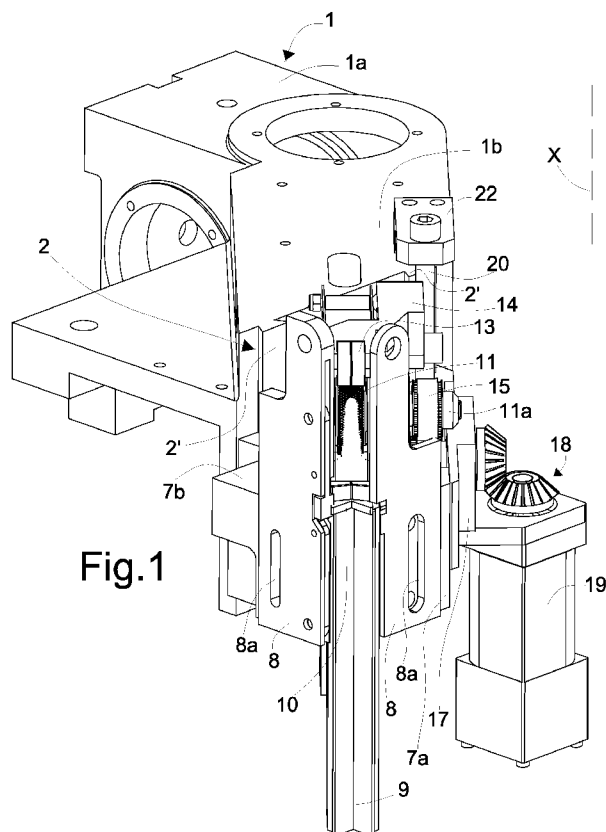




- (51) International Patent Classification:
B31B 3/00 (2006.01)
- (21) International Application Number:
PCT/IB2012/051915
- (22) International Filing Date:
17 April 2012 (17.04.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
FI2011A000081 20 April 2011 (20.04.2011) IT
- (71) Applicant (for all designated States except US): **EURO-PROGETTI S.R.L.** [IT/IT]; Via delle Prata, 167/A, 53048 Sinalunga (Siena) (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **SALETTI, Lamberto** [IT/IT]; Via Molise, 2, 53049 Torrita di Siena (Siena) (IT). **BROCCOLINI, Giovanni** [IT/IT]; Via N.A. 54H La Dogana, Loc. Pergo, 52044 Cortona (Arezzo) (IT).
- (74) Agents: **SOLDATINI, Andrea** et al.; Società Italiana Brevetti S.p.A., Corso dei Tintori, 25, 50122 Firenze (IT).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,

[Continued on next page]

- (54) Title: A CORNER JOINING HEAD FOR A BOX ERECTING APPARATUS



(57) Abstract: The present invention concerns the field of the apparatus for forming boxes, especially but not exclusively made of flat or corrugated cardboard to be subsequently lined with a covering sheet, and in particular it regards a variable height corner joining head for a box erecting apparatus.



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). **Published:**

— *with international search report (Art. 21(3))*

TITLE**A CORNER JOINING HEAD FOR A BOX ERECTING APPARATUS**DESCRIPTIONField of the invention

5 The present invention concerns the field of the apparatus for forming boxes, especially but not exclusively made of flat or corrugated cardboard to be subsequently lined with a covering sheet.

Background of the invention

10 In known box erecting and corner joining apparatus for forming packaging boxes, the same boxes are formed through folding flat blanks made of paper material, under the action of a mould or mandrel that reciprocates vertically and consisting of a block having a shape corresponding to the shape of the box to be formed.

15 The flat blank is fed to an erecting station in a feeding direction, and the folding of the blank around the mould, along folding lines that are both parallel and crosswise to the feeding direction, is carried out by engagement with underlying and fixed folding means, against which the blank abuts, pressed in a top-bottom direction by the same mold or mandrel. The vertical corners of the box being erected are joined by applying segments of heat adhesive tapes. Then, the box is disengaged from the mould and made to exit from the erecting station, on the opposite side with respect to the feeding side.

20 As far as the joining of the corners via heat adhesive tape is concerned, the apparatus provides for a plurality of heads acting on respective corners and comprising, in association with corner blank folding slabs, means for feeding and cutting the heat adhesive tape into segments and heating means for welding the corners via heated pressing pads. The pads are driven towards the respective corners to be joined, tightening against each corner the tape segment and transmitting to it a suitable amount of heat so that both the heat and the mechanical pressing action determine the welding of the segment over the relevant corner of the box being erected. An example of apparatus having these general features is disclosed in

25 European Patent Application EP655325.

30 When the corners have mutually different heights, as frequently occurs in boxes

with special shapes that are more and more the object of market demands, a problem arises in that the tape segment, the length thereof being predetermined so as to be the same for all the corners, exceeds or is too short for at least some of the corners. In particular, if the length is chosen based on the length (or height, being the measure
5 along the mould displacement direction) of a short corner, the longer corner or corners will result partly lacking the welding, with a consequent worsening of the quality or the necessity of subsequently applying supplementary segments. If a different choice is made (adapting the length to the longer corners), shorter corners will have excess tape that need be removed, with consequent additional labour costs. If one wishes to cut
10 and apply differently long segments fitting with the various corners, the welding has to be repeated for the various corners, so that the production times are unbearably lengthened and the quality is poorer, because the already joined corners are again subject to a heating and a pressure, with a resulting deterioration.

Summary of the invention

15 The object of the present invention is to overcome the above mentioned drawback, permitting to form boxes with corners of mutually different heights while ensuring minimal production times (not longer than the present ones for boxes with regular and homogeneous corners), a fully satisfactory quality and no additional costs due to supplementary labour.

20 This and other objects are achieved with the corner joining head according to the present invention, having the essential features defined by the first of the appended claims.

Brief description of the drawings

25 The characteristics and advantages of the corner joining head according to the present invention will be apparent from the following description of embodiments thereof, given as a non-limiting example with reference to the attached drawings, wherein:

- figure 1 is a schematic front perspective view of a head according to the invention;
- 30 - figure 2 and figure 3 are respectively a top plan view and a bottom plan view of the head of figure 1;

- figures 4 and 5 are side view of the head, in two different working conditions, corresponding respectively to maximum and minimum corner height settings.

Detailed description of the invention

Referring to the above figures, a head according to the invention comprises a support 1 to be mounted to a frame of an otherwise conventional box erecting apparatus, neither shown nor described in detail. The support 1 has in particular a first end 1a shaped so as to be suitable for said mounting, and to be functionally associated with the power supply and driving systems, as obvious to the skilled person and as such not being part of the invention.

10 A second end 1b, opposite to the first, mounting end 1a, faces a box erecting region and according to the invention defines a first linear guide 2, e.g. consisting of two dovetail rails 2', extending along an erection direction X that corresponds to the reciprocating displacement direction of the mould (not shown), and thus to the height of the box corner to be welded/joined, measured orthogonally with the base of the box.

15 .Between the two rails 2' of the first guide 2, the same end 1b provides for a passage 3, corresponding with a track 4 (figure 3) formed in a lower face 1c of the support 1 for permitting a reciprocating sliding, according to a pressing direction Y on a plane orthogonal with the erection direction X, of a thrust stirrup 5 for thrusting a pressing pad (see hereafter). More precisely, the stirrup 5 has in the example a L-shaped structure, with a first arm 5a that slides within the track 4 and projects beyond
20 the second end 1b of the support 1 through the passage 3, and a second arm 5b that protrudes downwards parallel with the erection direction X. The second arm 5b is outlined so as to define a second linear guide 6.

According to the main aspect of the invention, the guide system formed as a whole by the first linear guide 2 provided by the support 1 and the second linear guide
25 6 provided by the stirrup 5, serves for the reciprocating sliding engagement of a corner joining unit G comprising heat adhesive tape feeding and cutting means, blank folding slabs and a heated pressing pad.

In greater detail, the unit G comprises a slide 7 with a pair of flanks 7a, 7b that
30 engage at an end respectively with the two rails 2' of the first guide 2, projecting frontwards along the already mentioned pressing direction Y. At the other ends

(opposite the connection ends to the first guide 2), on the flanks 7a, 7b there are fixed respective blank folding slabs 8, between and underneath which (and thus also between the flanks of the slide) a pressing pad 9 extends. The pressing pad 9 is integral for sliding along the erection direction X with the slide 7 (and with the slabs 8),
5 having instead one degree of freedom as far as the sliding along the direction Y is concerned, under the thrust of the stirrup 5; in fact, the same pad is engaged at its rear side with the linear guide 6 of the stirrup 5. The assembly of stirrup 5 and pad 9 moves in the space determined by the spacing between the two flanks 7a, 7b. The slabs 8 are besides preferably mounted so as to be adjustable in height. To such purpose, their
10 mounting can e.g. be carried out via slots 8a that can be made to slide on respective threaded locking members, not shown.

Above the pad 9, between the slabs 8 and behind them, the figures make visible the following components, all movable integral with the slide 7 and having features as such analogous to the prior art: a counter-blade 10 for cutting the tape; a knurled roll 11
15 for driving the same tape, supported by a base 12 integral with the flanks 7a, 7b; an idle countering roll 13 tangentially cooperating with the knurled roll 11 and mounted on a lever 14 hinged to the base 12. All these components, and also the tape, the heating means associated to the pad, the driving means that drive the thrusting stirrup 5, are not shown in the drawings, and a more detailed functional description is omitted,
20 because, as mentioned, they are well known to the skilled person for their being analogous to the prior systems.

It is however to be noted that the knurled roll 11 is, according to a further aspect of the invention, driven by motor means mounted on the slide 7 and movable integral with the same along the direction X. In detail, a rotation axle 11a of the roll 11
25 protrudes from the base 12 to engage with a transmission belt 15 driven by a shaft 16 supported between a flank 7a of the slide 7 and a lateral plate 17 arranged on the same flank in a spaced fashion. The shaft 16, on the outside of the plate 17, is in turn brought into rotation by means of a gearing 18 with conical pinions, providing for the required feeding drive (i.e. the feeding of the tape) thanks to a motor 19 having a
30 vertical shaft and again mounted integral with the plate 17.

Turning back to the slide 7 and to its motion up and down along the erection

direction X, according to the invention there are also provided control and adjustment means for setting the position in height of the slide, and with it of the whole unit G. In the depicted embodiment such means simply consist of an endless screw 20, the rotation of which (around its own axis arranged parallel with the erection direction X) with respect to a bracket 22 fixed to the support 1, is actuated manually from the outside. The screw 20 is engaged in a threaded seat 21 (figure 3) formed in the slide 7, in this case at the base of the flank 7a.

It will be easily appreciated from the above that, thanks to the autonomously and independently controllable tape feeding means, and to the possibility of setting in height (that is, of varying the position along the direction X) the unit G, the length of the tape segment can be adjusted independently for each head, taking as a reference the end of the corner at the bottom of the box and arranging the tape cutting point exactly at the top end, fitting the extension in height of the same corner.

Such advantageous effect can be noticed in particular considering figures 4 and 5, that represent indeed the two extreme, run-end setting conditions between which one can choose continuously any desired setting. Such extreme conditions correspond respectively to a segment of tape cut for a "long" corner (figure 4, the cutting point is displaced upwards thanks to the slide 7 being completely lifted) and for a "short" corner (figure 5, the cutting point is displaced downwards thanks to the slide 7 being completely lowered). In any position of the slide, the engagement between the pad 9 and the stirrup 5 is assured by the second guide 6, and the operation of the said thrust stirrup 5 is made possible through the sliding of the same in the track 4, the passage 3 and between the flanks 7a, 7b of the slide 7.

Once adjusted as desired the setting of the slide in all the different heads of the apparatus, one single working step (operation of the pressing pads) allows for carrying out at the same time the cut and the welding of the segments, and thus the accurate joining along the entire length of all the mutually different corners, without reducing the working speed or repeating the same working step. In this way, the above mentioned problem with the known systems is fully solved.

Obviously, not all the heads of a single apparatus need necessarily have the features according to the invention. Even a combination of standard, fixed heads and

heads adjustable in height can bring about effective results, depending on the type of box to be processed. Generally speaking, the head according to the invention can be provided as a replacement kit for replacing a respective standard head of a substantially conventional apparatus. As mentioned, the possibility of adjusting also the height of the blank folding slabs 8 will allow for fitting even more accurately the head to the specific processing needs. In this respect, one should take into account that, as the height of the corner varies, and thus the position in height of the cutting point varies, it is preferable to displace the slabs so that the starting point of the fold is nevertheless kept at the same height.

10 The head is adapted to be controlled by the central control system of the apparatus, as obvious to the skilled person. Such control system will also automatically control also adjustment means that can differ from the screw system of the depicted embodiment (e.g. via linear actuators). Clearly, other constructive details can differ from the exemplifying embodiment, such as the driving means for driving the belt (still remaining autonomous and independent for each head), as well as the shape of the slide 7 and of the support 1.

 The references up, down, top, bottom, and the like used in the present description obviously refer to a head mounted in a working condition on the apparatus, as in fact arranged in the figures.

20 The present invention has been so far described with reference to preferred embodiments. It should be understood that there can be other embodiments falling within the same inventive concept, as defined by the scope of protection of the following claims.

CLAIMS

1. A corner joining head for a box erecting apparatus, the head comprising support means (1) arranged for a functional connection with said apparatus, and joining means (9, 10, 11, 13) for joining a corner of a box being erected from a flat blank, said joining means (9, 10, 11, 13) being supported by said support means (1) and comprising feeding means (11, 13) of a heat adhesive tape, tape cutting means (10) and tape heating means (9) generally extending along an erection direction (X), wherein at least said tape cutting and heating means (9, 10) are adapted to be displaced along said erection direction (X), and said feeding means comprise independent or independently controllable driving means (19).
2. The head according to claim 1, wherein said corner joining means are slidably connected with said support means (1) via linear guide means (2, 6) along said erection direction (X), control and adjustment means (20, 21, 22) being further provided for the displacement of said corner joining means with respect to said support means (1).
3. The head according to claim 1 or 2, wherein said corner joining means comprise a slide (7) supporting said driving means (19) and said cutting and heating means (9, 10) of the heat adhesive tape, said heating means comprising pressing means (9) of said tape over said corner, the pressing means being integral with said slide (7) as far as the sliding along the erection direction (X) is concerned, but movable with respect to the same slide along a pressing direction (Y) lying in a plane orthogonal with said erection direction (X), said slide (7) being slidable with respect to said support means (1) along first linear guide means (2), the head further comprising thrust means (5) slidably linked with said support means (1) so as to carry out a mutual sliding along said pressing direction (Y), and slidably linked with said pressing means (9) so as to carry out a mutual sliding along second linear guide means (6) in said erection direction (X).
4. The head according to claim 3, wherein said slide (7) comprises a pair of side flanks (7a, 7b) each engaged at an end with a rail (2') of said first linear guide (2), said side flanks projecting along said pressing direction (Y) starting from said rail-engaging end, said pressing means (9) and said thrust means (5) being slidably arranged

between said side flanks.

5. The head according to claim 4, wherein said thrust means (5) comprise a L-shaped stirrup (5), with a first arm (5a) that slides within a track (4) formed in said support means (1) and projects between said side flanks (7a, 7b) of said slide (7), and
5 a second arm (5b) that projects downwards along the erection direction (X) forming said second linear guide (6) for said pressing means (9).

6. The head according to any of the previous claims, wherein said tape feeding means comprise a motor (19) mounted on said slide (7) and driving through transmission means (15, 16, 18) a tape driving roller (11) arranged above said pressing
10 means (9).

7. The head according to any of the claims from 2 to 6, wherein said control and adjustment means for the displacement of the corner joining means comprise an endless screw (20) turnable around its own axis arranged parallel with said erection direction (X), and working between said corner joining means and said support means
15 (1).

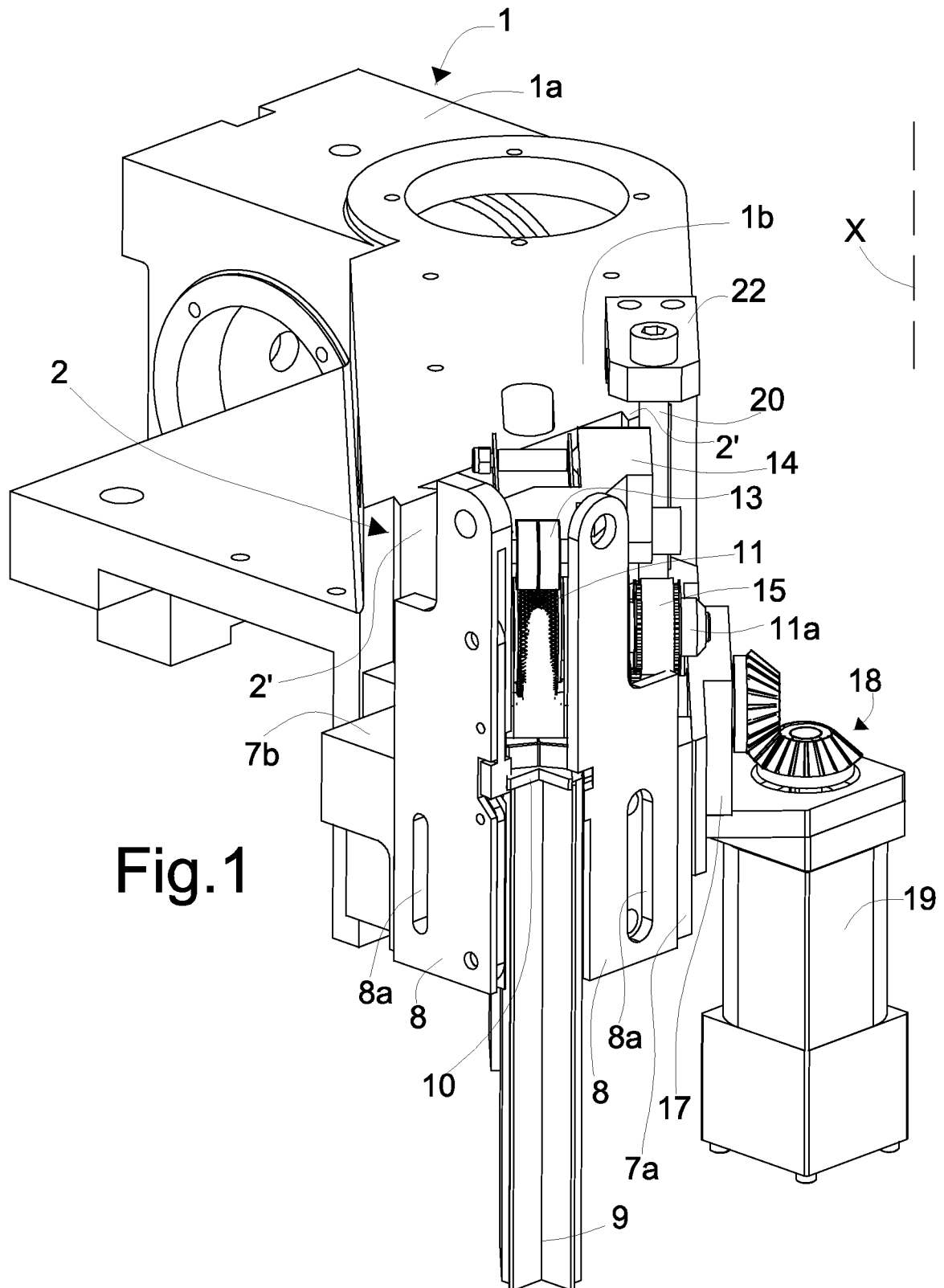
8. The head according to any of the claims from 2 to 6 wherein said control and adjustment means for the displacement of the corner joining means comprise linear actuator means.

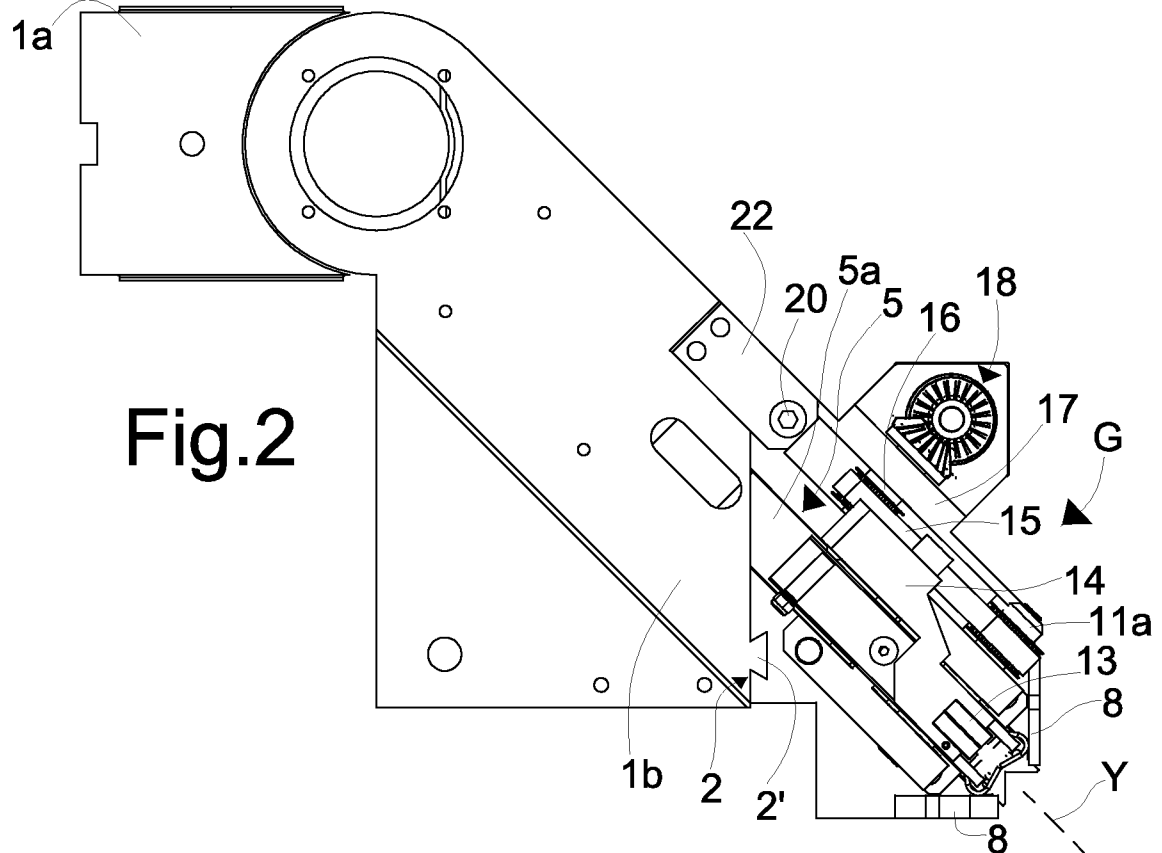
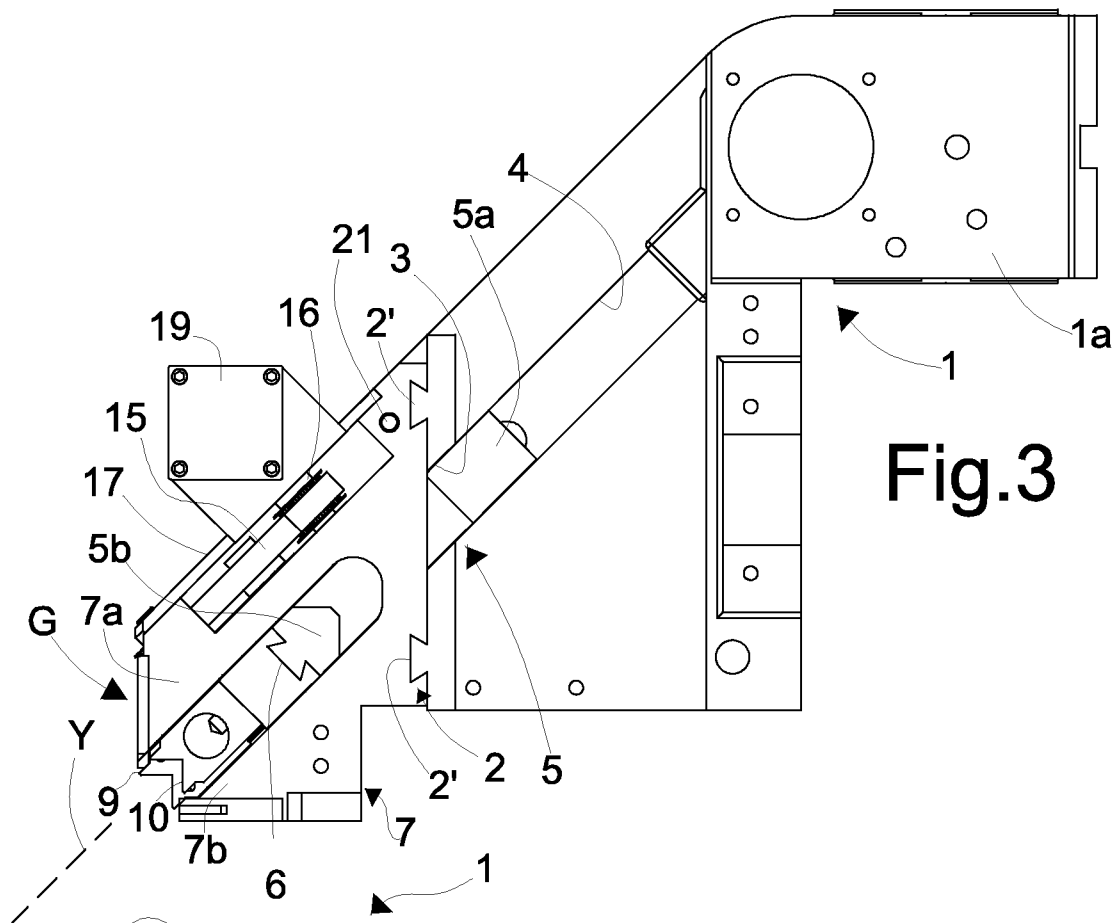
9. The head according to any of the previous claims, wherein blank folding means
20 (8) are associated with said corner joining means, said folding means (8) being displaceable with respect to said corner joining means along said erection direction (X).

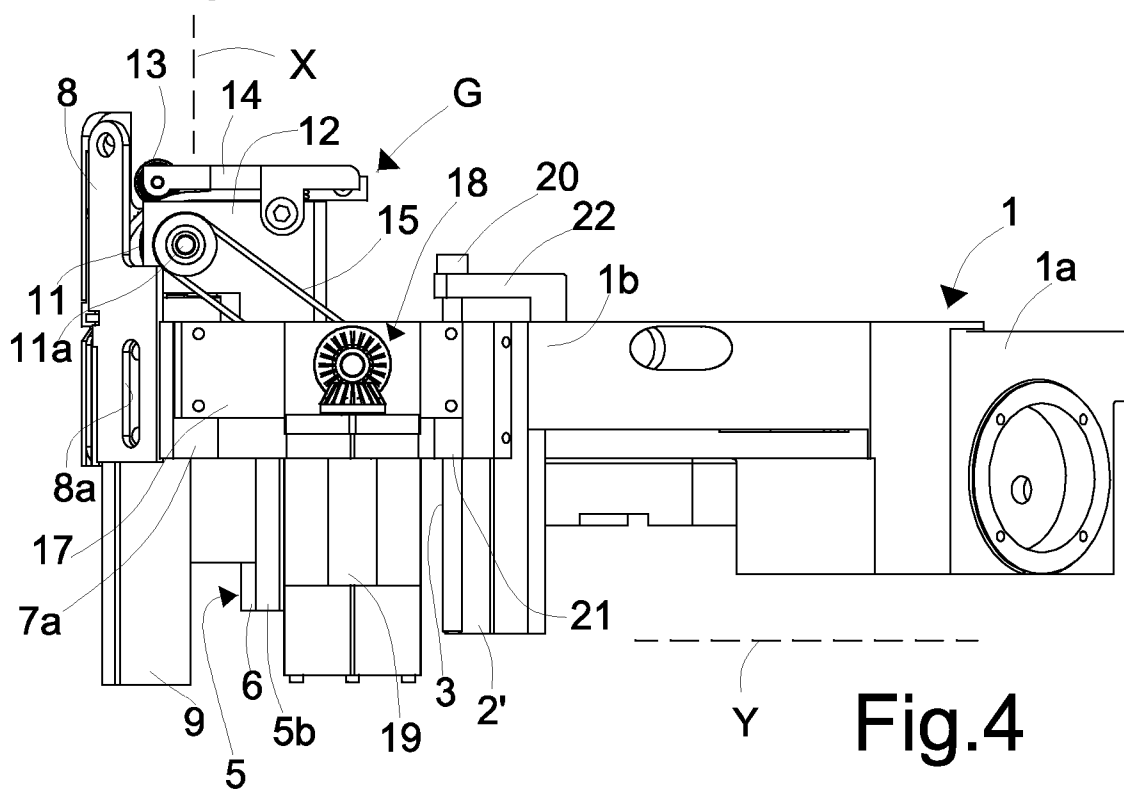
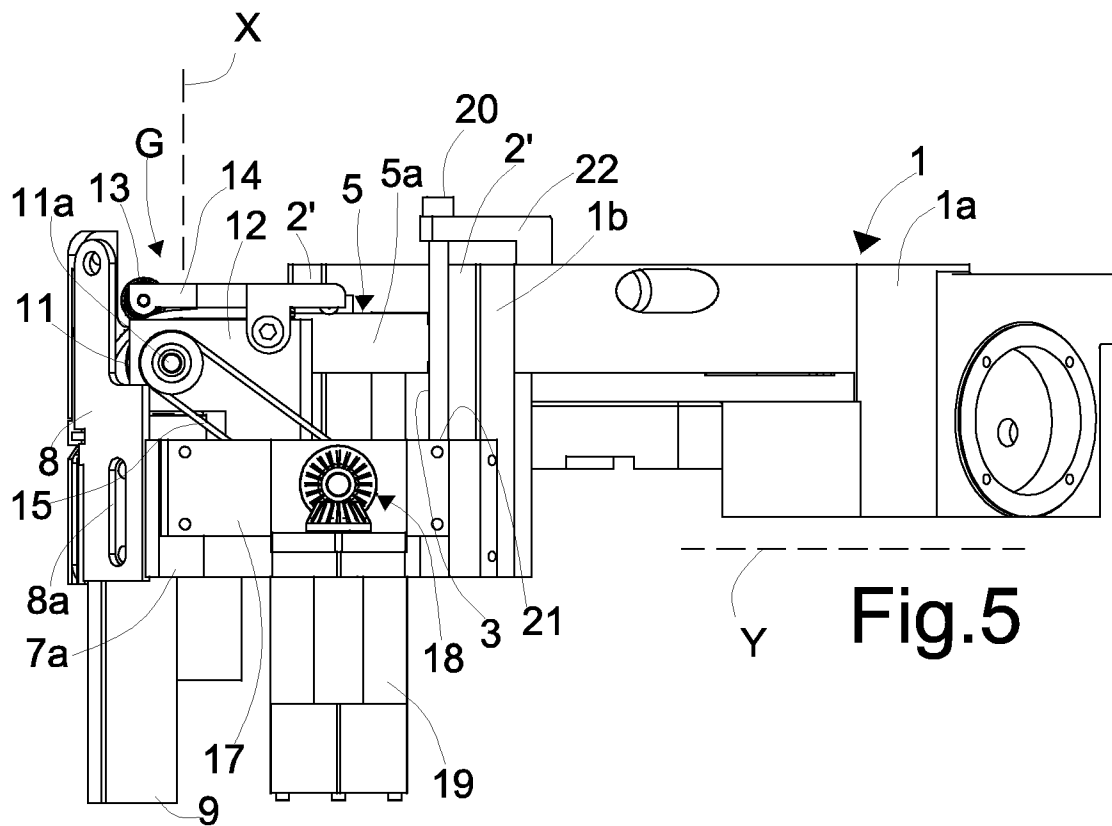
10. A box erecting apparatus comprising at least one head according to any of the previous claims.

11. A method for erecting and joining the corners of a box starting from a flat blank
25 with an apparatus according to claim 10, comprising two or more heads according to any of the claims from 1 to 9, wherein: each head is independently adjusted, by displacing at least said tape cutting and heating means along said erection direction (X); the supply of tape by said tape feeding means is independently controlled for each head in accordance with the height along said erection direction (X) of the relevant
30 corner to be joined; and the cutting and heating of segments of said tape that extend precisely for the whole length of respective corners of the box having different heights

along said erection direction (X) is carried out at the same time for all the heads in a single working step.







INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/051915

A. CLASSIFICATION OF SUBJECT MATTER
INV. B31B3/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B31B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 655 325 A2 (SANTINI RENZO [IT]) 31 May 1995 (1995-05-31)	1,2,6-11
A	column 1, line 5 - column 2, line 32; claim 1; figures 1-3 page 3, line 7 - page 4, line 43 -----	3-5
A	US 1 624 885 A (SAMUEL BERGSTEIN ET AL) 12 April 1927 (1927-04-12) page 2, line 110 - page 3, line 85; figures 1,2 -----	3-5



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

3 July 2012

Date of mailing of the international search report

17/07/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Bevilacqua, Vincenzo

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/051915

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0655325	A2	31-05-1995	DE 69405964 D1 06-11-1997
			DE 69405964 T2 26-03-1998
			EP 0655325 A2 31-05-1995
			ES 2110208 T3 01-02-1998
			IT 1265590 B1 22-11-1996

US 1624885	A	12-04-1927	NONE
