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METHOD AND APPARATUS FOR FOLDING CARTON FLAPS

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2 Sheets-Sheet 1

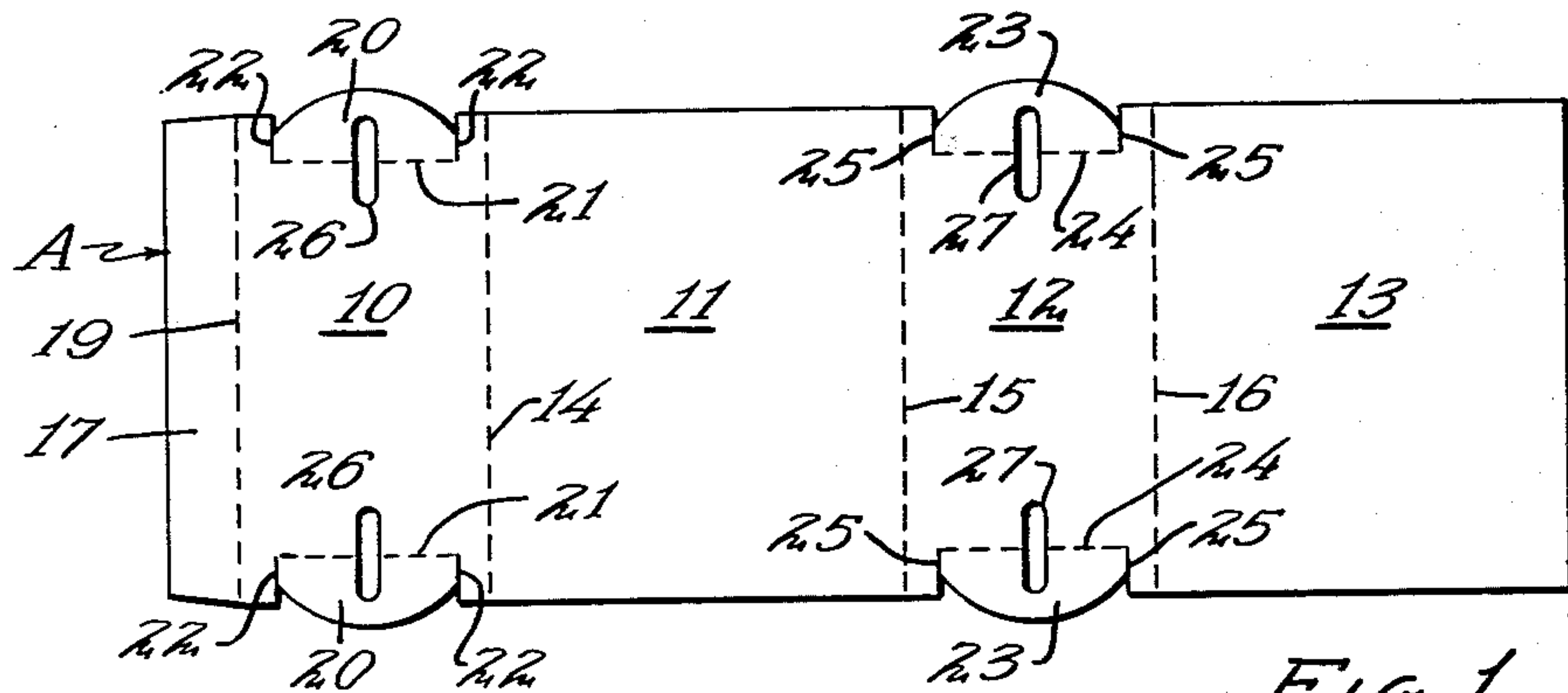


FIG. 1

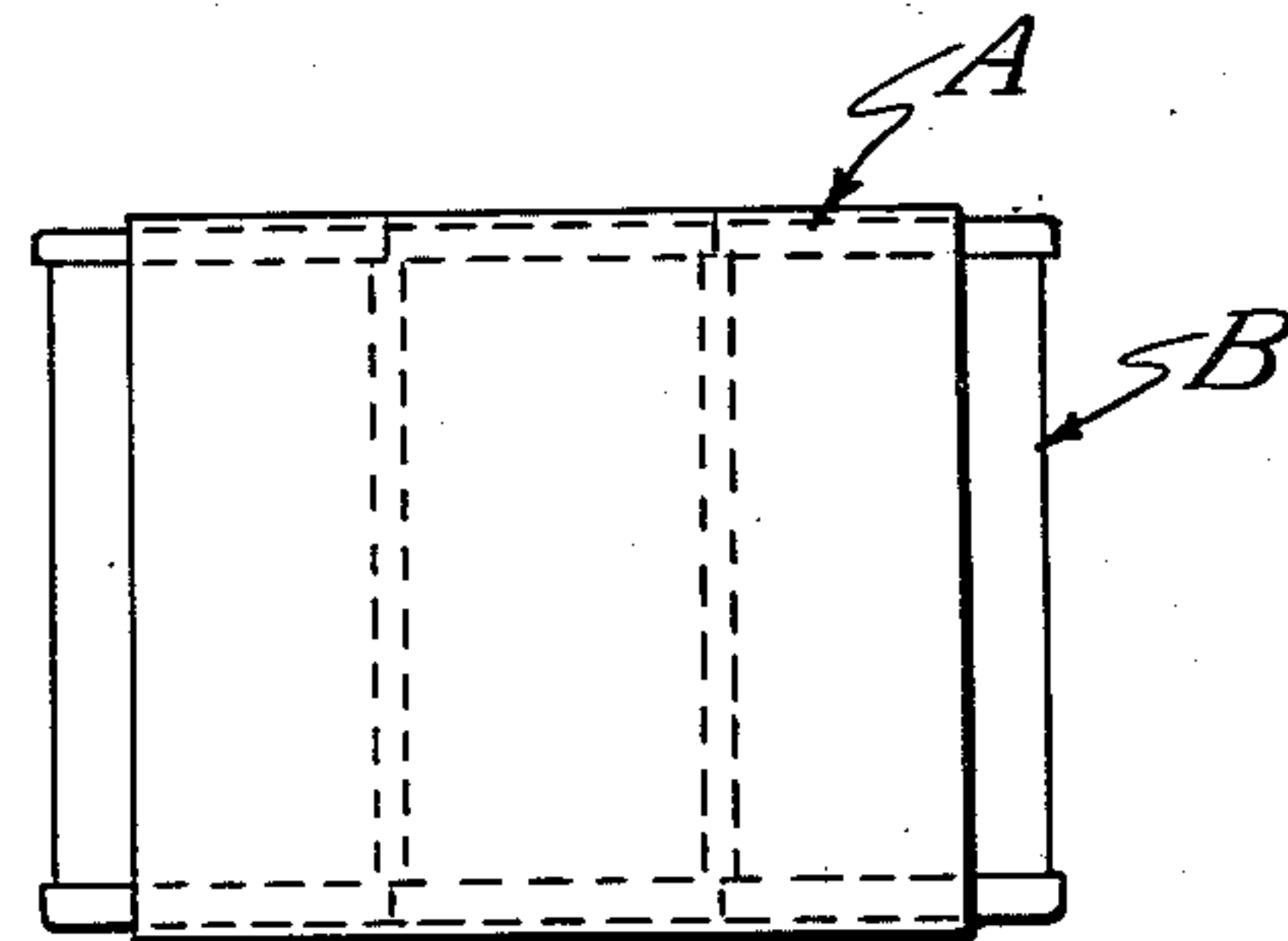
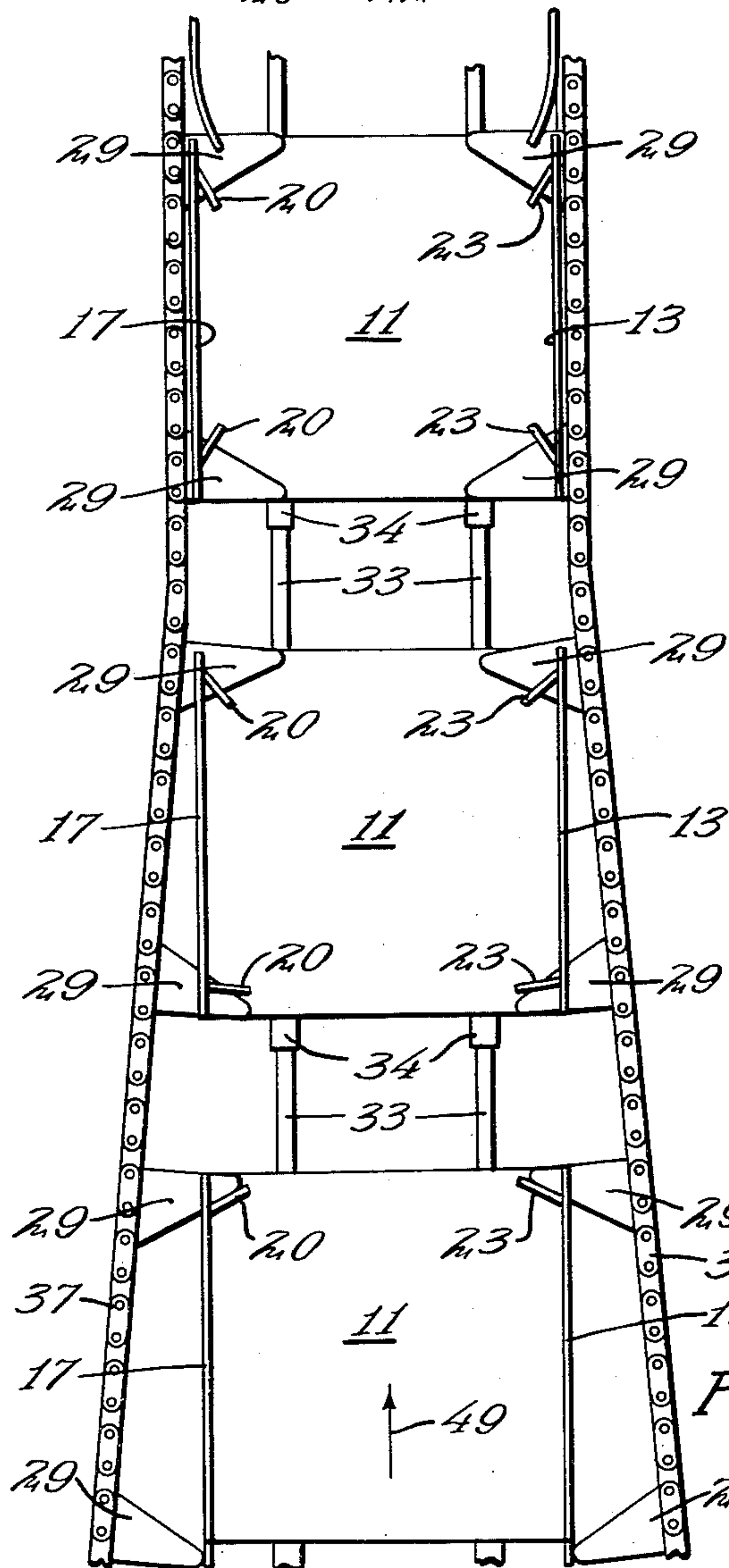


FIG. 2

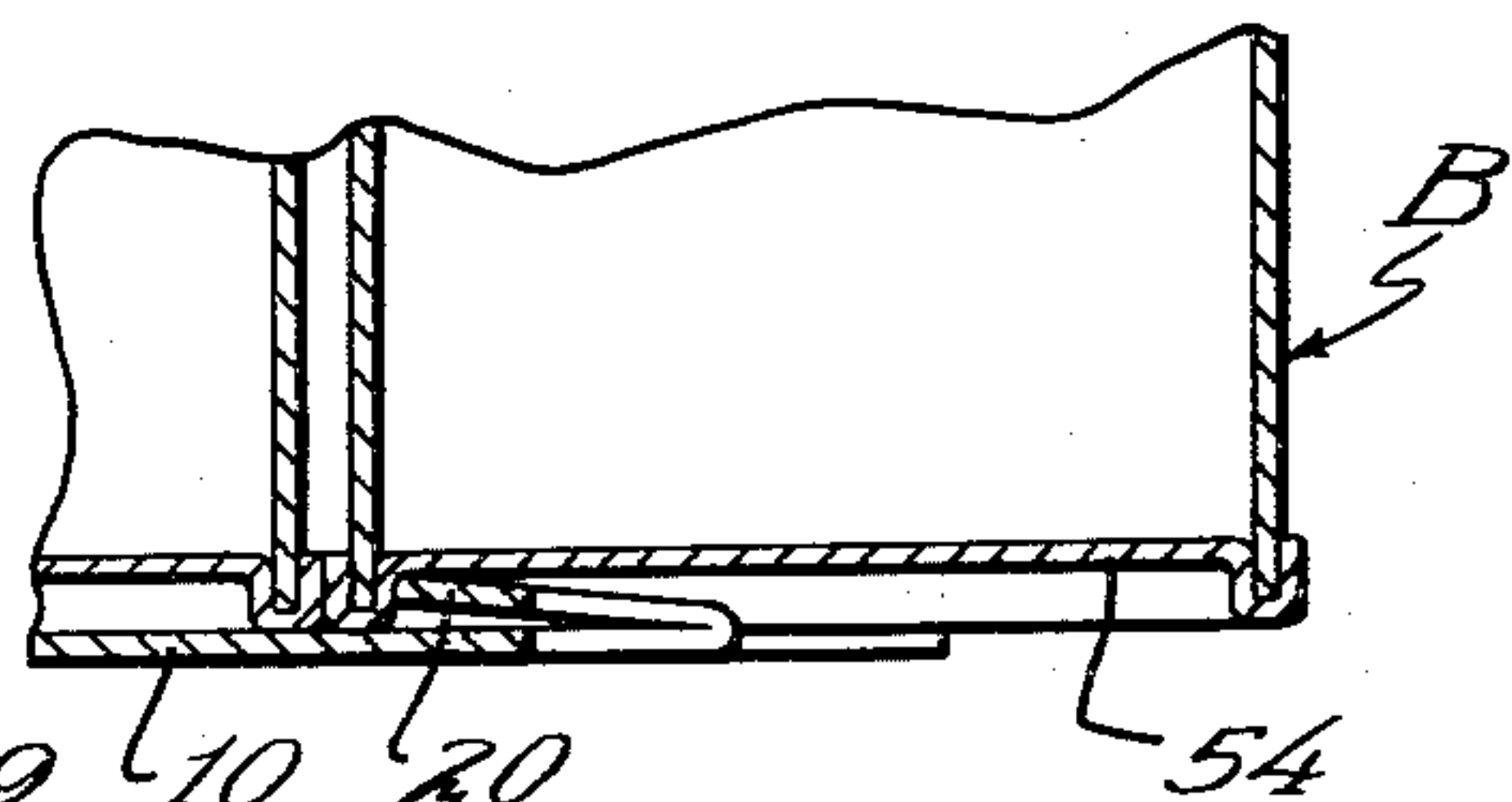


FIG. 3

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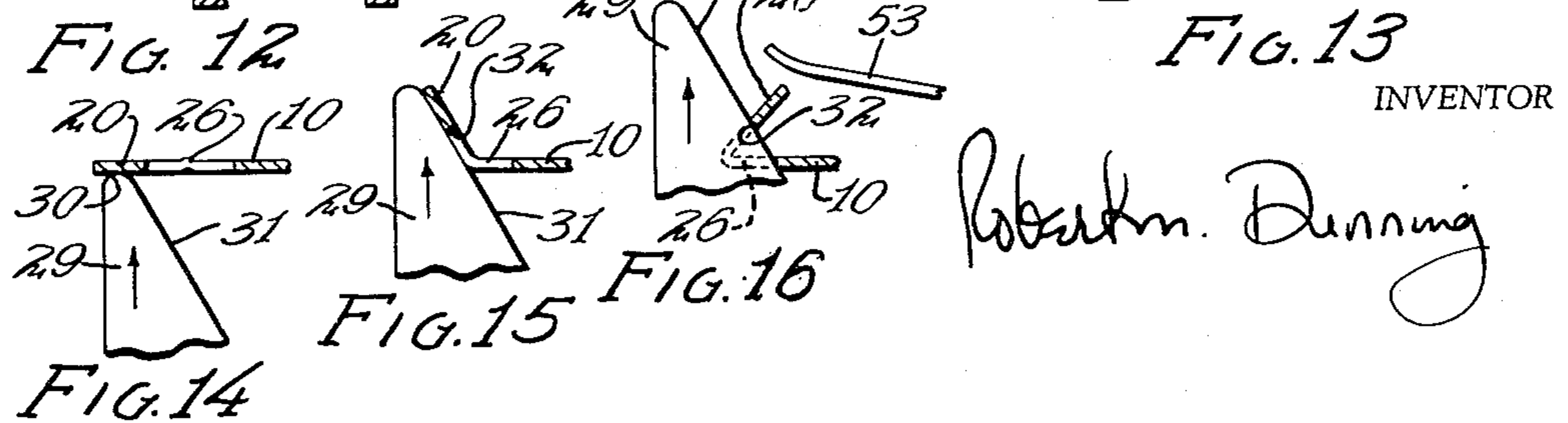
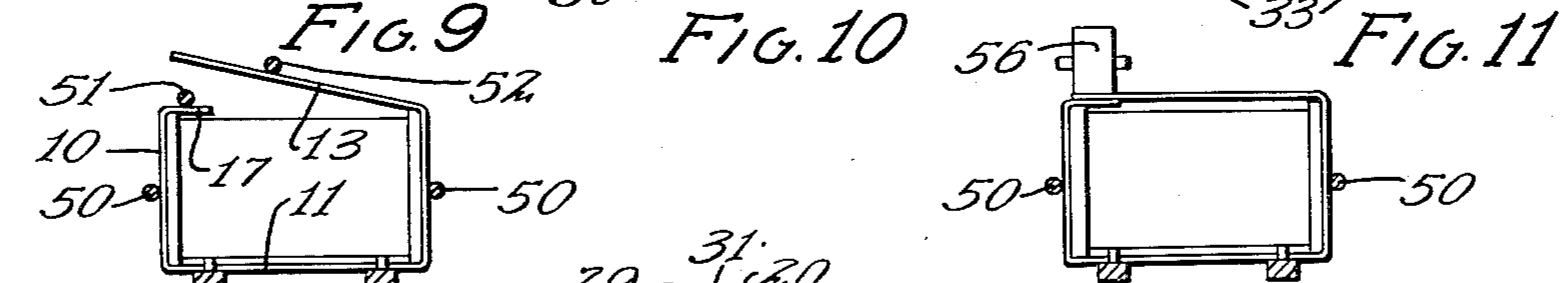
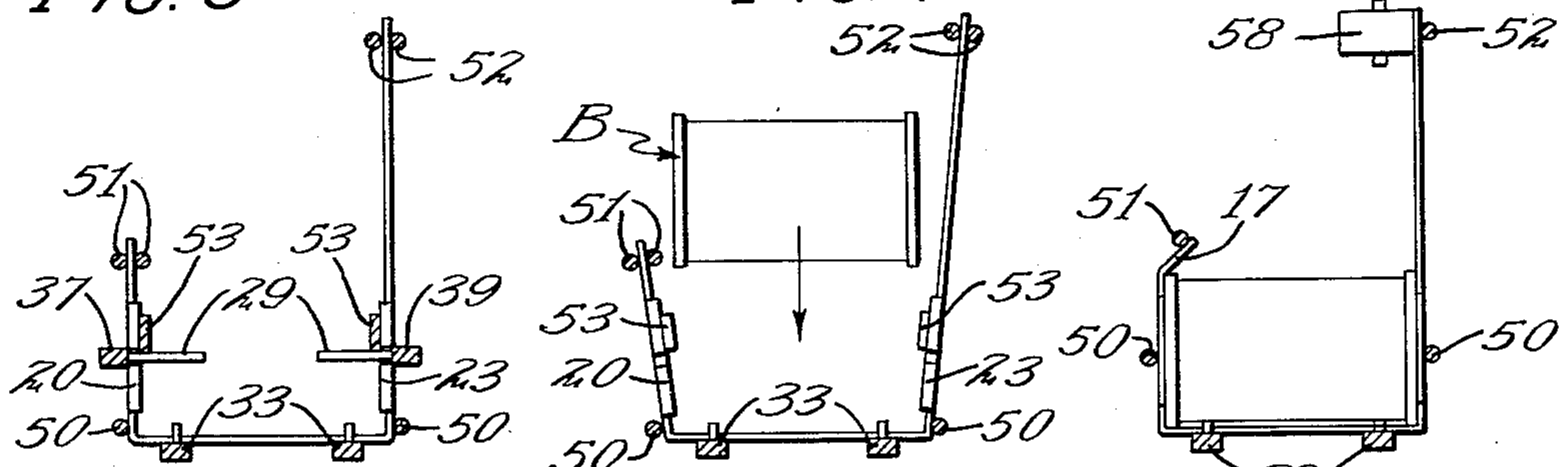
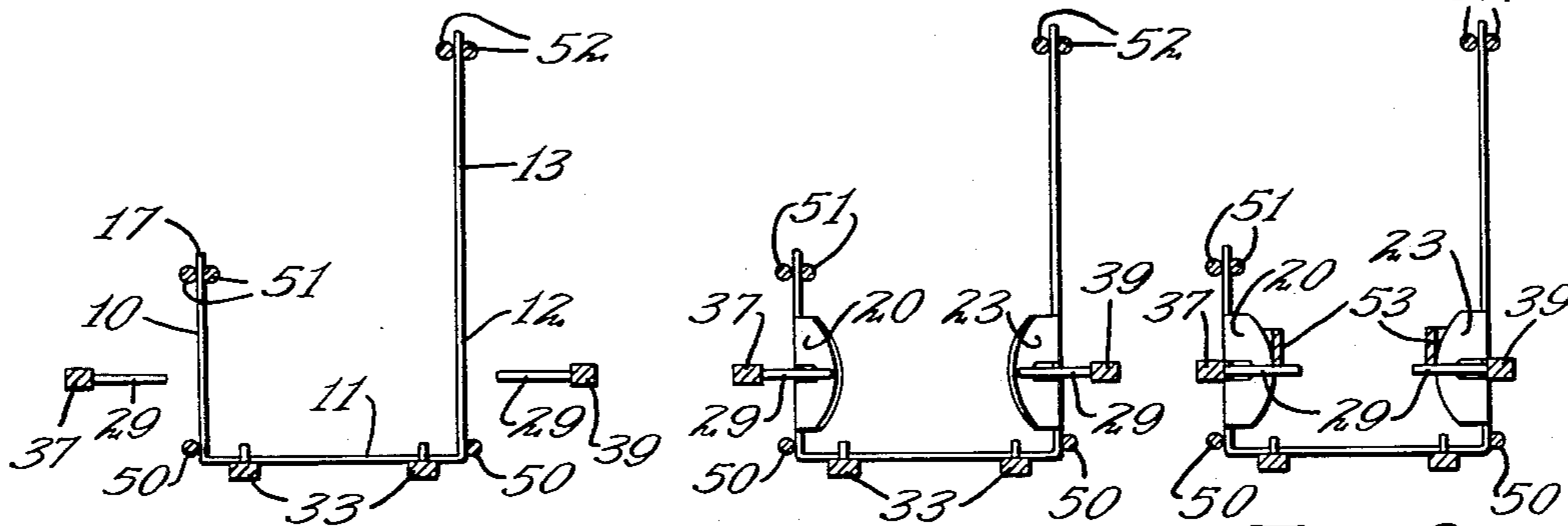
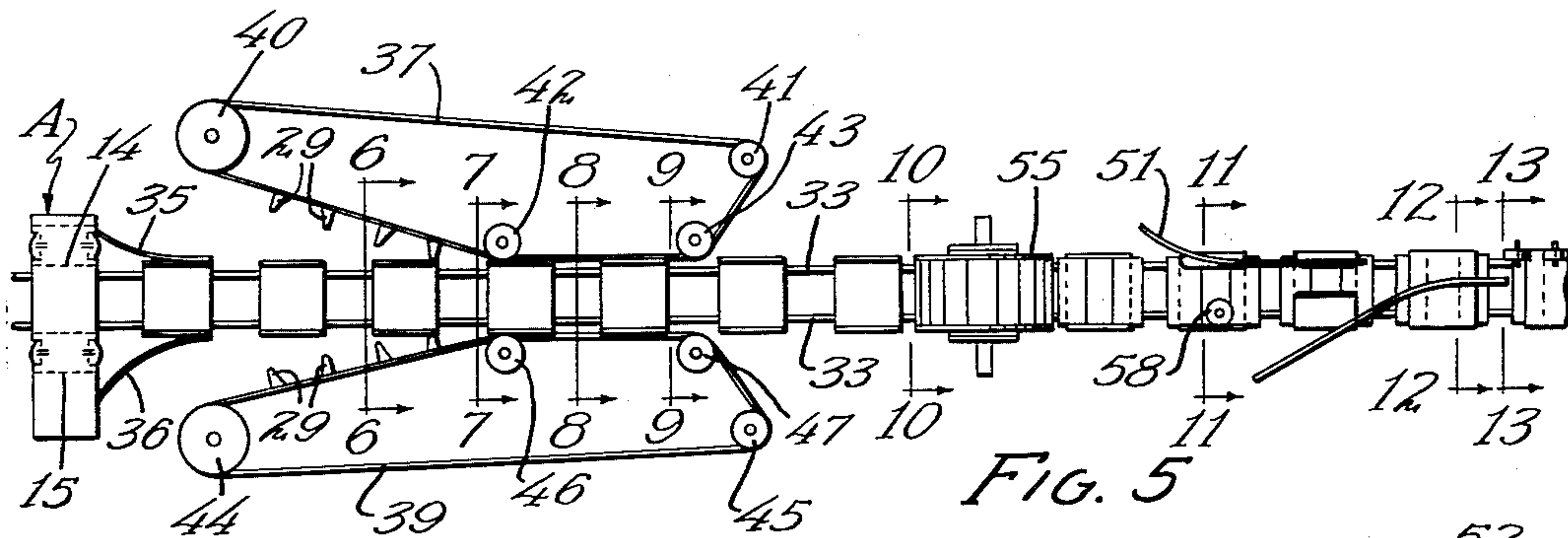
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2 Sheets-Sheet 2



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## METHOD AND APPARATUS FOR FOLDING CARTON FLAPS

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6 Claims. (Cl. 93—49)

This invention relates to an improvement in method and apparatus for folding carton flaps and deals particularly with a means of folding the flaps more than 90° with a linearly moving folding means.

In certain carton structures it is necessary to fold flaps or tabs through an angle of more than 90°. Such an arrangement usually requires either pivotally mounted flap folding means or a plurality of linearly moving folding means. It is an object of the present invention to provide a simple means of accomplishing the result with a single linear movement.

During recent years the use of cartons for containing cans became very popular. Many of these cartons are in the form of sleeves having hinged flaps or tabs at opposite ends of the sleeve which are folded back into the sleeve in order to engage the chimed ends of the cans, thus holding the cans from movement from the end of the sleeve. Sleeves of this type are usually filled on complicated filling machinery which is extremely expensive to produce. One of the functions of the machinery is to fold the tabs through an angle of 180° so as to lie inwardly of an adjoining part of the wall from which they are hinged. In some instances, the flaps are folded approximately 90° and then a blade is inserted in each end of the carton which folds the flaps the remaining distance. The cans are then inserted between the blades and the blades withdrawn while the cans are held in place, the flaps then springing back to engage the ends of the cans. While this type of machinery functions very effectively where the cost of the installation is warranted, it is desirable to have a somewhat simpler mechanism for use in smaller plants where the cost of expensive machinery is not warranted. An object of the present invention resides in the provision of a simple apparatus which can be constructed at relatively low cost.

A feature of the present invention resides in the provision of a flap hingedly connected to a carton panel and to provide an aperture or slot which intersects the fold line connecting the flap to the panel. When such an arrangement is provided, it is possible to fold the flaps through an angle of considerably more than 180° by a linear movement. A wedge shaped folding member engages the end of the flap outwardly of the aperture and folds the flap to the acute angle of the folding surface.

Further inward movement of the inclined surface causes the folding member to enter the aperture and to engage an edge of the aperture and to thereby cause the flap to be folded through perhaps 145°. From this position, the flaps may be engaged by a folding member inwardly of the carton panel and the flaps may be folded flat against the panels to which they are hinged.

A feature of the present invention resides in the provision of a simple and effective means for folding one or a plurality of flaps, the apparatus which is diagrammatically shown being designed to form a can sleeve having four flaps which must be folded back upon the adjoining portions of the panels from which they are folded.

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Obviously, however, the same arrangement can be used for folding one flap or a considerable number of flaps.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of the specification.

Figure 1 is a diagrammatic view of a form of blank embodying the present invention.

Figure 2 is a side elevational view of the completed sleeve enclosing a series of cans.

Figure 3 is a sectional view through a portion of the sleeve and through an end can of the series showing the manner in which the tabs engage the cans.

Figure 4 is a diagrammatic plan view of a portion of the apparatus for folding the flaps, this figure showing the manner in which the flaps are engaged and folded.

Figure 5 is a diagrammatic top plan view of the sleeve forming apparatus, the guide rails having been omitted so that the construction may be better understood.

Figure 6 is a diagrammatic end view of the blank and diagrammatic sectional view of the apparatus on the line 6—6 of Figure 5.

Figure 7 is a diagrammatic sectional view through the apparatus showing a subsequent stage in the folding operation.

Figure 8 is another diagrammatic sectional view through the apparatus of the point 8—8 of the Figure 5.

Figure 9 is a diagrammatic section at the point 9—9 of Figure 5.

Figure 10 is a diagrammatic section at the point 10—10 of Figure 5.

Figure 11 is a diagrammatic section on the line 11—11 of Figure 5.

Figure 12 is a diagrammatic section at the point 12—12 of Figure 5.

Figure 13 is a diagrammatic section at the point 13—13 of Figure 5.

Figure 14 is a diagrammatic view showing the manner in which the folding means engages the carton flap.

Figure 15 shows the folding means after it has partially folded the flap.

Figure 16 shows the folding means at the completion of its folding operation. The type of blank with which the apparatus may be used is shown at A in Figure 1 of the drawings. The blank includes an end panel 10, a side wall panel 11, end panel 12, and a side wall panel 13 connected along parallel fold lines 14, 15, and 16 respectively. A glue flap 17 is foldably connected to the panel 10 along a fold line 19. This glue flap 17 is designed to overlap the panel 13 and be secured thereto in the finished form of the carton.

The end panel 10 is provided near opposite ends thereof with flaps 20 which foldably connected thereto along fold lines 21. The fold lines 21 are oftentimes offset inwardly from the edge of the blank, the ends of the fold line being connected by cut lines 22 to the adjoining blank edge. This arrangement is provided to insure the fact that the sleeve extends to the center of the last can of the series. In other instances, the flaps 20 are cut from the end wall so that the ends of this end wall extend beyond the tabs. The present construction is adaptable to either such form of construction.

The end panel 12 is likewise provided with a pair of tabs 23 which are foldably connected thereto along fold lines 24. In the particular arrangement illustrated, the ends of the fold lines 24 are connected to the adjoining edge of the blank by cut lines 25. The tabs 20 and 23 are provided with arcuate edges which are designed to engage against the chime of the can when the carton is in use.

As is also indicated in Figure 1, the panel 10 is provided with a pair of apertures or slots 26 which intersect



the fold lines 21 and which extend a substantial distance on each side of the fold line. In the particular arrangement illustrated the slots extend an equal distance on each side of the fold line although this is not essential to the operation. Panel 12 is similarly provided with a pair of slots 27 which intersect the fold lines 24 and extend on opposite sides thereof. While the shape of the apertures 26 and 27 may be varied, the use of elongated slots which are elongated in a direction at right angles to the fold lines which they intersect is preferred as this arrangement provides the necessary carton openings without removing excessive paperboard, thus not weakening the flaps to any material extent.

The manner in which the flaps 20 and 23 may be folded beyond a 90° angle is best illustrated in Figures 14 through 16 of the drawings. These figures show a wedge shaped folding member 29 which moves in a direction at substantially right angles to the plane of the panel 10 or 12 to which the flap is connected. The folding member 29 is preferably provided with a rounded extremity 30 and is also provided with a folding surface 31 which extends at an acute angle to the plane of panel 10. Accordingly, when the end 30 of the folding member 29 is pressed against the extremity of the flap such as 20 and moved in a direction normal to the panel 10, the flap 20 is first folded to the plane of the folding surface 31 as indicated in Figure 15 of the drawings. Further inward movement of the folding member 29 causes the surface 31 to act as a cam surface engaging the edge 32 of the slot 26 and folding the flap 20 well beyond a right angular position. By arranging the surface 31 at the proper angle, it is possible to fold the flap 20 throughout substantially 135°.

A typical apparatus for forming the cam sleeve is illustrated in the drawings. The flap blanks in the form illustrated in Figure 1 of the drawings are placed upon a moving conveyor such as is indicated by the conveyor chains 33. These chains 33 have lugs 34 thereupon at predetermined intervals, the lugs being engageable with an edge of the blank such as the edge of the panel 11. As is diagrammatically illustrated in Figure 5 of the drawings the blanks are folded along the fold lines 14 and 15 by the folding horns 35 and 36 so that the carton blank is in U-shaped form as is indicated in Figures 6 through 10 of the drawings with the panel 10 and the glue flap 17 extending upwardly from one edge 14 of the panel 11 and with the panels 12 and 13 extending upwardly from the other edge 15 of the panel 11.

A pair of conveyor chains 37 and 39 are mounted on opposite sides of the conveyor chains 33 supported by pulleys mounted upon substantially vertical shafts. Pulleys 40 and 41 are spaced a considerable distance laterally of the conveyor chains 33 while intermediate pulleys 42 and 43 extend in close relation to the panel 10 of the blank, the pulleys 40, 41, 42, and 43 acting to support the conveyor chain 37. The conveyor chain 39 is similarly supported by a pair of pulleys 44 and 45 which are spaced a substantial distance laterally of the path of movement of the carton blank while intermediate pulleys 46 and 47 which are in opposed relation to the pulleys 42 and 43 extend substantially into contact with the panel 12 of the carton during movement of the blank. The conveyor chains 37 and 39 support opposed pairs of lugs 29 of the type previously described. These conveyor chains 37 and 39 move in timed relation to the conveyor chains 33 and as a result, the lugs 29 are gradually forced against the tabs 20 and 23 to first flex these tabs inwardly from the position shown in Figure 14 to the position shown in Figure 15 and then to fold the flaps to an acute angle from the panels to which they are hinged as indicated in Figure 16.

Figure 4 of the drawings shows the manner in which the conveyor chains 37 and 39 shows the manner in which the lugs 29 gradually engage the ears 20 and 23 to fold them inwardly. The conveyor chains 33, 37, and 39 are

moving toward the top of the view in the direction of the arrow 49. As the conveyor chains 37 and 39 converge toward the sides of the carton blank, they gradually engage the various tabs to fold them inwardly in the manner shown in Figure 4 of the drawings.

Figure 6 of the drawings diagrammatically illustrates the manner in which the blank is carried by the conveyor chains 33 between side guides 50, the sides of the blank being held in upright position by a pair of inner and outer guide members 51 engaging the glue flap 17 and a second pair of inner and outer guide members 52 engaging the inner and outer surfaces of the panel 13. Figure 7 diagrammatically illustrates the blank just after the lugs 29 have engaged the flaps 20 and 23 to start the folding action. Figure 8 shows a subsequent position of the ears 20 and 23 after they have been folded into an acute angle with respect to the panels to which they are hinged, the flaps then being in the position illustrated in Figure 16 of the drawings. At this point folding horns 53 are supported above the level of the lugs 29 against which the edges of the flaps 20 and 23 engage, the folding horns 53 preventing the flaps 20 and 23 from unfolding toward their original position. These folding horns 53 are curved so as to fold the flaps 20 and 23 into substantial contact with an adjoining portion of the panels from which they are hinged. When in this position, the blank is in the condition illustrated in Figure 9 of the drawings. At this point, the conveyor chains 37 and 39 diverge away from the path of travel of the carton blank and are withdrawn, the folding horns 53 still maintaining the flaps 20 and 23 in their folded condition.

As indicated in Figure 10 of the drawings a plurality of cans B having chimed ends 54 are fed into the blanks as from a pocketed wheel 55 diagrammatically illustrated in Figure 5. The wheel 55 rotates in timed relation to the conveyor chains 33 and carries the cans into position upon the panel 11 of the blank. As is indicated in Figure 10, the guides 51 and 52, as well as the folding horns 53 are bent outwardly slightly at this point to admit the cans B between the guides and between the folding horns 53. For example if the sleeve is to contain three cans, the wheel 55 deposits three cans upon the blank, the rearmost can being engaged by the lugs 34 on the conveyor chain 33 to carry the cans in unison with the blank. The foremost can B of the series has its chimed end in registry with the edge of the inturned flaps or tabs 20 and 23 at the leading edge of the blank and the rearmost can of the series is in registry with the inturned flaps 20 and 23 at the trailing edge of the blank. Figure 3 of the drawings indicates the manner in which the inturned flaps such as 20 engages the chimed end 54 of the can B.

Once the cans are in place, the folding horns 53 terminate and the inner of the guides 51 and 52 also terminate. The outer guide 51 is curved to fold the glue flap 17 downwardly to overlie the cans at one end thereof. The inner surface of the panel 13 is engaged by a glue roller diagrammatically illustrated at 58 in Figure 11 of the drawings to apply a strip of glue thereto. The side guides 50 are also elevated at this point so as to hold the panels 10 and 12 against the opposite ends of the cans B.

As indicated in Figure 12 of the drawings, the panel 13 is then folded downwardly along the fold line 16 and the guide 51 is discontinued as the edge of the panel 13 folds over the flap 17. As is diagrammatically illustrated in Figure 13 of the drawings, the sleeve then passes beneath pressure rollers 56 which supply the necessary pressure to adhere the edge of the panel 13 to the glue flap 17. The apparatus has been diagrammatically shown as the details of construction may vary considerably. In place of adhering the glue flap in the manner illustrated, locking tongues may be provided which inter-engage the parts 13 and 17 together. Perhaps the most important elements of the combination comprise the engagement of the flaps 20 and 23 by the lugs or folding members 29



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to fold the flaps beyond 90°. The flaps are then folded into substantial surface contact with the panels to which they are hinged and the cans are inserted while the flaps are thus folded so that the flaps or tabs engage in the chimed ends of the cans.

In accordance with the patent statutes I have described the principles of construction and operation of my carton blank and method of folding the same, and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. The method of folding carton flaps beyond ninety degrees, the carton including a carton panel and a flap hingedly connected thereto, the carton having an aperture intersecting the fold line connecting said flap and said panel, the flap folding method employing a folding member having a folding surface arranged at an acute angle to the plane of the panel, the method including the steps of moving the folding member against the flap at a point outwardly of said aperture in a direction at right angles to said fold line, moving said folding member in a direction normal to the plane of the panel to fold said flap inwardly, continuing said inward movement until said folding surface enters said aperture, said folding surface engaging the edge of said flap adjoining said aperture and thereby folding said flap substantially beyond ninety degrees.

2. The method of claim 1 and including the steps of moving said carton and folding member in unison in a direction substantially at right angles to said fold line during said folding operation.

3. The method of claim 2 and including the further step of engaging said flap when folded past ninety degrees and guiding said flap into surface contact with the carton panel.

4. An apparatus for folding a carton flap past ninety degrees the carton including a panel and a flap hingedly

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connected thereto along a fold line, the carton having an aperture therethrough intersecting said fold line and extending on opposite sides thereof intermediate the ends thereof, the apparatus including a lug having a folding surface arranged at an acute angle to said carton panel, means supporting said carton with said flap in the path of movement of said lug, means movably supporting said lug for movement in a direction substantially normal to the panel whereby movement of said lug will engage said flap outwardly of said aperture to fold the flap inwardly to the plane of said folding surface, continued movement of said lug causing said lug to engage an edge of said flap adjoining said aperture and to continue the flap folding beyond ninety degrees.

5. The structure of claim 4 and including means engaging said folded flaps to keep them from unfolding.

6. A carton folding apparatus for folding a carton flap past ninety degrees, the carton including a panel and a flap hinged thereto along a fold line, said carton having an aperture therein intersecting the said fold line and extending into said panel and said flap, the apparatus including a lug having a folding surface arranged at an obtuse angle to the panel surface and supported for movement toward said flap, said lug having an end engageable with a portion of the flap outwardly of said aperture to fold the flap to an obtuse angle to said panel, said lug folding surface entering said aperture upon continued movement of said lug, against said flap and engaging the edge of the aperture nearest the free end of the flap to fold the flap past ninety degrees.

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