United States Patent [19]

Yamamura

[11] **3,779,140**

[45] **Dec. 18, 1973**

[54] **METHOD AND APPARATUS FOR AUTOMATICALLY SETTING UP OF PAPER CASES WITH THE BENDABLE-HEADED INNER CASE**

[75] Inventor: **Yoshinobu Yamamura,** Kyoto, Japan

[73] Assignee: **Kinki Insatsu Kabushiki Kaisha,** Mitejima, Nishiyodogawa-ku, Osaka, Japan

[22] Filed: **Mar. 29, 1972**

[21] Appl. No.: **239,116**

[30] **Foreign Application Priority Data**

Oct. 19, 1971 Japan 46/83161

[52] **U.S. Cl.** ..... **93/36.01,** 93/39 R, 93/53 LF, 93/55, 93/36 DA

[51] **Int. Cl.** **B31b 17/74**

[58] **Field of Search** ..... 93/55, 36 R, 36 C, 93/36.01, 39 R, 40, 43, 53 LF, 54 R, 54.2, 36 DA; 53/169, 175

[56] **References Cited**

UNITED STATES PATENTS

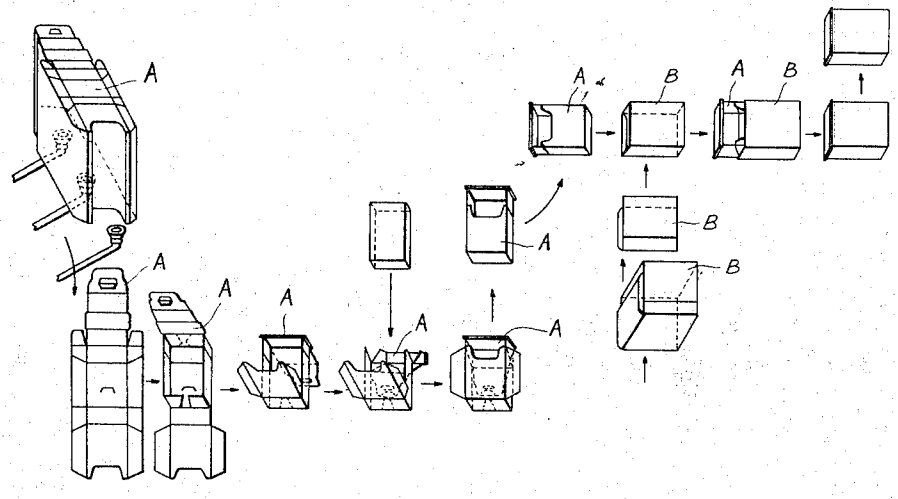
2,082,565	6/1937	Benoit	93/55 X
2,645,984	7/1953	Linstedt	93/55 X
2,541,914	2/1951	Conser	93/55 X
2,342,158	2/1944	Moore	93/36 R X
1,830,342	11/1931	Stokes	93/43 X
3,425,324	2/1969	Becker et al.	93/36.01

Primary Examiner—Andrew R. Juhasz
Assistant Examiner—James F. Coan
Attorney—Auslander & Thomas

[57] **ABSTRACT**

Apparatus for automatically setting up of a paper case including an inner case whose head or lid portion bends to one side when pushed at the bottom for opening and the method of making same comprising an inner case setting up process wherein inner case blanks cut in the desired shape and piled up, are transferred intermittently one by one, are folded up and down along creases automatically, during which a locking portion which prevents, at a certain point, folding over of the end portion of inner case, is led under a guide plate, a tapered end of the inner case is led from the lower side to the upper side of said guide plate and the end of the guide plate is inserted between the back part and said locking portion; an outer case setting up process wherein folded blanks for the outer case in piled conditions are transferred intermittently one by one onto a different line from that for setting up inner cases, after which the outer case is formed, straightened up and drawn out as it is seized at its interlocking flap, which is folded inwardly; and an insertion process wherein the set up inner case is inserted in the set up outer case.

3 Claims, 32 Drawing Figures



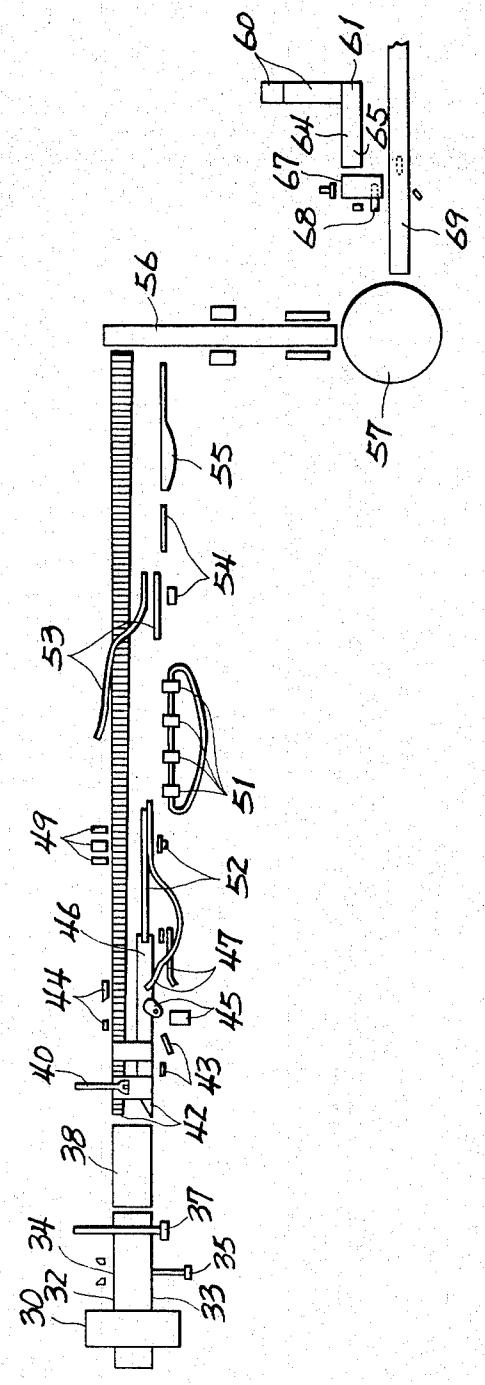

60
61
64
65
67
68
69
56
57
55
54
53
51
49
52
46
47
44
45
40
43
42
38
37
34
35
30
32
33

FIG. 1

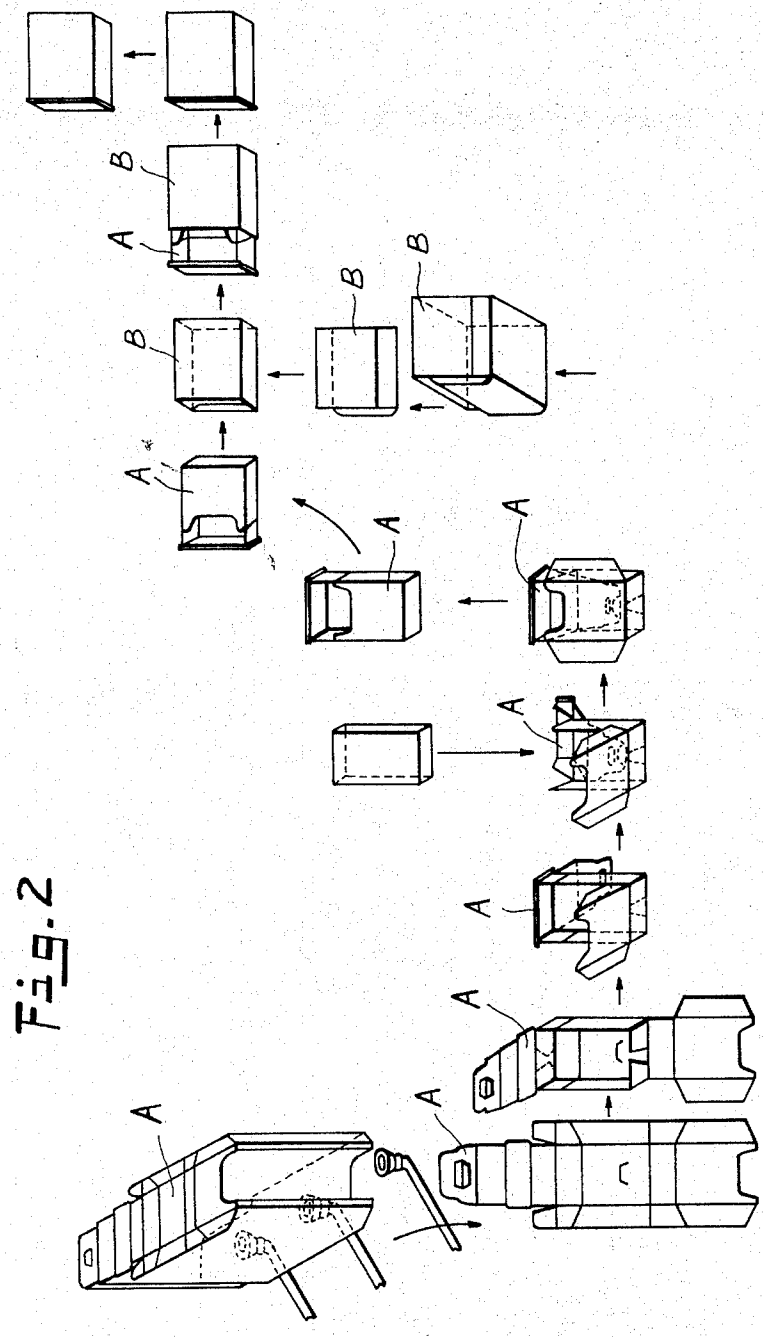


Fig. 2

Fig. 3

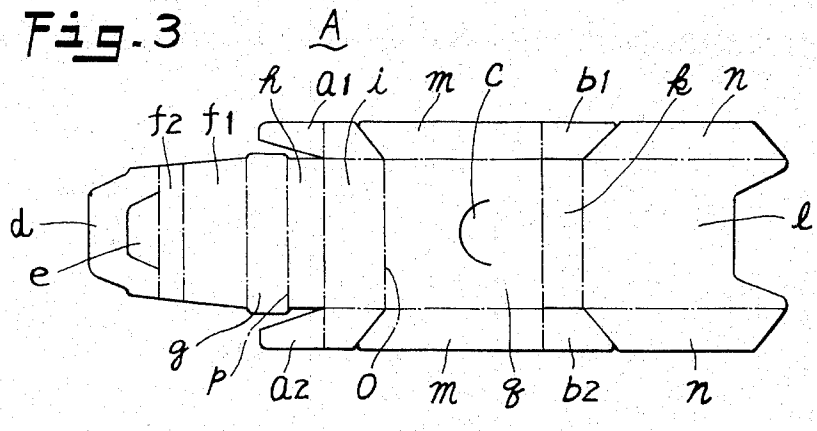

A
h
a1
i
m
c
b1
k
n
f2
f1
d
e
l
g
p
a2
o
m
g
b2
n

Fig. 4

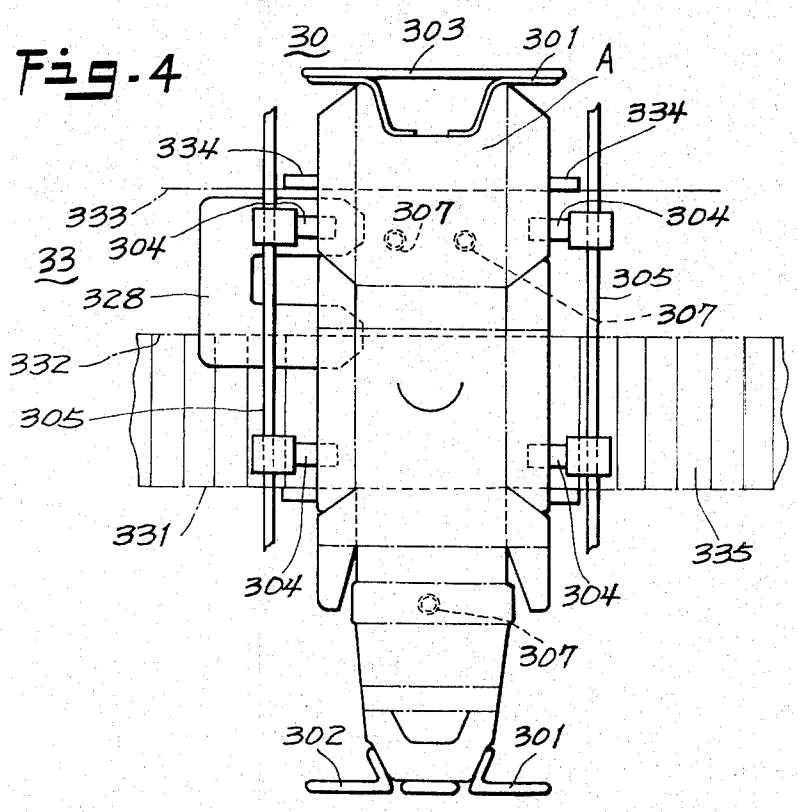

30
303
301
A
334
334
333
304
307
304
33
328
305
307
332
305
331
304
304
335
307
302
301

Fig-5

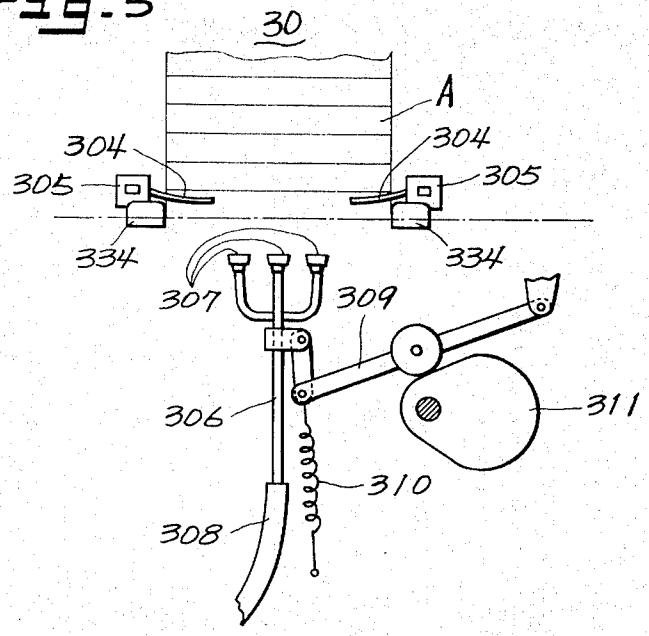

30
A
304
304
305
305
334
334
307
309
306
311
310
308

Fig-6

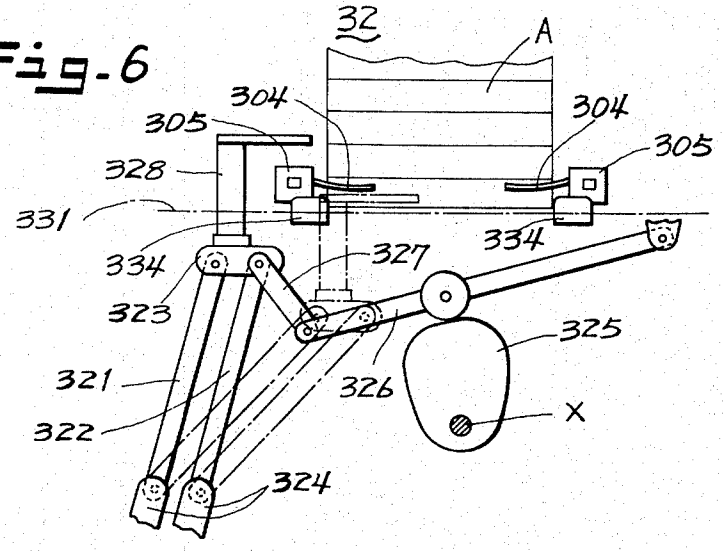

32
A
304
304
305
305
328
331
334
334
327
323
325
321
326
322
X
324

Fig-7

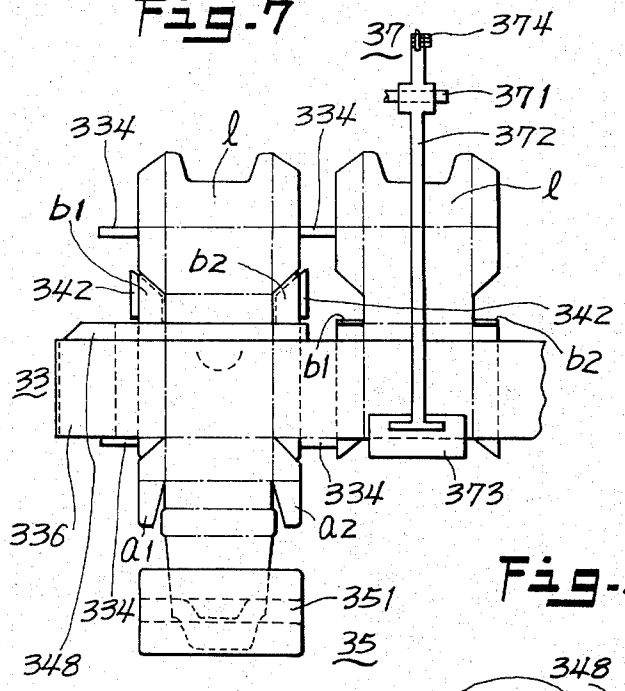

37
374
371
372
334
l
334
l
b1
b2
342
342
b1
b2
33
334
373
336
a1
a2
334
351
348
35

Fig-8

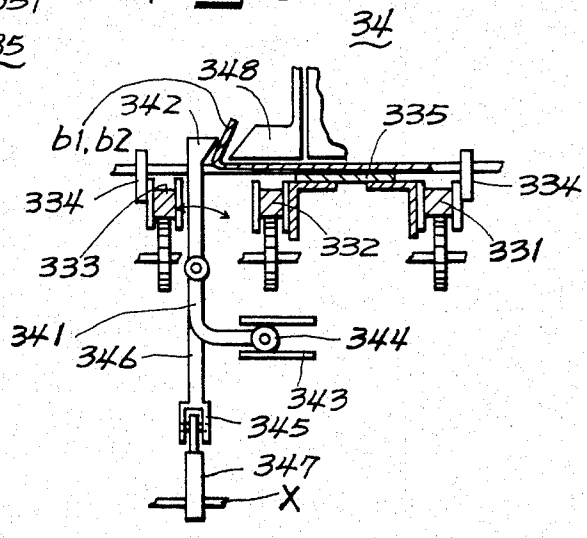

34
348
342
335
b1, b2
334
334
333
332
331
341
344
346
343
345
347
X

Fig-9

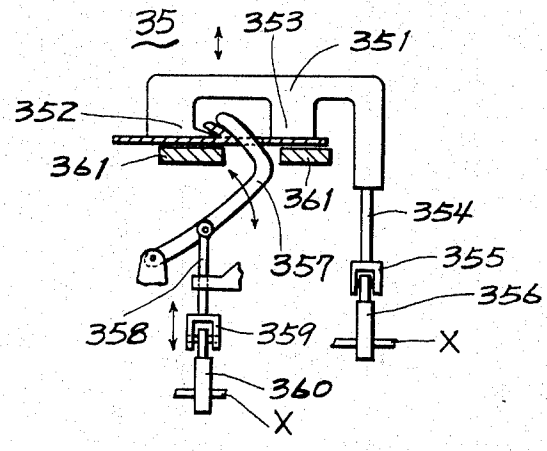

35
353
351
352
361
361
354
357
355
356
358
359
X
360
X

Fig-10

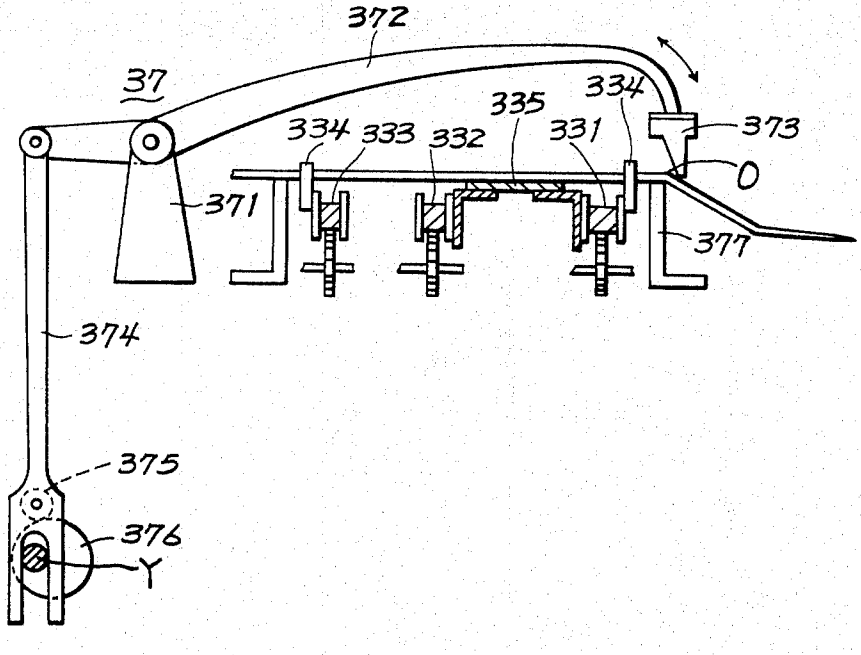

372
37
334
335
334
333
332
331
373
O
371
377
374
375
376
Y

Fig. 11

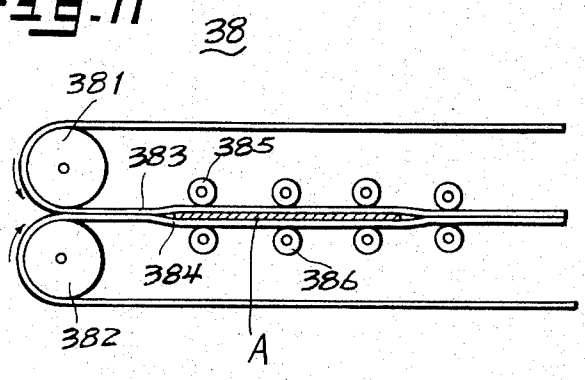

38
381
383
385
384
386
382
A

Fig. 12

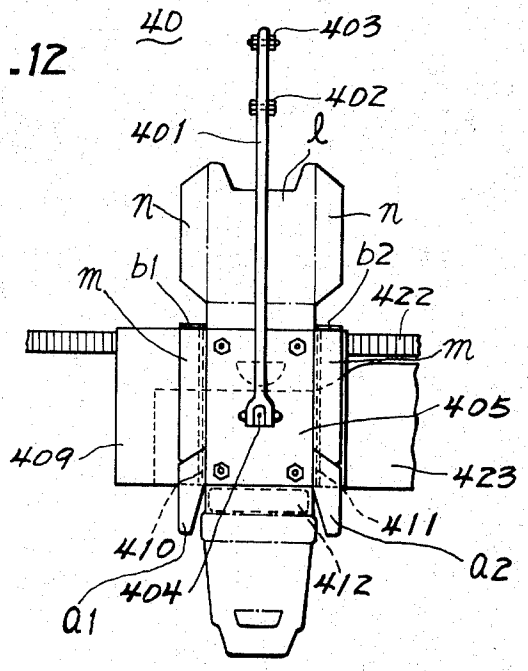

40
403
402
401
l
n
n
m
b1
b2
422
m
405
409
423
411
410
Q2
404
412
Q1

Fig. 13

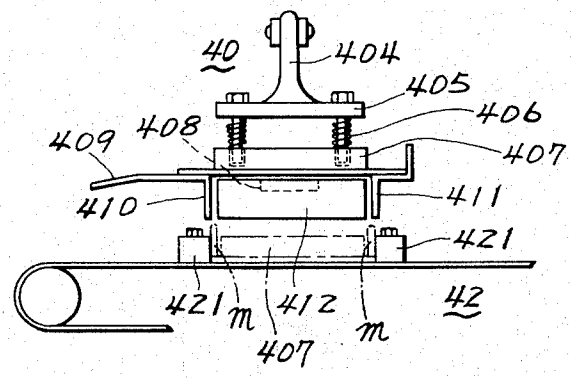

40
404
405
406
407
408
409
410
411
421
421
m
412
m
407
42

Fig. 14

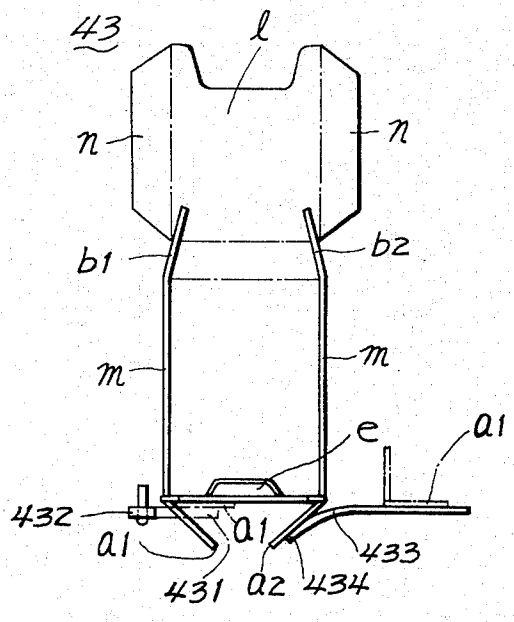

43
l
n
n
b1
b2
m
m
e
a1
432
a1
a1
433
431
a2
434

Fig. 15

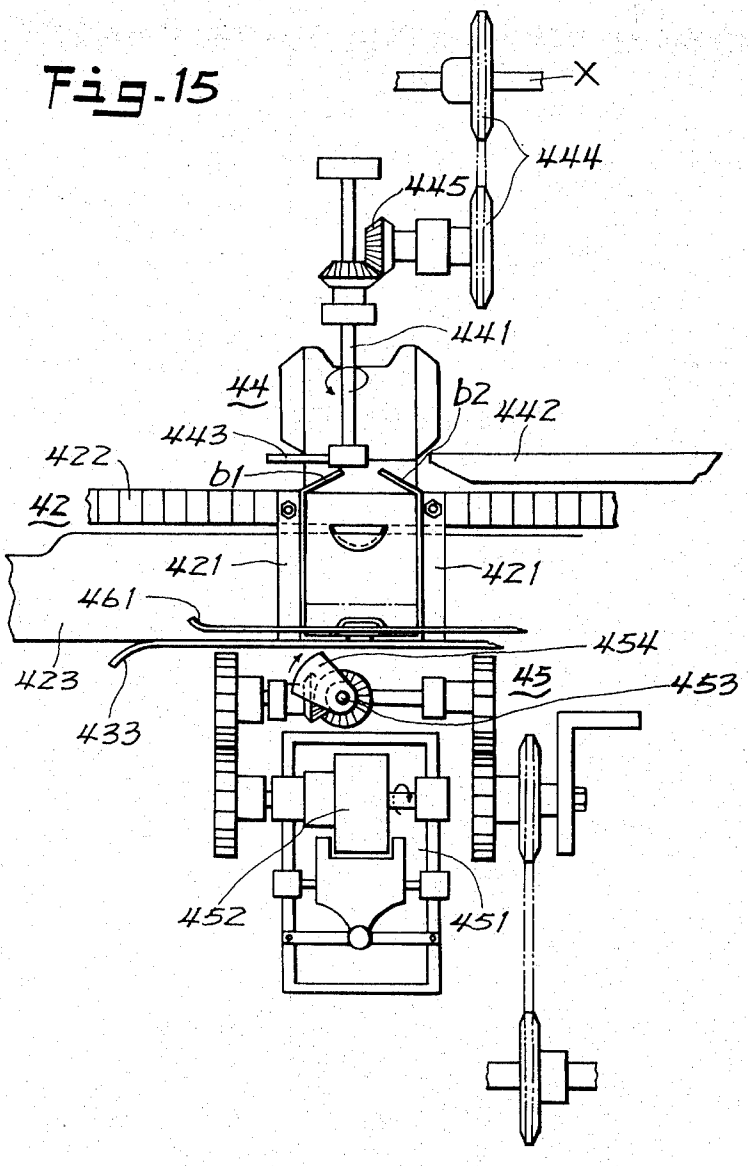

X
444
445
441
44
b2
442
443
422
b1
42
421
421
461
454
423
45
453
433
452
451

Fig. 16

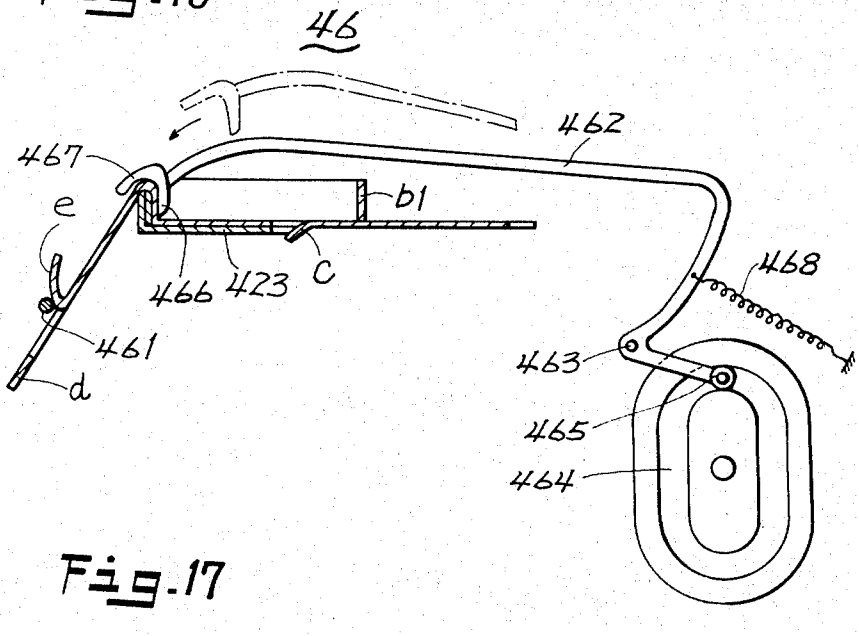
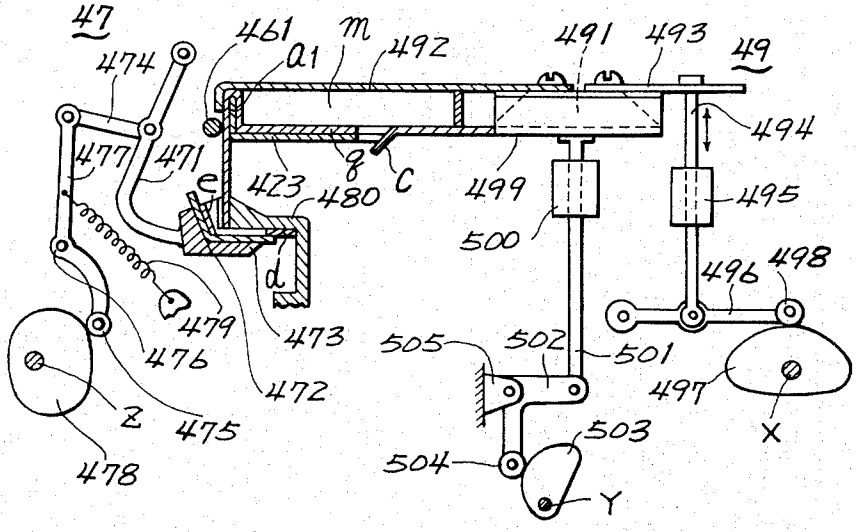

46
462
467
e
b1
466
423
C
468
461
d
463
465
464

Fig. 17


47
461
m
492
491
493
49
474
a1
494
477
471
e
423
480
C
499
495
500
496
498
479
473
505
502
501
476
497
472
503
475
Z
X
504
478
Y

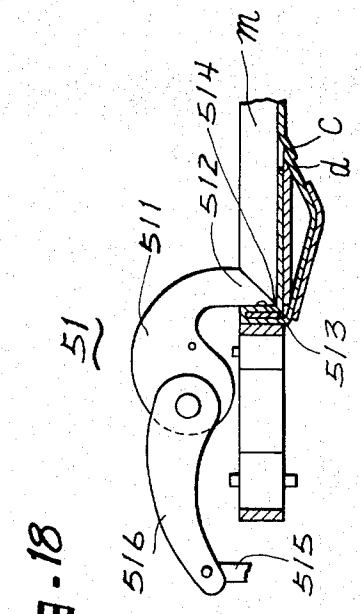


Fig. 18

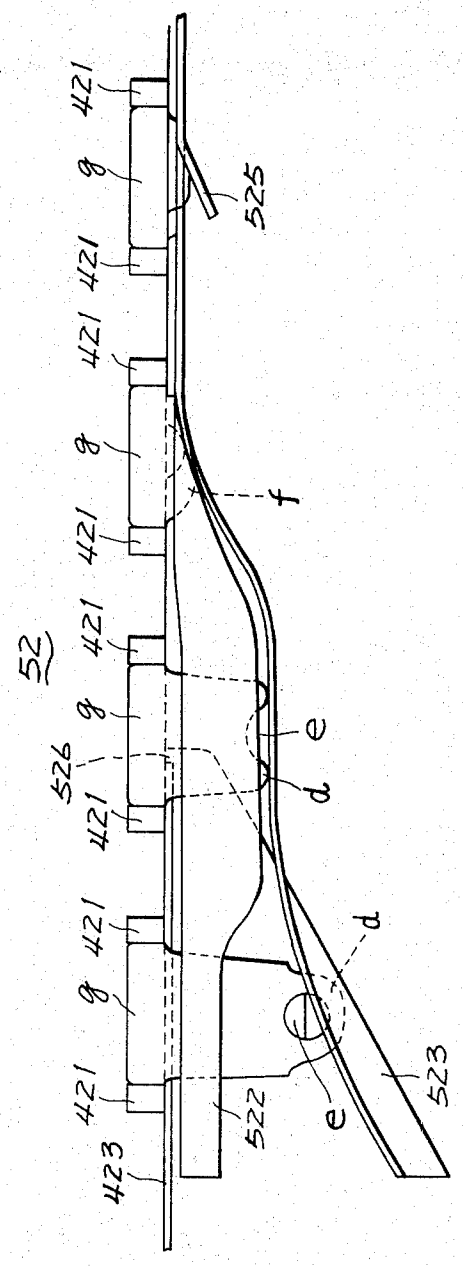


Fig. 19

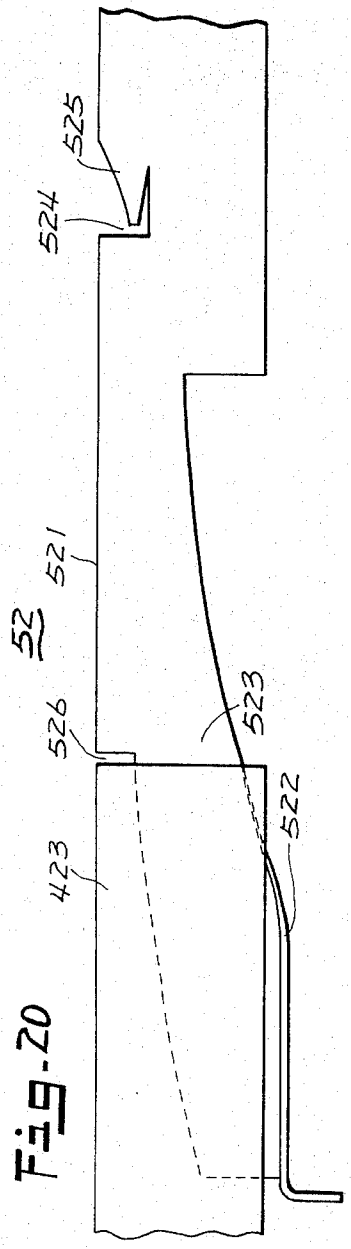

525
524
521
52
526
523
522
423

Fig. 20

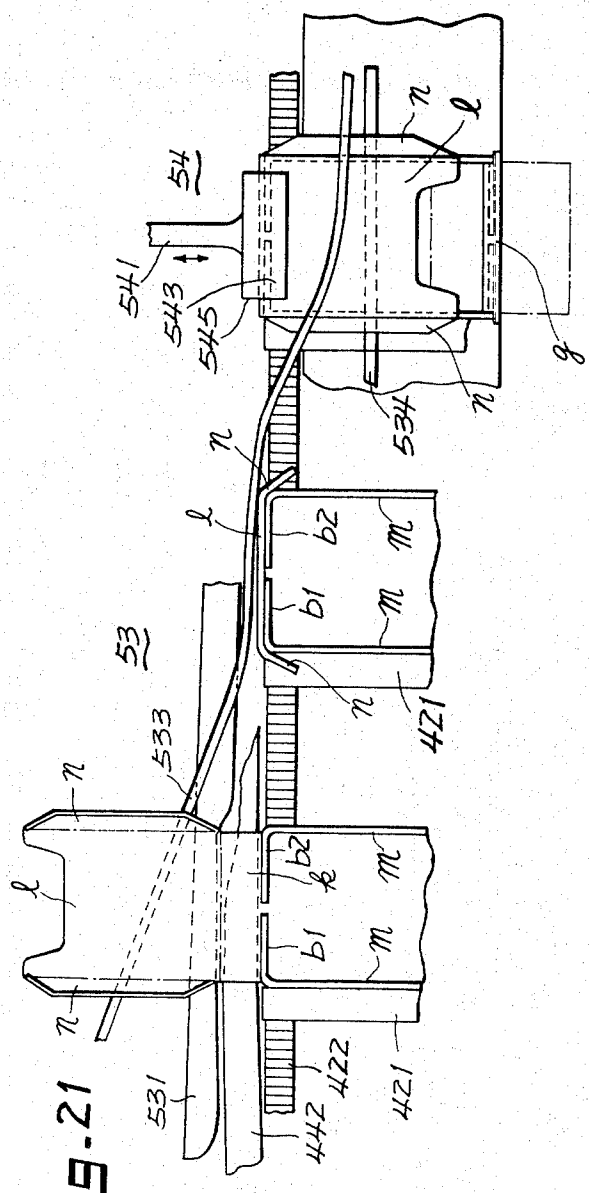

54
541
543
545
n
l
g
534
n
l
b2
m
b1
m
53
533
n
421
n
l
b2
k
b1
m
m
n
531
422
442
421

Fig. 21

Fig. 22

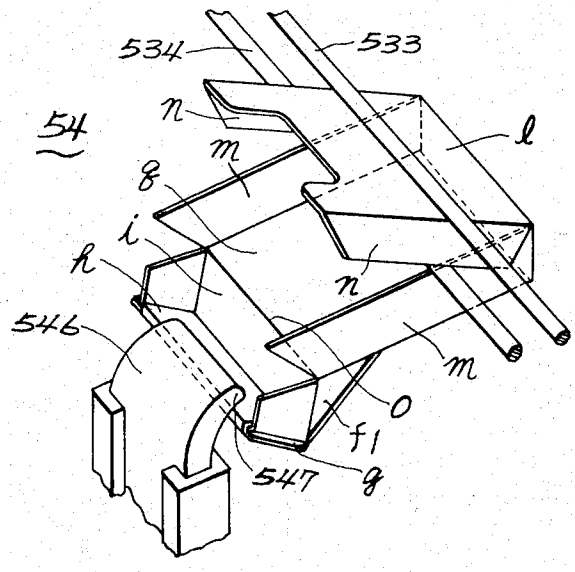


Fig. 23

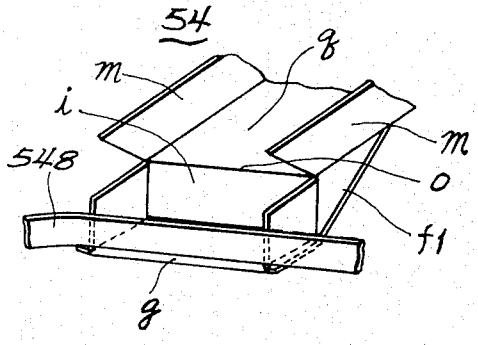


Fig-24

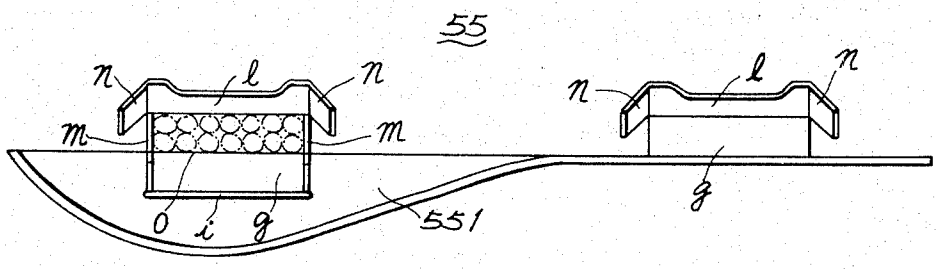


Fig-25

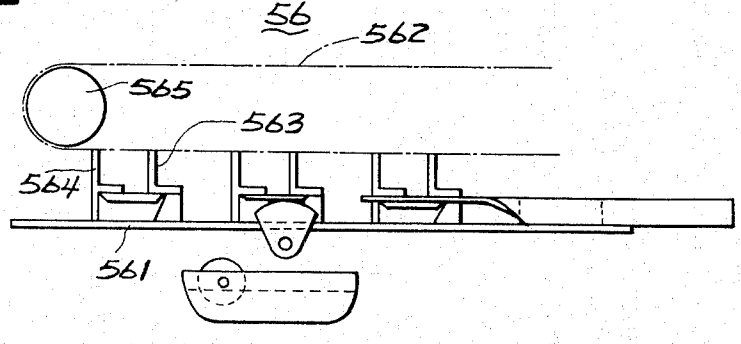


Fig. 26

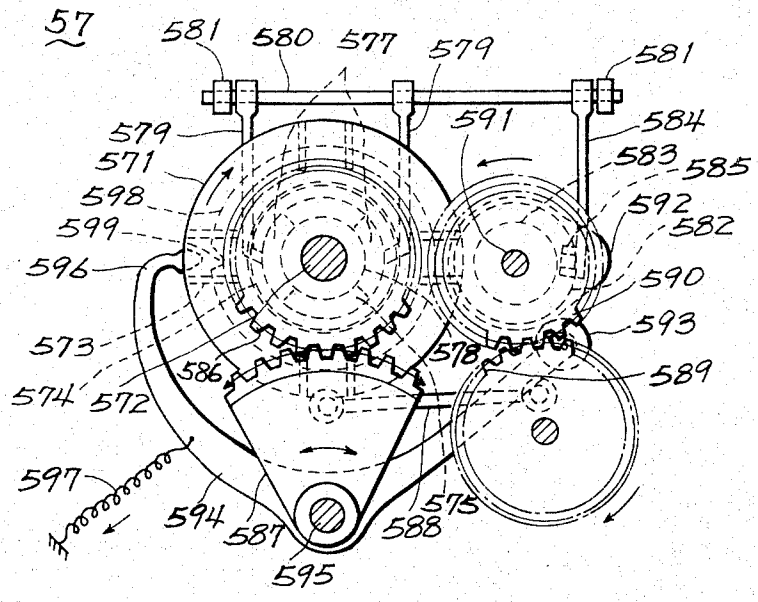

57
581
580
577
579
581
579
571
598
599
596
573
574
572
597
594
587
595
591
584
583
585
592
582
590
593
578
589
586
588
575

Fig. 27

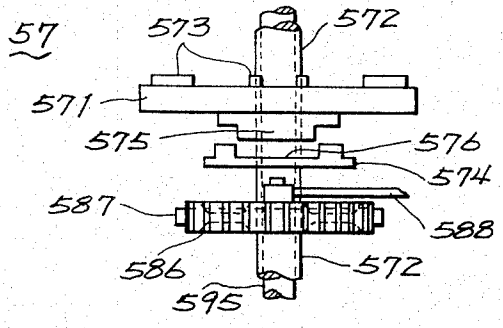

57
573
572
571
575
576
574
587
588
586
572
595

Fig. 28

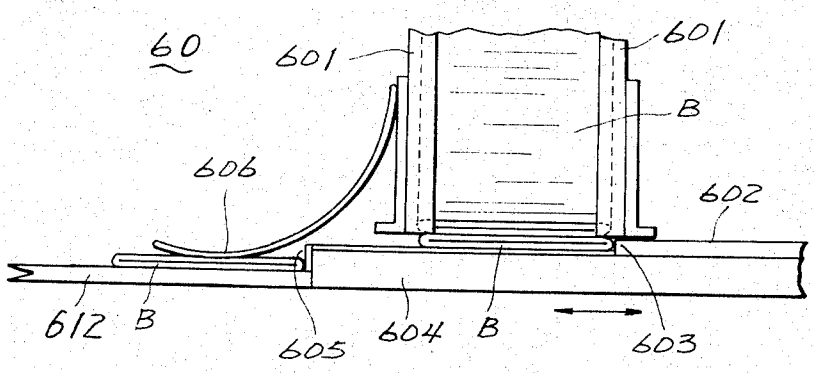

60
601
601
B
606
602
612
B
605
604
B
603

Fig. 29

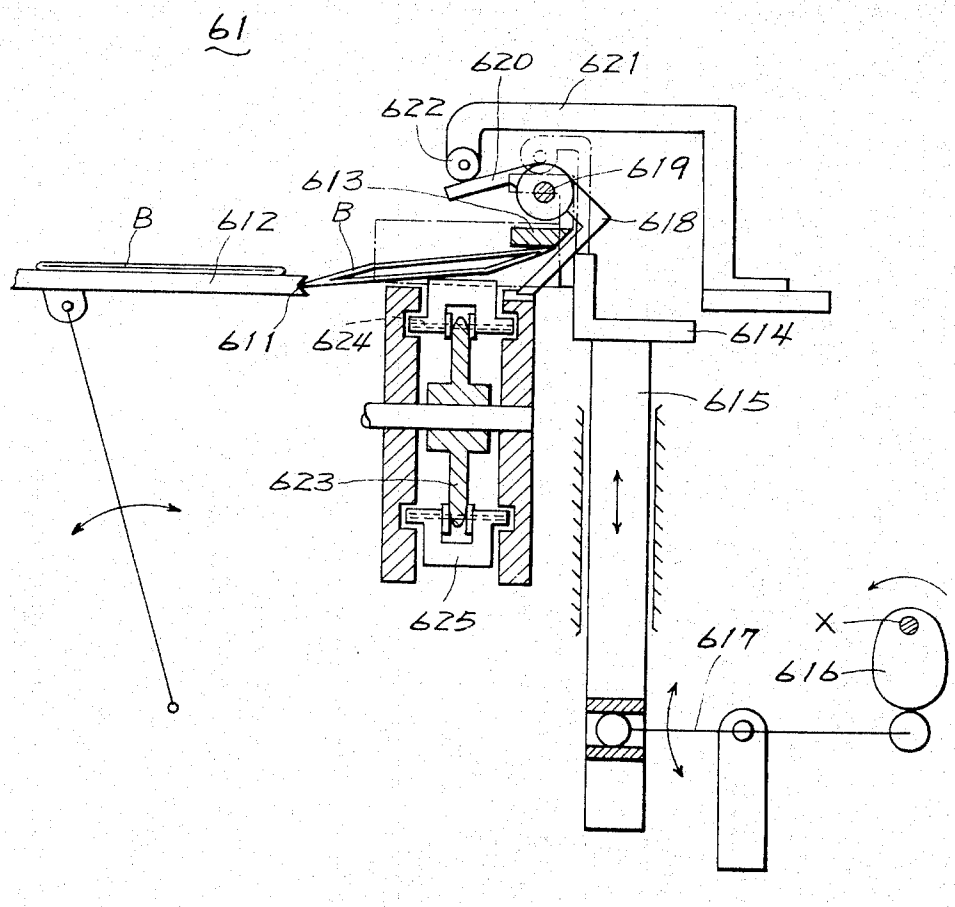

61
620
621
622
619
613
618
B
612
B
611
624
614
615
623
625
617
X
616

Fig. 30

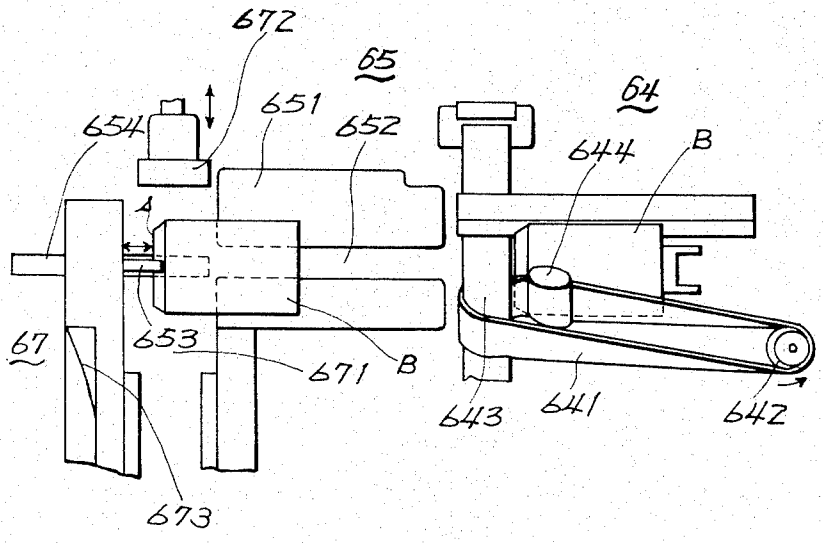
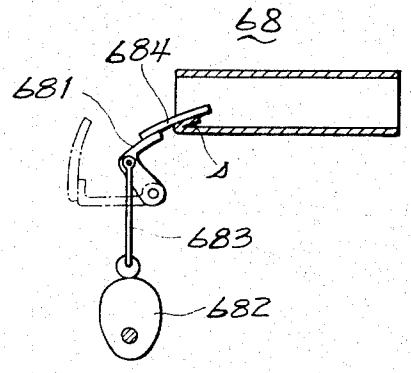

672
65
64
654
651
652
644
B
A
67
653
671
B
643
641
642
673

Fig. 31


68
684
681
A
683
682

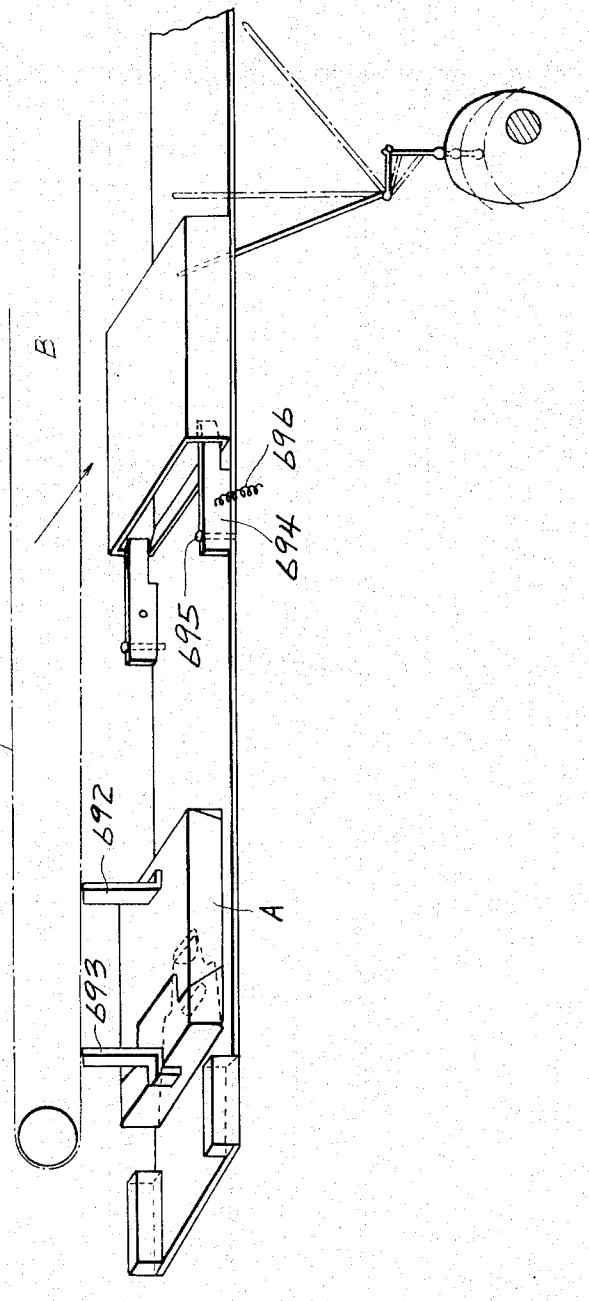


Fig. 32

69

METHOD AND APPARATUS FOR AUTOMATICALLY SETTING UP OF PAPER CASES WITH THE BENDABLE-HEADED INNER CASE

This invention relates to a method and an apparatus for automatically setting up of paper cases, chiefly for cigarettes and chocolate, in which an inner case and an outer case are provided with an interlocking flap respectively, more specifically, relates to a method and an apparatus for automatically setting up of push-type paper cases wherein interlocking flaps of the inner case and the outer case engage with each other by pushing the bottom of the inner case and further pushing given to the bottom causes a bendable top portion or lid portion of the inner case to bend to one side to faciliate taking out of contents.

Conventional paper cases for cigarettes, chocolate and the like are so designed that the inner case is slipped in or out of the outer case by pushing its top or bottom part. Various methods and apparatuses for automatically setting up of such push-type cases have been available, but improvements on such conventional type cases have recently been made, whereby the top or lid portion of the inner case bends to one side as it is pushed at its bottom to make it easy to take out the contents. Such paper cases have already been used as containers for cigarettes, chocolate and the like. However, in setting up of such improved type paper cases, while it is required for the setting up of inner case to cut cardboard in the desired shape by punching, to give necessary cuts and ruled lines thereto, to turn down and up such an inner case blank, to make an interlocking flap at the turned-up part and to insert a top portion of the turned-up part into a locking portion cut in the back part, it is necessary for the outer case to have at one of its top edges an interlocking flap turned down inwards and finally the inner case must be inserted in the outer case with its interlocking flap turned down inwards. For setting up of the above-mentioned paper cases on the complete automation system, the conventional method and apparatus cannot be used and it has been earnestly desired to realize an apparatus whereby the above-mentioned paper cases are set up automatically.

The present invention has been made to meet the above requirements and provides a novel method and an apparatus for setting up, on complete automatic basis, of push-type paper cases in which the head portion of the inner case bends to one side as it is pushed at the bottom to facilitate taking out of the contents. More concretely, the present invention has for an object to provide a method and an apparatus for setting up of paper cases, wherein while inner case blanks which have been made by punching and cutting cardboard in the desired shape and piled up and transferred intermittently one by one and are bent along the ruled lines on automatic basis, a locking portion for preventing the inner case body from being pushed further than is necessary is put along the underside of a guide plate, an insert portion of the inner case is led from the underside of the guide plate to the upper side and is inserted between the back part and the locking portion (the inner case setting up process); outer case blanks which have been folded flat and piled up are transferred intermittently one by one on a line separate from the line for inner cases, are set up in the proper form and removed of strain, are pulled out as they are pinched at the interlocking flap and thereafter the interlocking flap is bent

inwards (the outer case setting up process) and finally the set up inner case is slipped in the set up outer cases.

The nature and advantages of the present invention will be understood more clearly from the following description made with reference to an embodiment and the accompanying drawings, in which

FIG. **1** is a diagram showing the arrangement of the apparatuses of the present invention.

FIG. **2** is a diagram explaining the setting up process of a paper case having an inner case whose head portion bends to one side on opening.

FIG. **3** shows an inner case as it is spread out.

FIG. **4** is a plan view of an inner case blank feeding device.

FIG. **5** is a side view of a suction device.

FIG. **6** is a side view of an inner case stabilizing apparatus.

FIG. **7** is a plan view of a bottom flaps inward bending device, an interlocking flap inward bending device and a bendable head portion creasing device.

FIG. **8** is a side view of the bottom flaps inward bending device.

FIG. **9** is a side view of the interlocking flap inward bending device.

FIG. **10** is a side view of the bendable head portion creasing device.

FIG. **11** is a side elevation of a device for nipping and transferring of blanks.

FIG. **12** and FIG. **13** are respectively a plan view and a front view of a device for bending inwards the three-sectioned sides of the back part.

FIG. **14** is a plan view of a device for bending the sides of the ceiling part.

FIG. **15** is a plan view of a device for bending of bottom flaps and a device for pasting of the outer side of the ceiling part.

FIG. **16** is a side elevation of a device for creasing the ceiling part.

FIG. **17** is a side elevation of a device for bending the ceiling part and a device for bending the sides of the front part.

FIG. **18** is a side elevation of a device for fixing the pasted part.

FIG. **19** is a front view of the main part of a device for bending and inserting the insert portion.

FIG. **20** is a plan view of the main part of the device shown in FIG. **19.**

FIG. **21** is a plan view of a device for bending the front part and a device for bending the bendable head portion.

FIG. **22** is a perspective view of the main part of the device for bending the bendable head portion.

FIG. **23** is a perspective view of a levelling plate of the device shown in FIG. **22.**

FIG. **24** is a front view of a lid closing device.

FIG. **25** is a front view of a transferring device at the latter stage.

FIG. **26** is a base view of a device for changing the course of the inner case.

FIG. **27** is a front view of the device shown in FIG. **26.**

FIG. **28** is a side elevation of an outer case blanks feeding device.

FIG. **29** is a side elevation of a device for forming the rectangular tube.

FIG. **30** is a plan view of a shaping and finishing device, a pulling out device and a pushing out device.

FIG. 31 is a side view of a device for bending the interlocking flap of the outer case.

FIG. 32 is a perspective view of a device for inserting the inner case in the outer case.

The following description is made of the construction of the present invention, with reference to an embodiment and accompanying drawings.

FIG. 3 shows an inner case A, as it is spread out, having cut-ins (shown with solid lines in the drawing) and ruled lines (shown with chain lines in the drawing) and cut in the desired shape: (a_1) and (a_2) are flaps at the ceiling part, (b_1) and (b_2) are flaps at the bottom, (c) is a locking portion, (d) is an insert portion, (e) is an interlocking portion, (f_1) and (f_2) are folded down portions, (g) is an outer side of the ceiling, (h) is an inner side of the ceiling, (i) is a back of the bendable head, (k) is a bottom part, (l) is a front part, (m) is a side of the back part, (n) is a side of the front part, (q) is a back part, (o) is a crease line between the back part (q) and the back of the bendable head (i), and (p) is a crease line between the inner side of the ceiling (h) and the outer side of the ceiling (g).

The inner case blanks feeding device **30** (FIG.4) sucks inner case blanks and transfer them one by one onto the conveyor. A yoke body **301** which supports inner case blanks piled up thereon, is provided with a yoke **302** of L-shaped section and a yoke **303** of flat stand-like section at either side. It is further provided with support rods **305** which support elastic support pawls one-sidedly. Said support rods are located at such a distance that when an inner case blank curves slightly, it leaves said pawls. The suction pipe **306** is connected with a vacuum pump (not shown in the drawing), through the medium of a rubber pipe or the like **308** at its lower end, and a sucker **307** at its top end, and is fixed to the link **309.** It is biased downward at all times by a spring **310.** With the rotation of a cam **311** fixed to the main axis X, said sucker is actuated to do vertical motion and is so adjusted that at its highest position it reaches the under surface of the inner case blank. The main axis X is preferably supported by bearing or the like and is linked with a motor through the medium of a reduction gear and also connected with cams, links and the like which drive each device.

The inner case stabilizing apparatus **32** (FIG.6) is for stabilizing a sucked inner case blank A on the chain. It is so designed that two rods **321, 322** in parallel with each other, with a seat **323** at their upper ends and with their lower ends rotatably connected to fixing plates **324,** repeat reciprocating motion in diagonal direction, keeping their parallelism, by a link **326** and a coupling rod **327** linked thereto with the rotation of a cam **325** fixed to the main axis X. At this time, a stabilizing press **328** secured to the main axis X. At this time, a stabilizing press **328** secured to the upper side of the seat **323** is pushed on the upper surface of a sucked inner case blank A, presses it lightly, does reciprocating motion in diagonal direction cooperatively with the descending of the suction pipe **306** and stabilizes the inner case blank A on the chain. For this purpose, the stabilizing press **328** is provided in parallel with the seat **323.**

The transferring device at initial stage **33** stabilizes fed inner case blanks A so that they may not rise and transfer them intermittently. Provided in parallel at the underside of the inner case blank feeding device **30** are endless conveyor chains **331, 332, 333** in three rows, of which **331** and **333** (outer conveyor chains) are provided with pawls **334** extending over the whole circumference, two at regular intervals (an interval almost equal to the depth of an inner case blank). Provided between conveyor chains **331** and **332** is a caterpillar **335** which causes said conveyor chains to do intermittent motion. Inner case blanks are transferred as they are beld between conveyor chains **331, 332, 333** and an endless belt **336** put on a driving pulley (not shown in the drawing) which is driven intermittently in synchronism with said conveyor chains.

The bottom flaps inward bending device **34** (FIG.8) pushes up flaps (b_1), (b_2) from below and then bends them inwardly. A L-shaped rod **341** has at its upper end a projection portion **342** and at its lower end a roller which slides laterally in a horizontal guide channel **343.** Pivotally secured to the central part of said L-shaped rod is a push-up rod **346** carrying at its lower end a roller **345.** By the rotation of a cam **347** secured to the main axis X, said push-up rod is caused to do vertical motion, which causes the L-shaped rod **341** to do circular reciprocating motion, with the result that bottom flaps (b_1), (b_2) are pushed up and then bent inwardly. A stationary upper mould **348** which is fixed slightly above the inner case blank acts as both a preventor of the inner case blank from rising and a press plate against afore-mentioned projection **342.**

Upon inward bending of bottom flaps (b_1), (b_2), inward bending of the interlocking flap (e) is effected by the interlocking flap inward bending device **35** (FIG.9), which pushes up the interlocking flap (e) from below and then bends it inwardly.

An E-shaped press yoke **351** has at its one end a press plate **352** having an acute-angled projection and at its central part another press plate **353.** The other end of said press yoke **351** is connected to a roller **355** via a coupling rod **354.** Under this arrangement, the press yoke **351** does vertical motion by the rotation of a cam **356** fixed to the main axis X. A L-shaped push-up rod **357** pushes up the interlocking flap (e) and then bends it inwardly. A coupling rod **358** is pivotally secured to the intermediate part of said L-shaped push-up rod. Under this arrangement, the coupling rod **358** is caused to do vertical motion by a roller **359** provided at one end of said coupling rod and a cam **360** fixed to the main axis X, which causes the L-shaped push-up rod **357** to do reciprocal motion in diagonal direction. Numeral **361** denotes a fixed yoke.

The bendable head portion creasing device **37** (FIG.10) bends the part (i)–(d) downwardly along the ruled line between the back part (q) and the back of bendable head (i) and creases it. To a top end of a lever **372** pivotally secured to a fulcrum **371** is fixed a press mould **373** and to the other end of the lever is pivotally secured a coupling rod **374** carrying at its lower end a yoke, at the base end of which is provided a roller **375.** With the rotation of a cam **376** provided at the main axis Y, the coupling rod **374** is caused to do vertical motion, by which a press mould **373** provided at the tip of the lever **372** does circular motion. Numeral **377** denotes a fixed yoke. The main axis Y is provided separately from the main axis X which rotates continuously.

The nipping and transferring device **38** (FIG.11) transfers the inner case blanks, whose bottom flaps (b_1), (b_2) and interlocking flap (e) have been bent by the preceding processes, to the following process and also bends the interlocking flap (e) toward the ruled line (o). Endless belts **383, 384** which are driven by

driving pulleys **381, 382** and others, are arranged adjacent to each other and are supported properly by carrier rollers **385, 386** and other. The lower endless belt **384** is larger in width than the upper endless belt **383** and the interlocking flap (*e*) is loaded on that wider part, above which a guide plate **423** is provided. The starting end portion of said guide plate is arranged perpendicularly to the endless belt **384** or in such a manner that its underside is slightly slanted leftward so as to lift up the interlocking flap (*e*). Therefore, the guide plate presents such a curved surface state that it slants inwards by degrees as it advances and becomes parallel with the endless belt **384** at its terminal end portion.

The three-sectioned side bending device **40** (FIG.12) catches the inner case blank A sent from the aforementioned nipping and transferring device **38** at the prescribed position and by pushing it out from above by the press plate, bends sides (*m*), (*m*) of the back part and the part ranging from the inner side of the ceiling (*h*) to the insert portion (*d*) upwardly and perpendicularly to the back part (*q*). A rod **402** which does vertical motion by the cam device which gears with the main axis X is pivotally secured to the intermediate part of a lever **401.** A fulcrum **403** and a rising & falling rod **404** are pivotally secured to the rear end and the top end respectively of said lever. Fixed to the lower end of said rising & falling rod is a support plate **405,** below which is fitted through the medium of a spring **406** a press plate **407** having a width and a length corresponding to the width of the back part (*q*) and the total length of (*q*) and (*i*). At the under surface of the nearly central part of said press plate is provided a push-down projection **408** having almost the same section as that of the locking portion (*c*) in such a fashion that it protrudes from the under surface (FIG.13). A transferring plate **409** is positioned slightly below the under surface of the press plate **407** when the press plate is at the highest position and sends the inner case blank A which was fed by endless belts **383, 384** and others below the three-sectioned side bending device **40.** A lower templet at the back **410** and a lower templet at the front **411** are arranged in such a manner that they are slightly wider than the depth of the press plate **407.** Numeral **412** denotes a right-side lower mould, which bends the part ranging from the inner side of the ceiling (*h*) to the insert portion (*d*) along the ruled line between the back of bendable head (*i*) and the inner side of the ceiling (*h*) of the inner case blank A. Therefore, said right-side lower mould has a depth equal to that of the press plate **407.**

The intermediate transferring device **42** (FIG.15) receives the inner case blank A pushed out by the three-sectioned side bending device **40** into the mould yoke **421** and transfers it intermittently. The mould yoke **421** which is fixed open-sidedly by an endless chain **422** at regular intervals and extending over the whole circumference, has the depth equal to that of the back part (*q*), the width equal to the total width of the back part (*q*) and the back of bendable head (*i*) and the depth equal to that of the side (*m*) of the back part (*q*) of the inner case blank A. Its right side and left side are open. A guide plate **423** transfers the locking portion (*c*) pushed down upon bending of the three-sectioned side, along its underside, and at the same time holds the afore-mentioned mould yoke **421** horizontally.

The ceiling flaps bending device **43** (FIG.14) bends the ceiling flaps (a_1), (a_2) toward and in tight contact with the back of the inner side of the ceiling (*h*). A tucking-in plate **431** does circular motion with a pivot **432** as a fulcrum by a crank device connected to said pivot, whereby bending the ceiling flap (a_1). A doubling plate **433** is provided oppositely to the tucking-in plate **431.** The starting end **434** of said doubling plate starts with the backward curving. In Proportion to the advance of the mould yoke **421,** it gradually approaches the back of the inner side of the ceiling (*h*) and becomes parallel with the direction of the advance of said mould yoke, while keeping a gap corresponding to the width of the ceiling flaps (a_1), (a_2) between the inner side of the ceiling (*h*) and itself, and is connected to the immediate front of the ceiling bending device **46.**

The bottom flaps bending device **44** (FIG.15) is for bending still further the bottom flaps (b_1), (b_2) which have been bent and for resting them on the bottom part K accurately. A rod **441** gearing with the main axis X via the pulley and the bevel gear is provided above the afore-mentioned mould yoke **421.** To the extreme end of said rod is fixed a fan-shaped rotary plate **443,** which does rotation. A doubling plate **442** is provided, ranging from the bottom flaps bending device **44** to the front part bending device **49,** close to and in parallel with the endless chain **422.**

The ceiling outer side pasting device **45** (FIG.15) effects pasting on the under surface of the outer side of the ceiling (*g*). It is provided with a pasting roll **452** which is so designed as to be soaked in paste in the paste container **451.** A fan-shaped pasting plate **454** is fixed to the perpendicular axis **453** geared with said roll. Said fan-shaped pasting plate having the thickness almost equal to the width of the outer side of the ceiling (*g*), is so designed that it makes contact with the pasting roll **452** and also the under surface of the outer side of the ceiling (*g*) during rotation.

The ceiling creasing device **46** (FIG.16) creases the part ranging from the outer side of the ceiling (*g*) to the insert portion (*d*), along the ruled line between the inner side of the ceiling (*h*) and the outer side of the ceiling (*g*). A guide & bending rod **461** starts with the position near the ceiling outer side pasting device **45** and is positioned a little higher than the distance to the inner side of the ceiling (*h*)-flap (f_1) bent at a right angle to the back part. (*q*). It makes contact with the inside of the insert portion (*d*) in such a state that it is interposed between the pushed out interlocking flap (*e*) and the insert portion (*d*) and is curved downwardly and rightwardly by degrees in the direction of the advance of the mould yoke **421.** Under this arrangement, it bends the outer side of the ceiling (*g*)-insert portion (*d*) in perpendicular state toward the right side. A creasing rod **462** is pivotally secured, at its one end, to a roller **465** connecting to a grooved cam **464.** Provided at the other end of said creasing rod are a perpendicular part **466** which makes contact with the whole surface of the inner side of the ceiling (*h*) and a creasing mould **467** which bends and creases the part ranging from the outer side of the ceiling (*g*) to the insert portion (*d*) along the ruled line between the inner side of the ceiling (*h*) and the outer side of the ceiling (*g*). It is biased upwardly by means of a spring **468.**

The ceiling bending device **47** (FIG.17) bends the insert portion (*d*) toward the left at a right angle to the flap (f_1) and bends the interlocking flap (*e*) in the direction opposite to the insert portion (*d*). A L-shaped rod **471** is pivotted rotatably at its upper end and is fit-

ted with a press mould **473** having an obtuse-angled cut-in **472** as a presser of the interlocking flap (*e*) at its lower end. It is pivotally secured, at its intermediate part, to a coupling rod **474,** to which is connected a lever **477.** One end of said lever is fixedly rotatably to a roller **475** and the other end does reciprocating motion with a fulcrum **476** as a center. A cam **478** is fixed to the main axis Z and is forced to make constant contact with the roller **475** by means of a spring **479.** The main axis Z is provided separately from the main axis X. A fixing templet **480** makes a pair with the press mould **474** and does bending of the insert portion (*d*).

The device for bending sides of the front part **49** (FIG.17) bends the sides (*n*),(*n*) of the front part upwardly and perpendicularly to the front part (*l*) and at the same time ensures the crease at the ruled line (*p*) between the inner side of the ceiling (*h*) and the outer side of the ceiling (*g*). A cubic press mould **491** has the width and the depth corresponding to those of the front part (*l*). It is fitted with a L-shaped creasing plate **492** and a support plate **493** on either side. Said support plate **493** is fixed open-sidedly to a rising & falling rod **494,** whose lower end is pivotally secured to a coupling rod **496** through the medium of a shock absorber **495.** It is caused to do vertical motion by a cam **497** fixed to the main axis X and a roller **498** connecting to said cam. Accordingly, the afore-mentioned press mould **491** also does vertical motion. One end of the L-shaped creasing plate **492** is bent downward at right angles, whereby ensuring the creasing of the ruled line (*p*). A receiving mould **499** having a U-shaped section which fits the afore-mentioned press mould **491,** is fixed to a rising & falling rod **501** through the medium of a shock absorber **500.** The lower end of the rod **501** is pivotally secured to a link **502,** which carries at one end a roller **504** connecting to a cam **503** fixed to the main axis Y and is rotated by the action of said roller and a fulcrum **505,** causing the rising & falling rod **501** to do vertical motion. The press mould **491** and the receiving mould **499** are so adjusted as to engage with each other on the same plane as the back part (*q*).

The pasted part fixing device **51** (FIG.18) sticks the outer side of the ceiling (*g*), which has been pasted, to the inner side of the ceiling (*h*) with ceiling flaps (a_1), (a_2) therebetween and fixes them. A press rod **511** carries at one end a press mould **512** having a V-shaped section which comprises a plane part **513** to make face-contact with the inner side of the ceiling (*h*) when the press rod **511** reaches the lowest position by its circular motion and a point **514** which fits a bending line between the inner side of the ceiling (*h*) and the back of bendable head (*i*). The rising & falling rod **515** which gears with a conventional grooved cam is connected to the afore-mentioned press rod **511** through the medium of a coupling rod **516.**

The insert portion bending and inserting device **52** bends further the folded down portions (f_1),(f_2) which have been bent gradually by the before-mentioned guide & bending plate **461** from the perpendicularly upward bend to the downward bend and further to the perpendicularly downward bend by the ceiling bending device **47.** The guide & bending rod **461** which starts at the neighborhood of the ceiling outer side pasting device **45** extends to the front of the ceiling bending device **47.** At the back of said ceiling bending device, a guide plate **521** is arranged under the locking portion guide plate **423.** The starting end of said guide plate branches to an insert portion guide plate **523** which slants with its right side upward together with a folded down portions guide plate **522.** The starting end of said folded down portions guide plate is curved rightward and is so provided that folded down portions (f_1),(f_2) are inserted between said folded down portions guide plate and the locking portion guide plate **423.** It is so designed that the insert portion guide plate **523** is made gentle in its inclination by degrees, is made horizontal and is again made to slant with its left side upward, whereupon its position relative to the locking portion guide plate **423** is reduced. Thus, teh folded down portions guide plate **522** turns from its perpendicular state to the inclination with its right side upward and makes its angle of inclination gentle by degrees.

The left end of the insert portion guide plate **523** keeps the same level with the locking portion guide plate **423,** with a small gap therebetween. The left end of the insert guide plate **523** and the right end of the folded down portion guide plate **522** are also kept on the same level and maintain horizontally the mould yokes **421** supported open-sidedly by the endless chain **422.** The guide plate **521** has at its left end a notch **524,** which allows a triangular projection **525** to project downward and effects lifting of the interlocking portion (*c*). Then, the guide plate **521** is maintained horizontally and extends to the front of the last stage transferring device.

The front part bending device **53** (FIG.21) bends perpendicularly the front part (*l*) sent in horizontal state and put it upon the sides (*m*),(*m*) of the back part (*q*). A front part guide plate **531** arranged in parallel with the doubling plate **442** about its terminal end is formed in V-shape at its right end so that it is made easy to lift and guide the front part (*l*) of the inner case blank or it spreads out like an unfolded fan in the direction of advance, on the other hand, the doubling plate **442** is tapered to cope with the spreading out (like an unfolded fan) of the front part guide plate **531,** keeping a gap therebetween. A guide rod **533** is curved downward to the right side and an inner surface support rod **534** is provided horizontally below the right side of said guide rod.

The bendable head portion bending device **54** (FIG.22, FIG.23) effects pushing down of the bendable head portion in the case where it is necessary to put contents in the inner case and also effects levelling so as to make it easy to bend the bendable head portion along the ruled line (*o*). An inner case push-out mould **541** (FIG.21) does lateral reciprocating motion by the cam device connected to the coupling rod and has a horizontal surface **543** and a perpendicular surface **545,** the former presses the outside of the front part (*l*) from above and the latter makes contact with the outer surface of the bottom part (*k*). A bendable head push-down plate **546** (FIG.22) is geared with the cam device so that it does circular motion by being guided by the curved track, and with the advance of the inner case push-out mould **541,** it rises gradually. At the top of the bendable head push-down plate **546** is provided a pawl **547** which engages with the edge portion of the inner side of the ceiling (*h*). A levelling plate **548** is arranged in front of the bendable head push-down plate **546** and keeps the bendable head in pushed down state. The end of said levelling plate is curved outwardly so that it gradually approaches the ceiling flaps (a_1),(a_2).

The bendable head closing device **55** (FIG.**24**) is to close the bendable head which has been opened to insert proper contents therein. A return guide plate **551** is mounted vertically to the machine direction with its one end fixed to the right end of the guide plate **521** and gradually curves upward at the right side, reducing its width, and comes on the same plane as the guide plate **423**. As shown by FIG.**25**, the last stage transferring device **56** is to transfer the inner case set up through various preceding devices in the direction perpendicular to the preceding transferring direction so as to insert the set up inner case into the outer case. A guide bottom plate **561** which meets at right angles with the guide plate **521** is fixed in the same plane as said guide plate and an endless chain **562** is set in parallel with and above said guide bottom plate. Inner case support yokes **563** and front part pressing yokes **564** are provided at regular intervals, extending over the whole circumference of said endless chain which is driven by intermittent driving sprocket wheels. The inner case direction changing device **57** (FIG.**26**, FIG.**27**) is, after receiving the inner case fed from the last stage transferring device **56**, to change the direction of the inner case by the angle of 90°. Numeral **571** denotes a turntable which is made rotatable with a shaft **572** as the center. Numeral **573** denotes four inner case support means provided protrudingly and radially on the surface of the turntable **571**. Numeral **574** denotes a clutch which is put on the shaft **572** slidably in axial direction and carries an upward concave member **576** to fit with a downward convex member **575** under the surface of the turntable **571**. Numeral **577** denotes a clutch holding means which lightly holds the clutch from both sides of a groove **578** which is made annularly at the side of the clutch. Numeral **579** denotes a crank, to one end of which fixes said clutch holding means **577** and the other end of which is fixed to a rod **580** which makes reciprocating motion. Numeral **581** denotes a bearing of the rod **580** and numeral **582** is a cam having on its periphery an uneven curved cam groove **583**. Fitted rotatably in said cam groove **583** is a cam roll **585** which is secured on one end of an arm rod **584** whose end base end is fixed to the rod **580**. Numeral **586** denotes a gear which is mounted fixedly below the clutch **574**. Numeral **587** is a sector which is secured to a frame so that it may be engaged with the gear **586**. Numeral **588** denotes a coupling rod with one end thereof secured to the upper surface of the sector **587** and the other end secured to the upper surface of a gear **589**. Numeral **590** is a gear fixed around the same shaft as the cam **582** and makes meshing motion with the gear **589**. The operation of the above means is described hereinafter. The rotation of the cam **582** which is geared with the main shaft X causes oscillatory motion of the cam roll **585** along the curved line of the cam groove **583**, which causes the arm rod **584**, the rod **580** and the crank **579** to make reciprocating motion, causing vertical movement of the clutch holding means **577** and thereby making the convex member **575** at the back of the turntable **571** engage with or disengage from the concave member **576** at the surface of the clutch **574**, at a certain spaced period. On the other hand, the rotation of the gear **590** which rotates on the same shaft as the cam **582**, causes rotation of the gear **589** engaged therewith and accordingly causes the reciprocating motion of the coupling rod **588**, which induces the reciprocating motion of the sector **587** and as a result which causes the accurate one fourth rotation of the turntable **571** at the desired intervals and speed in order to effect an engagement of the clutch **574** during each reciprocating motion of said sector. Numeral **591** denotes a shaft of the cam **582**, on which shaft an eccentric cam **592** is provided in addition. Numeral **593** is a cam roll which makes contact with said cam **592** and numeral **594** denotes a lever which carries at one end the cam roll **593** and a projected pawl **596** at the other end, with its center secured at a fulcrum **595**. Numeral **597** is a spring which is so provided as to pull a free end of the lever **594** outwardly. Numeral **598** denotes a control disk below the turntable **571**, which control disk has an engageable recess **599** on its periphery and is provided at such a position as to be controlled by the pawl **596**. The pawl **596**, at the end of the lever **594** of the roller **593** which makes contact with the eccentric cam **592**, engages with the recess **599** when a longer diametric portion of the eccentric cam makes contact with the roller, whereby ensuring locking of the turntable **571** after its one-fourth revolution.

The outer case blanks feeding device **60** (FIG.**28**) feeds outer case blanks B piled up flat one by one and forms them into tubes, cooperatively with the rectangular tube forming device **61** shown by FIG.**29**. An outer case blank supporting yoke **601** is provided with four angle bars set upright, in which flat folded outer case blanks B are piled. Two push-out reciprocating rods **602** are so provided that they are in parallel with each other and make contact with the lower face of the lowermost outer case blank B and make continuous reciprocating motion by a cam train. A stepped portion **603** faces the rear end of the piled outer case blanks B on retreating of the upper face of said rod **602** and the tip of the rod **602** is adapted to feed the outer case blank B to the next process upon its forward drive. Two guide rods **604** provided fixedly in parallel with each other and along the side of the rod **602**, act as rails for the rod **602** and have a depressed portion **605** at a position where the rear end of the outer case blank B in the intermediate drive comes. Thus, the blank B pushed out by the stepped portion **603** of the rod **602** falls onto the depressed portion **605** when it is driven forward to said depressed portion and rests there temporarily. At this time, the tip of the rod **602** lies at a far forward position and drives forward the preceding outer case blank B resting at the depressed portion **605** to feed it to the next process.

The condition of the utmost forward drive of the reciprocating rod **602** is as described before. After the utmost forward drive, the rod retreats by itself, leaving behind a blank B at the tip portion and another blank B at the intermediate portion. When the stepped portion **603** comes back to the rear end of the outer case blank B, the rod discontinues its retreat and resumes forward drive, whereupon the stepped portion **603** pushes, at the tip, the blank B and the rod **602** pushes the preceding blank B resting temporarily on the depressed portion **605** to the desired position. Every blank B stops and rests temporarily at said portion **605** and loses support by the rod **602** when the rod **602** retreats to the utmost. By repetition of the above process, outer case blanks B are fed to the desired portion one by one. Numeral **606** is a spring which supports the blank from above and lead it to the proper place.

The rectangular tube forming device **61** (FIG.**29**) is to form the flat folded outer case blank B into a rectan-

gular tube and transfer said tube to a conveyer. A press bar **612** having at its tip a wedge-shaped notch **611** is provided in such a manner that it is enabled to make reciprocating motion by a link mechanism, whereby an outer case blank B is pushed forward as it is caught by the tip of the bar.

Provided ahead the bar **612** is a ⇀ shape guide yoke **613** which is connected to a L-shaped push-up bar **614** for making vertical motion. Secured to said push-up bar is a vertically oscillating bar **615** which makes vertical motion by a link mechanism **617** gearing with a cam **616** fixed to the main axis X. The ⇀ shape guide yoke **613** is provided with a longitudinal groove in which a L-shaped guide yoke **618** is fitted to make circular motion as it is crossing said guide yoke. The L-shaped guide yoke **618** is connected to a fulcrum **619**, to which is connected a lever **620** which oscillates, supported by a roller **622** at the end of a fixed yoke **621** mounted above said lever. A conveyer chain **624** to be driven by a sprocket **623** is arranged in order to transport outer cases set up in rectangular form. Said conveyer is provided with a pawl **625** at a certain spaced relationship in order to transfer the outer cases intermittently.

The shaping device (FIG.**30**) is to shape an outer case by folding an outer case blank over so as to remove the dynamical stability of the case to return to its original flat shape. Numeral **641** is a shaping belt which is arranged at the left side of the machine direction of a conveyer chain **624** and is driven by belt pulleys **642** and **643**, rotating axis of which are perpendicular to each other.

While the front belt pulley **642** has its rotating axis in the vertical direction, the rear belt pulley **643** has its rotating axis in the horozontal direction. Provided at the intermediate of the shaping belt **641** is a press roller **644**. The outer case blank B which has been formed into a rectangular tube is gradually pressed by the shaping belt **641** while it is being transferred as it is caught by a pawl **625** of the conveyer chain **624**. Thus, the rectangular tube is freed from strain. The drawing out device **65** (FIG.**30**) is to catch and draw forward the rectangular tube which has been fed by the conveyer chain. Conveyer chains **624** are arranged in several rows, starting from the rectangular tube shaping device **61** to the shaping device **64**, and are provided with pawls **625** at regular intervals over the whole circumference. Numeral **651** is a support bottom plate and a guide groove **652** is provided at the center thereof, in the machine direction. Provided in said guide groove are a holding means **653** and a sleeper **654** which are adapted to slide up and down in a pair. The outer case B is drawn forward as it is held between said holding means and said sleeper.

The push-out device **67**(FIG.**30**) is to push out the draw-out rectangular tube for outer case in a direction at a right angle to the drawing device, during which an interlocking flap of outer case (*s*) is folded toward the inside of the rectangular tube. A support bottom plate **671** is provided on the same plane as the afore-mentioned support bottom plate **651** at a right angle thereto. Slidably provided at said support plate **671** is a push-out bar **672** which moves back and forth by crank. Toward the forward right side of the push-out bar **672**, is arranged an interlocking flap guide plate **673**, which leads to the interlocking flap folding device **68**. The pushout bar **672** feeds the outer case B, at one stroke, to the interlocking flap folding device **68**. The interlocking flap guide plate **673**, which has a cut of curved surface gradually uprising in the machine direction, folds the outer case interlocking flap (*s*) vertically.

The interlocking flap folding device **68** (FIG.**31**) is to fold the interlocking flap which stands upright toward the inside of the outer case. A L-shaped push-up rod **681** is rotatably supported by a shaft with one end thereof as a fulcrum. Rotatably connected to the intermediate of the device **68** is a coupling rod **683** linked with a cam **682**. A circular arc-shaped plate **684** is fixed to the top of said L-shaped push-up rod, which makes circular motion in accordance with vertical motion of the coupling rod **683**.

The insert device **69** (FIG.**32**) is to insert a set up inner case into a set up outer case. An endless chain **691** is provided with an inner case support rod **693** and an inner case press rod **692** at a certain spaced relationship respectively, over the whole circumference.

For the outer case B, a guide pawl **694** is supported rotatably by a bolt **695** at the left end thereof and is pulled outward to a slight degree by means of a spring **696** and the other end of said pawl is curved inward to a slight degree.

As described hereinbefore, the present invention makes it possible to set up automatically a paper case, wherein the head portion or lid portion of the inner case bends outwardly on opening by pushing the bottom of the inner case and particularly makes it possible to save much labor, compared with the known method, owing to the complete automation of processes, such as turning up and down of the part ranging from the outer side of the ceiling (*g*) to the insert portion (*d*) and inserting of said insert portion into a locking portion which have hitherto been done manually.

What I claim is:

1. A method of setting up the paper case with an inner case whose head or lid portion bends to one side on opening, comprising an inner case setting up process wherein inner case blanks cut in the desired shape and having ruled lines and cut-ins for forming interlocking flaps and a locking portion (*c*) are transferred intermittently, during which folding up and down at ruled lines are effected, the locking portion is led under a guide plate and an insert portion (*d*) is led from the lower side to the upper side of said guide plate and is inserted between the back part (*q*) and the locking portion (*c*); an outer case setting up process wherein the outer case blank having an interlocking flap to engage with an interlocking flap of the inner case is formed into a rectangular tube, the interlocking flap of the outer case is folded inwardly and the rectangular tube is turned back into a form of lozenged section to remove the dynamical stability of the outer case blank for proper shaping of the outer case; and a final setting up process wherein the set up inner case is inserted into the outer case and the completed paper case is transferred to the desired position.

2. A method of setting up the paper case with an inner case whose head or lid portion bends to one side on opening as defined in claim **1**, wherein the inner case setting up process includes the step of changing direction of the inner case by an angle of 90° to be joined to the afore-mentioned outer case.

3. Apparatus for manufacturing the paper case with an inner case whose head or lid portion bends to one side on opening, comprising the combination of an ap-

paratus for setting up the inner case including an endless conveyor to support inner case blanks thereon and feed them out one by one, an intermittent transferring device connected to said conveyer, an inner case blanks storage arranged above and in front of said conveyor to store therein inner case blanks in piled conditions, an inner case blanks feeding device to feed inner case blanks onto the conveyer one by one from said storage, a folding device arranged along the conveyor to fold each part of the inner case blank, a guide plate arranged along the conveyer to turn up and down the outer part of the ceiling (g) and adjacent fold-down portions (f_1) and (f_2), a guide plate for a locking portion (c), a doubling plate for the bottom part (k) and a guide rod for the front part (l); and apparatus for setting up the outer case including an outer case blanks storage to store therein flat folded outer case blanks in piled conditions, an outer case blanks feeding device to push out outer case blanks from the underside of said outer case blanks storage, an outer case blanks guiding device, an outer case blank shaping device to open out the outer case blank into a rectangular tube, an outer case shape correcting device to turn back the rectangular tube into a form of lozenged section and an outer case interlocking flap folding device; and an apparatus for inserting the set up inner case into the set up outer case and transferring the completed paper case to the desired position.

* * * * *