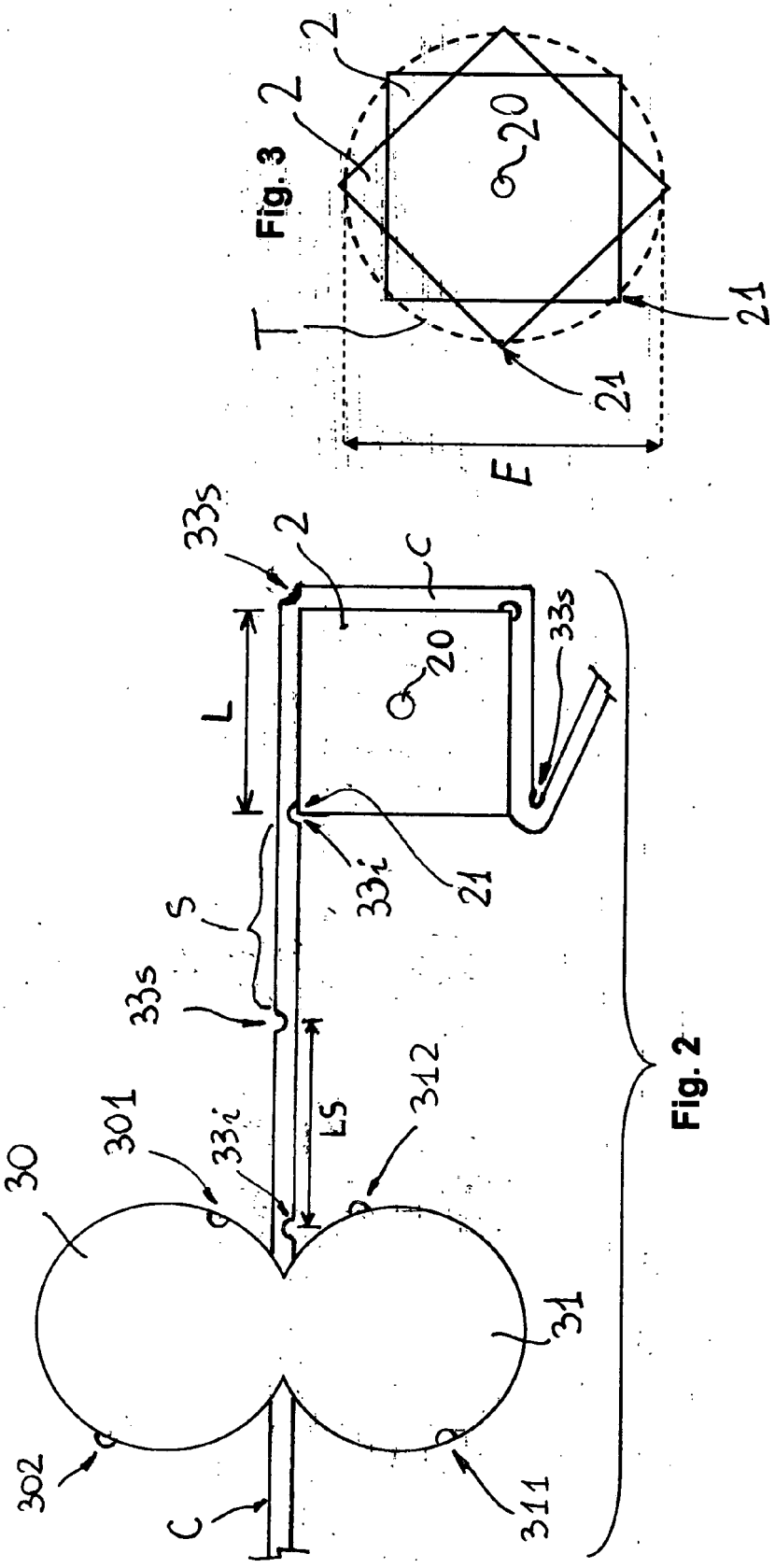

335
2
C
L
20
335
33i
21
S
335
LS
33i
301
312
30
31
302
C
311

Fig. 2

2
2
20
T
21
21
E

Fig. 3

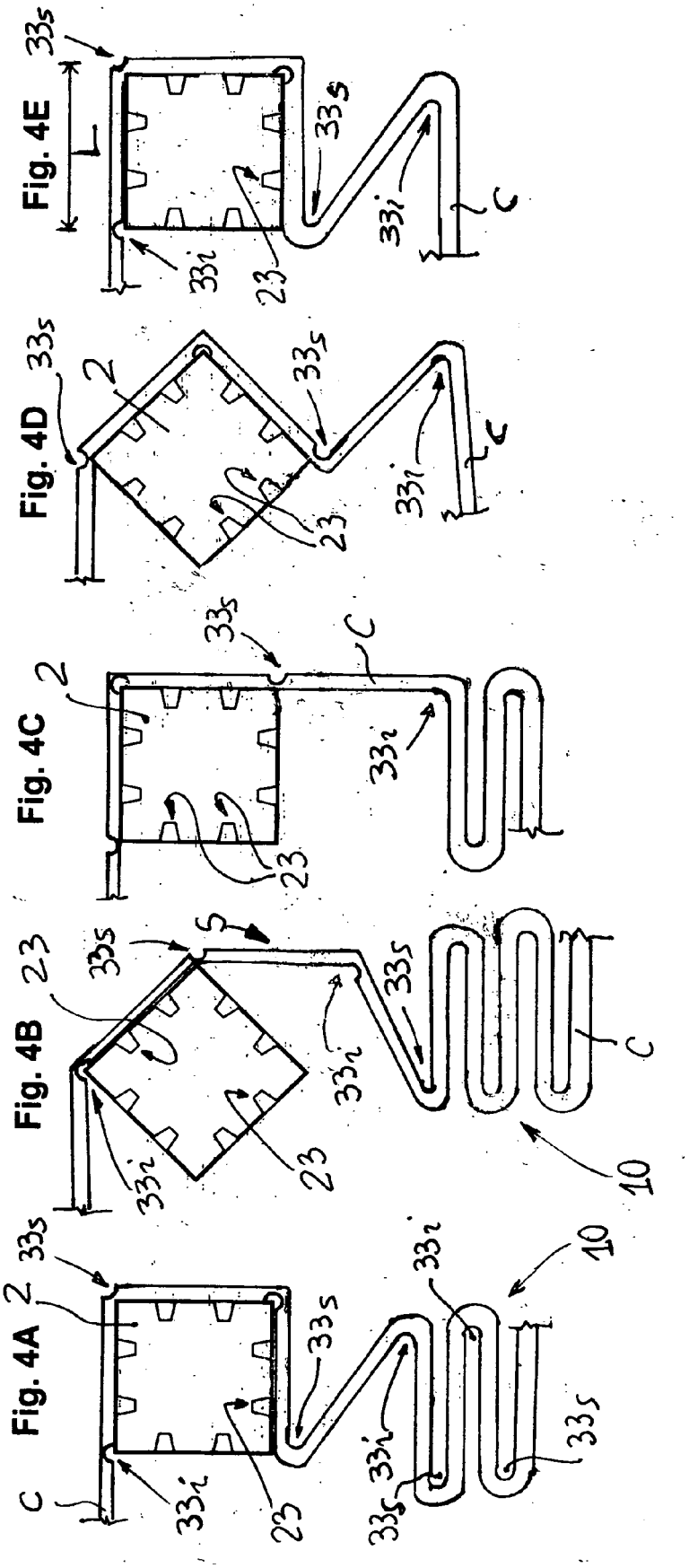


Fig. 4E
L
33s
33i
23
C
Fig. 4D
2
Fig. 4C
Fig. 4B
5
10
Fig. 4A