

Sept. 29, 1953

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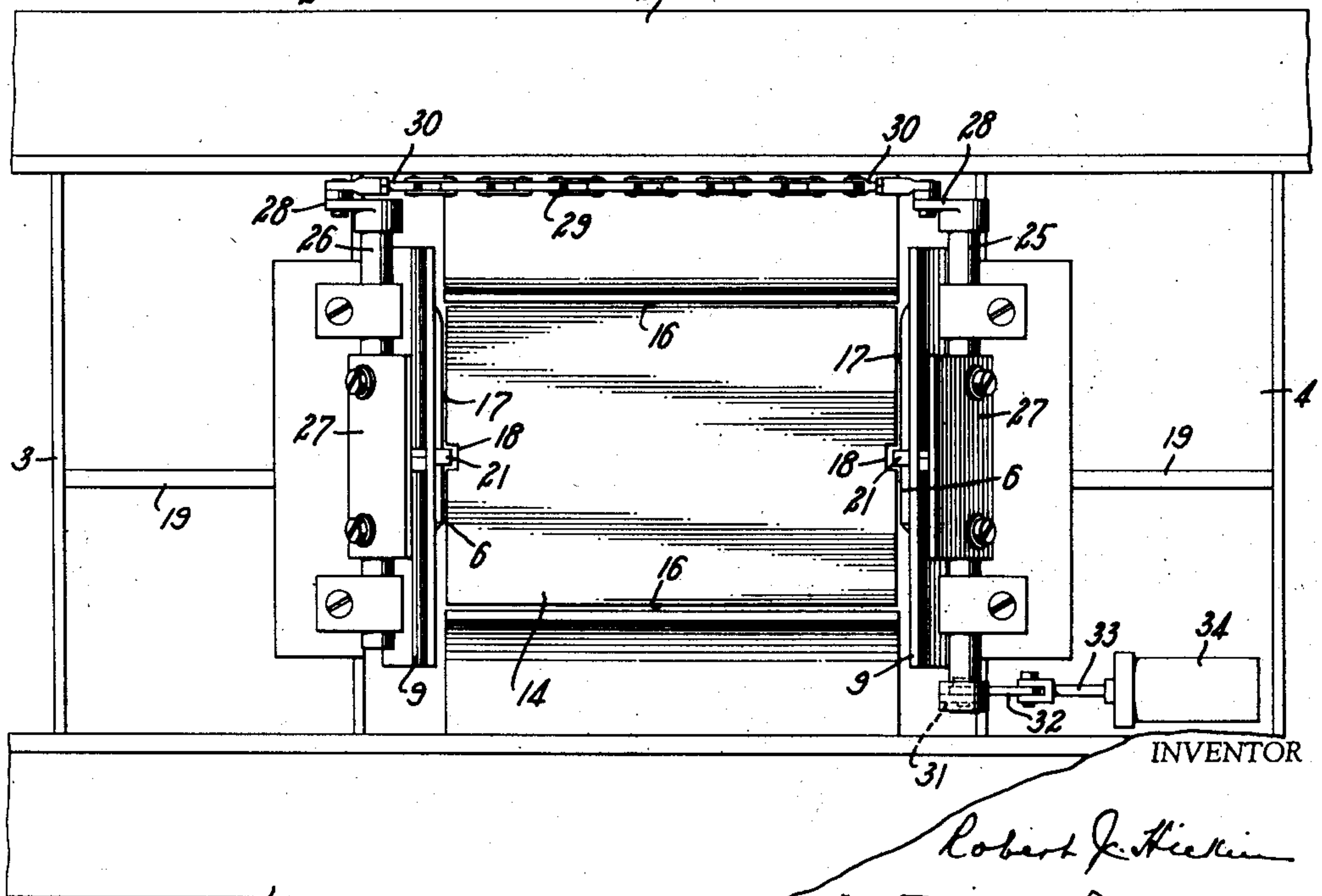
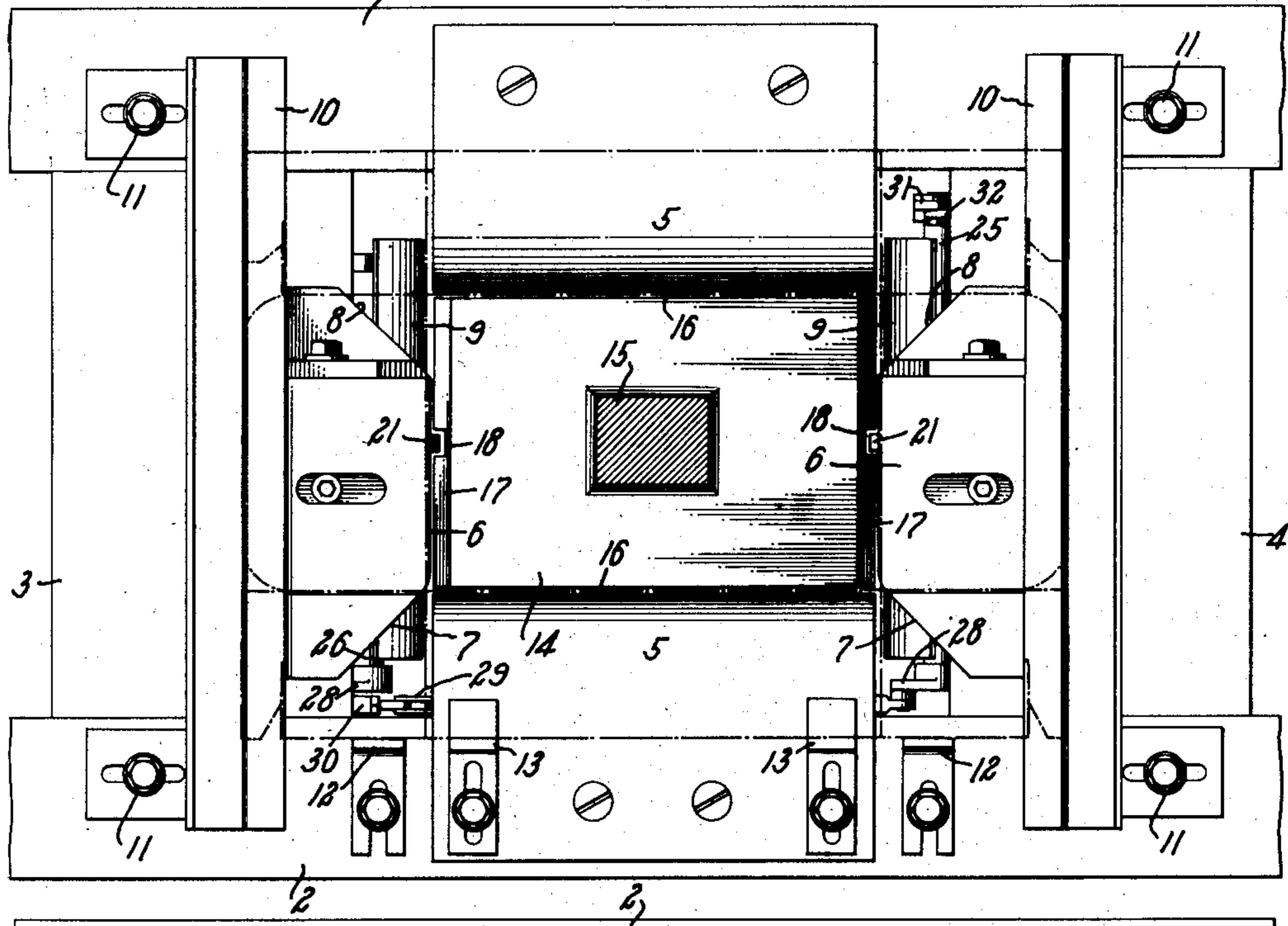
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CARTON ERECTING MECHANISM

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4 Sheets-Sheet 1

Fig. 1.



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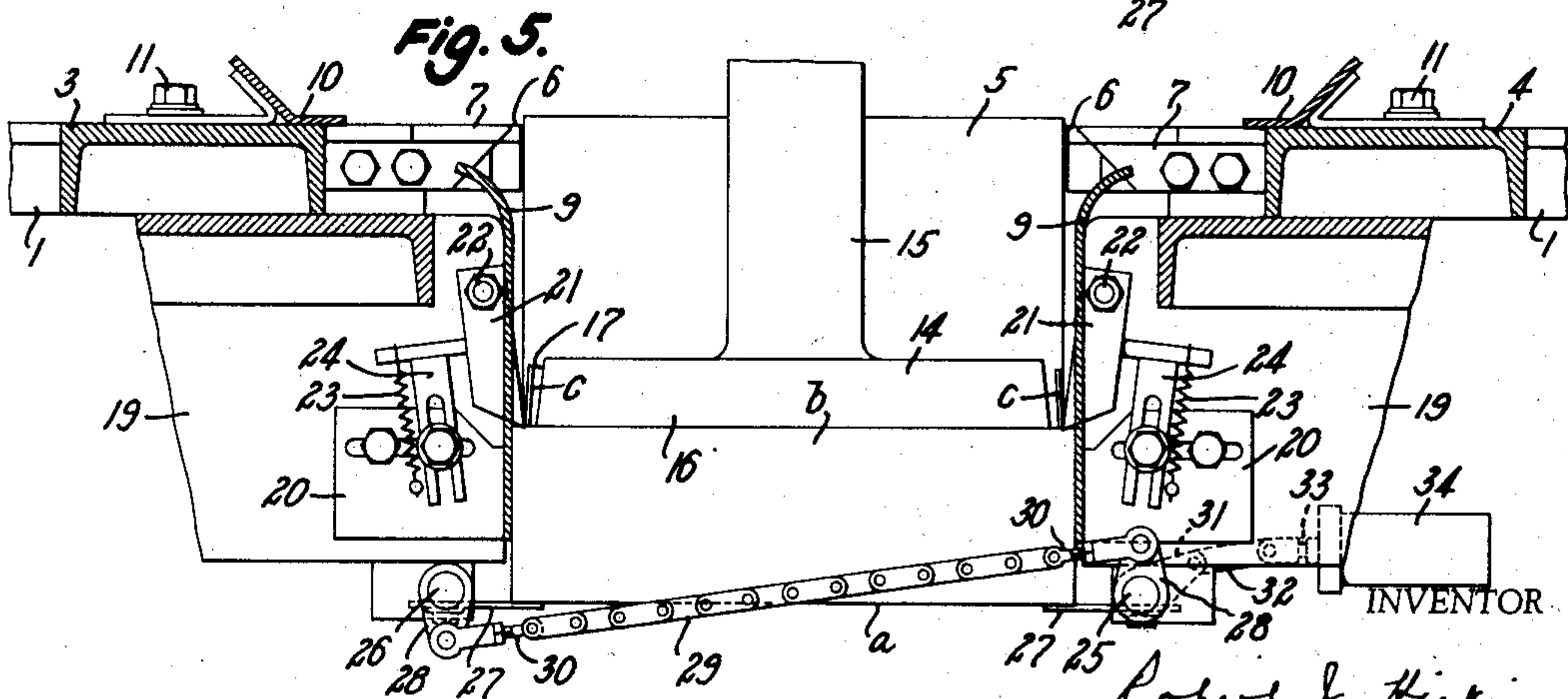
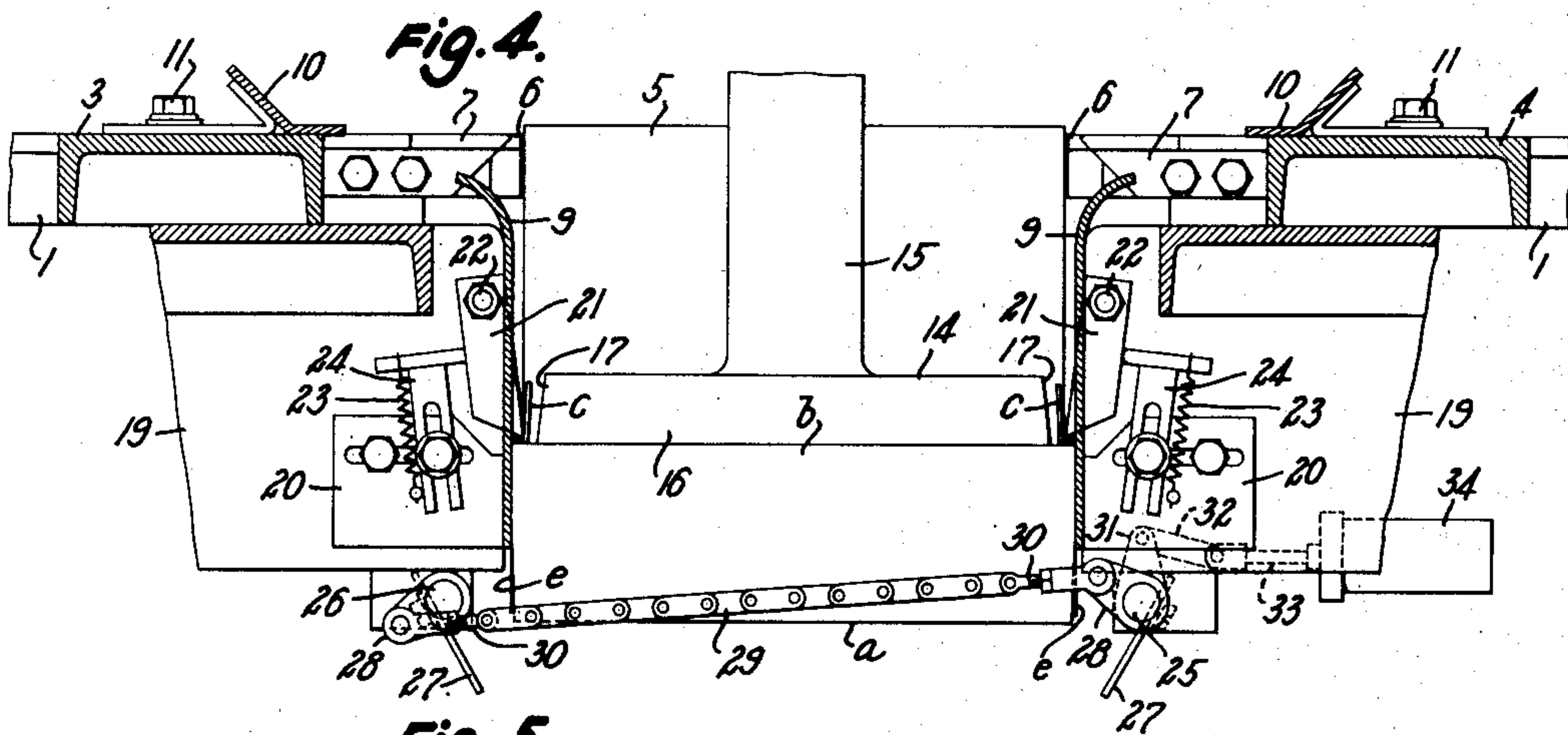
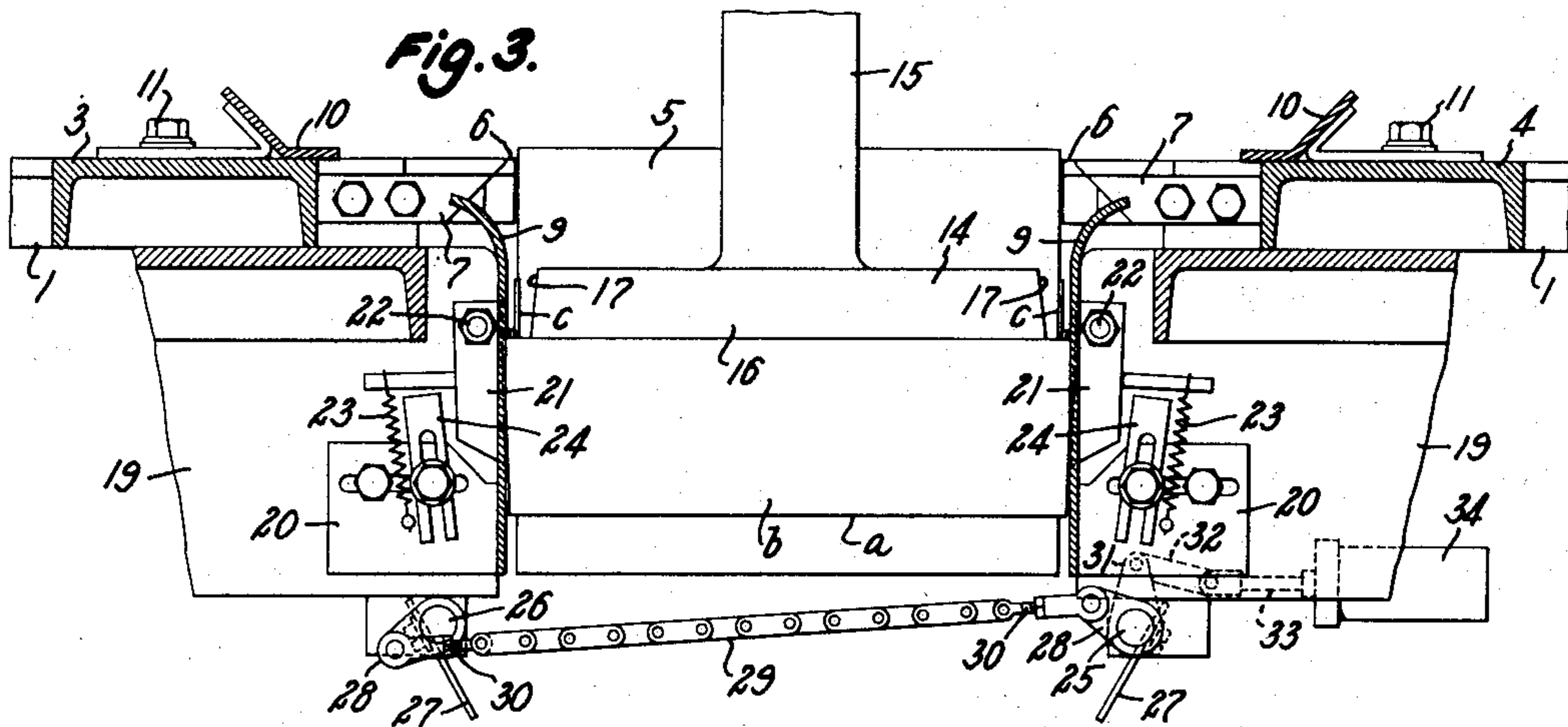
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2,653,524

CARTON ERECTING MECHANISM

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4 Sheets-Sheet 2



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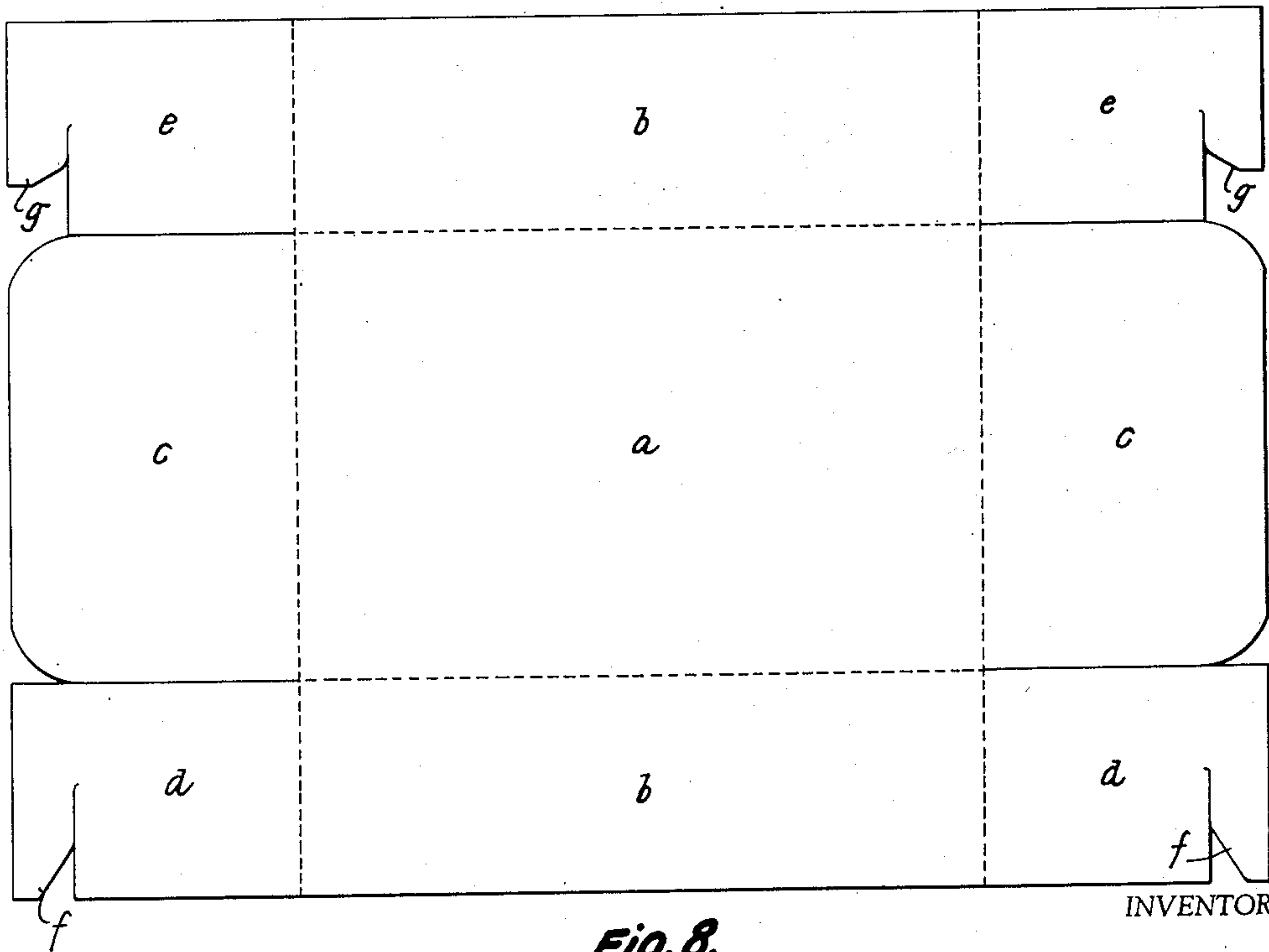
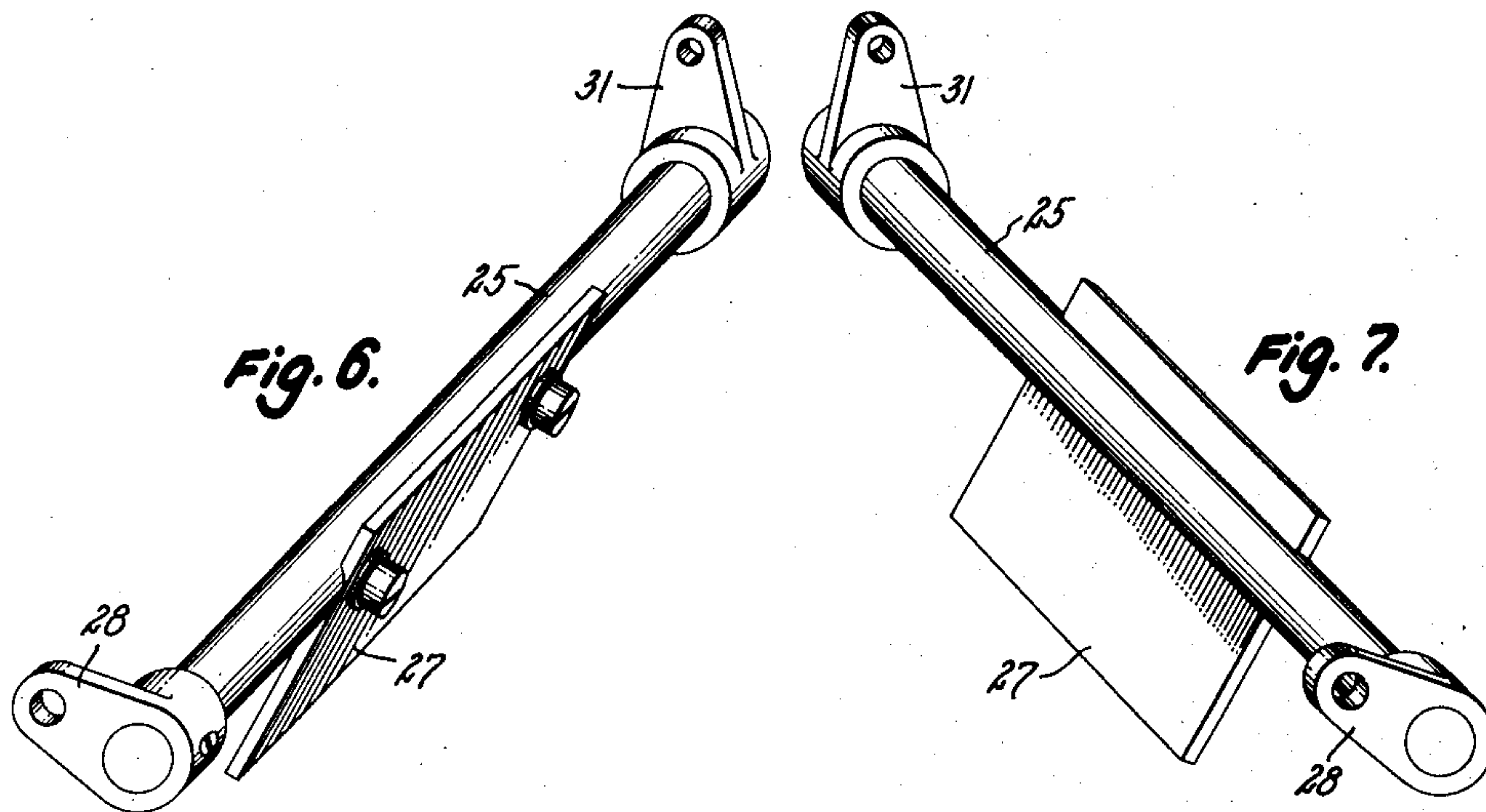


Fig. 8.

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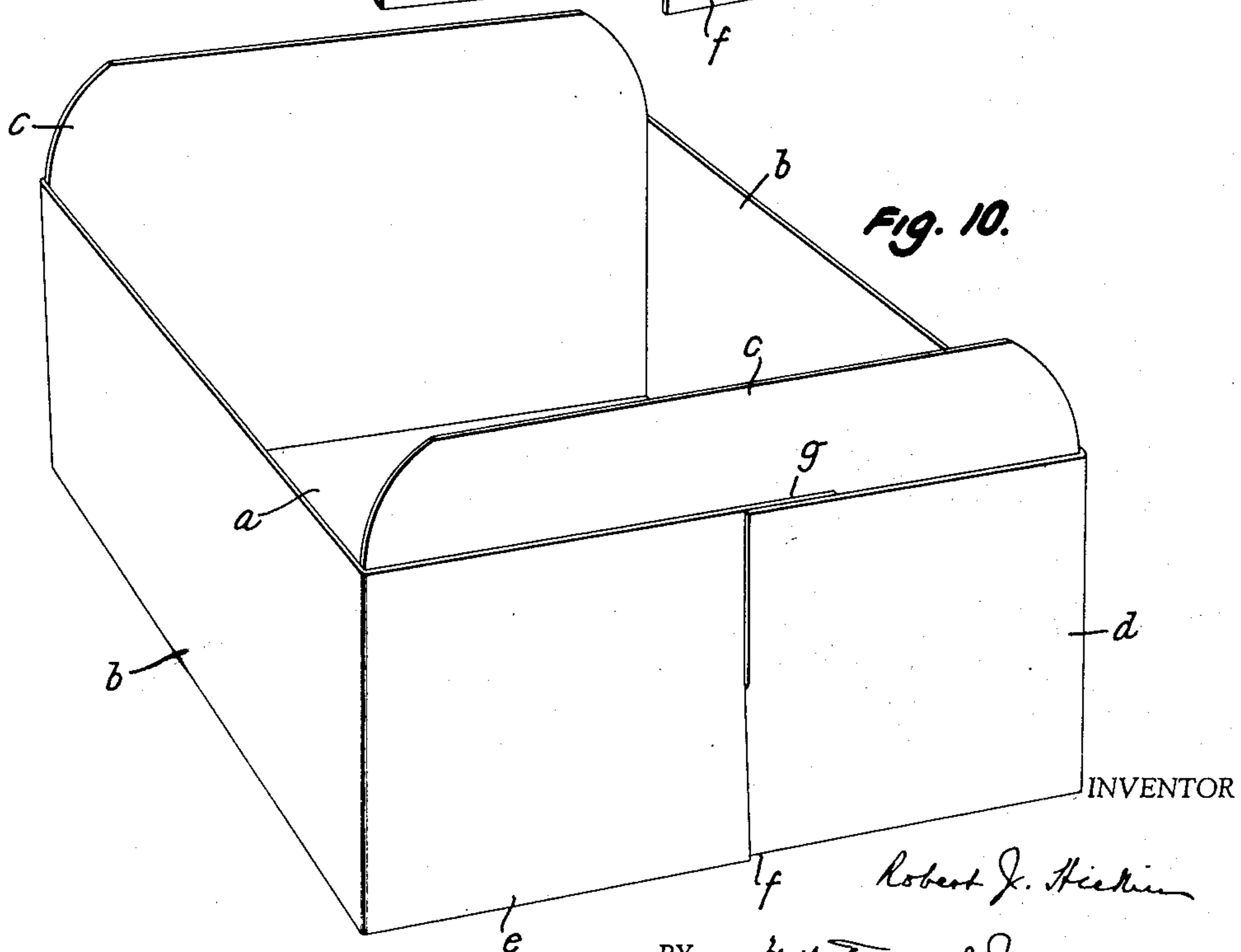
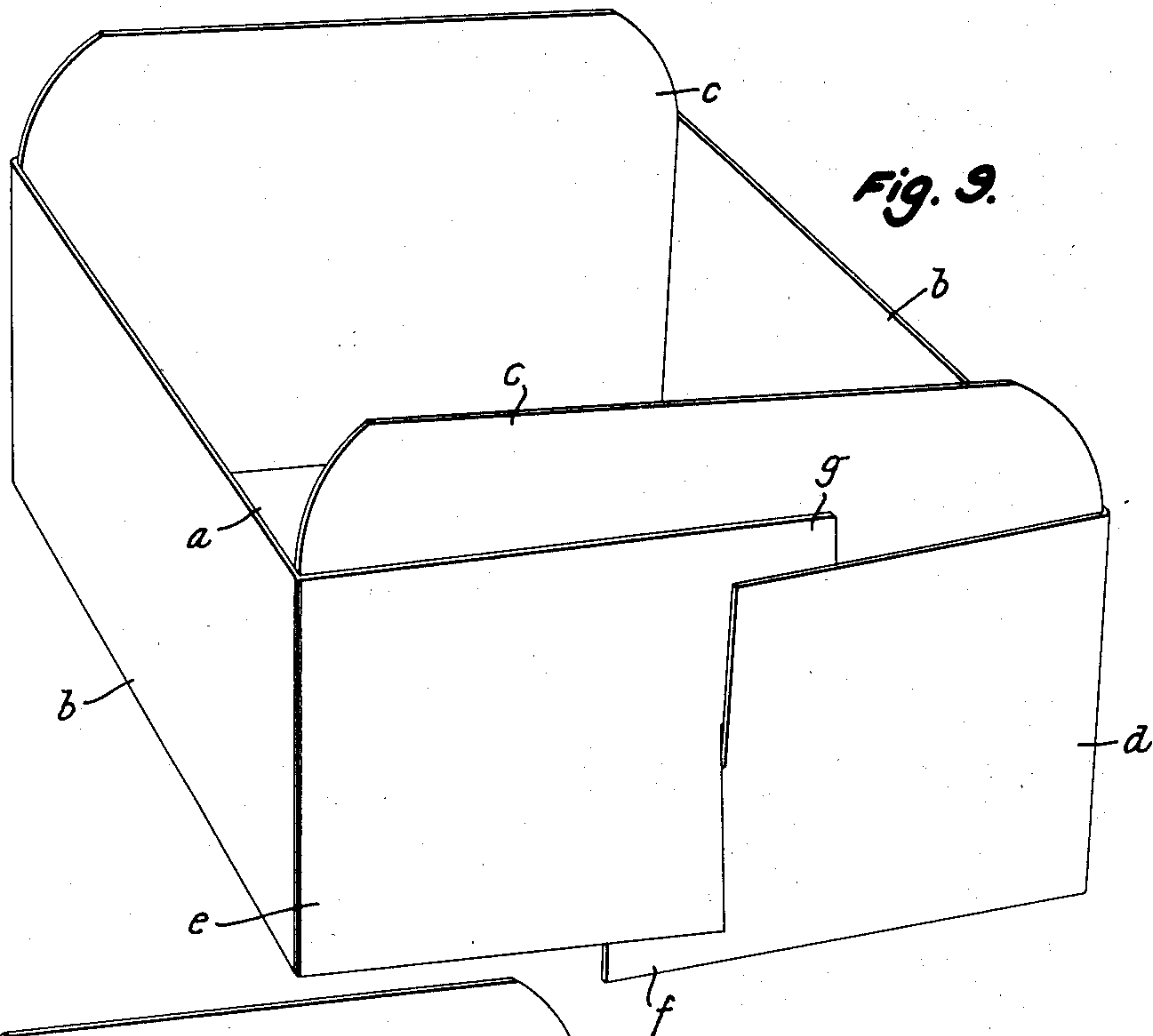
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CARTON ERECTING MECHANISM

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4 Sheets-Sheet 4



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CARTON ERECTING MECHANISM

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10 Claims. (Cl. 93—51)

1

This invention relates to carton erecting machines, and it has special reference to mechanism associated with a die and plunger machine for erecting, from their flat paperboard blanks, cartons particularly of the so-called hook-end style which include end flaps ultimately arranged exteriorly of the ends of the carton and provided with interengaging hook members which hold the carton in relatively rigid set up condition.

The ordinary die and plunger machine for erecting cartons of this type includes die-forming members providing an opening or cavity through which the carton blank is forced by a plunger or mandrel, and including means on the die-forming members which serve to plow or guide the wall-forming parts of the carton blank, in proper relative order, into erected condition with the locking hooks of the securing end flaps in engagement.

In the usual operation of such machines, a reasonably short stroke of the plunger with relation to the die cavity will effect erection of the carton parts, but only a partial interlocking engagement of the hook-end locking flaps will be attained, and their complete interlocking engagement, and properly finished squared-up erection of the carton, are accomplished only after from two to four inches of further movement of the plunger with respect to the die cavity.

This has undesirable aspects in that it requires a relatively large and cumbersome machine for a given size of carton, resulting in concomitant reduction in speed of the machine, due to added machine mass and operative movement, and increase in the time-to-production factor.

The object of the present invention is to provide a die and plunger machine of the type and for the purpose referred to, with mechanism which will automatically insure full interengagement of the hook-end flaps during the erection of the carton and with a relatively short movement of the plunger with respect to the die, say of approximately only three-eighths of an inch, in excess of that necessary to plow the wall forming parts to the assembled condition as has been pointed out, thus making possible the use of a relatively small, light-weight, short-stroke machine with increase in production rate, and at the same time insuring desired complete, squared-up erection of the cartons as they are discharged from the machine.

To this end the invention comprises, in combination with a carton erecting machine of the die and plunger type having die members for effecting set-up and assembly of the carton parts as the carton blank is forced through the die by

2

the plunger, of means engageable with the upper edges of the hook-end flaps and serving as stops to insure horizontal alignment of such upper edges, and means operable to exert substantially instantaneous upward pressure, in the nature of a slap or tap, against the lower portion of the carton walls, including the lower edges of the hook-end flaps to force their upper edges into engagement with the stop means, thus effecting full cooperative engagement of the hook members, horizontal alignment of the flaps and appropriate desired squaring-up of the carton, all as will be explained hereinafter more fully and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

Fig. 1 is a top plan view of the parts forming the die cavity of a carton erecting machine of the type generally hereinbefore referred to, with mechanism, including a plunger or mandrel, according to the invention associated therewith, a hook-end style carton blank being shown in dot and dash lines superimposed thereon,

Fig. 2 is a bottom plan view of the parts shown in Fig. 1, the representation of the carton blank being omitted,

Fig. 3, Fig. 4 and Fig. 5 are vertical sectional elevations taken longitudinally of the machine and illustrating three substantially consecutive steps in the operation of the mechanism,

Figs. 6 and 7 are enlarged perspective views showing the outer and inner faces, respectively, of one of the pressure applying members of the mechanism of the invention,

Fig. 8 is a plan view, enlarged, of the inner face of a more or less conventional paperboard blank for a hook-end carton of the style to which the erecting mechanism of the invention is directed,

Fig. 9 is a further enlarged perspective view of a hook-end style carton formed from the blank of Fig. 8, and showing the hook-end flaps in partially interengaged condition and to the completion of engagement of which the mechanism of the invention is directed, and

Fig. 10 is a view similar to Fig. 9 but showing the hook-end flaps fully engaged and horizontally aligned and the carton in properly erected, squared-up condition.

Having reference to Figs. 8 to 10, it will be seen that the typical so-called "single hook-end style carton" shown is formed from a flat paperboard blank provided with appropriate cuts and folding scores to define a bottom wall *a*, side walls *b*,

end walls *c*, and end flaps *d* and *e* (the hook-end flaps) provided, respectively, with hook members *f* and *g*.

As has hereinbefore been intimated, and as is well known to those skilled in the art, this type of carton blank is erected, or set up, to tray form by cooperation therewith of the plunger and die members of the erecting machine, the plunger serving, by engagement with substantially the full area of the bottom wall *a*, to force the blank into the die cavity, and the die members serving to erect the side walls *b* and end walls *c* and to fold inwardly across these end walls the end flaps *d* and *e* in proper manner and sequence to cause interengagement of their respective hook members *f* and *g*.

Ordinarily, as has been pointed out, the erection of the carton to this state will result in only partial interengagement of the hook members *f* and *g*, as shown in Fig. 9 and, in accordance with now prevailing practice, further operations, with additional movement of the plunger, are necessary to accomplish complete engagement of the hook members and the squaring-up of the carton to the desired condition shown in Fig. 10.

Referring to Figs. 1 to 7, it will be seen (Fig. 1) that the machine has a bed frame comprising longitudinal members 1 and 2, and transverse members 3 and 4. In the substantially rectangular space formed by these members is the die cavity of the machine provided with carton forming members 5 and 6 for the side walls *b* and end walls *c*, respectively, and folding members 7 and 8 for the hook-end flaps *d* and *e*, respectively. Below the end wall forming members 6 and the folding members 7 and 8 there are provided guide members or walls 9 which, with the side wall forming members 5, provide a well-like die enclosure or cavity of rectangular form having a length and width substantially in conformity with the corresponding external dimensions of the erected carton.

Carton blanks may be fed to the machine by any appropriate mechanism from which they are pushed onto and supported by ways 10 so spaced relatively to each other as to accommodate the overall length of the flat carton blank, and so adjustably located, by appropriate adjusting means 11, with relation to the die cavity as to properly register the fed flat blanks thereover. Adjustable edge stops 12 serve to limit the progress of and accurately position the blanks as they are fed over the die cavity, along the ways 10, and adjustable supports 13 serve to holding the leading edges of the blanks at proper elevation and prevent their possible sagging. The dot and dash outline superimposed upon Fig. 1 illustrates a blank properly registered and supported above the die cavity.

The plunger or mandrel 14 has a shank 15 connected with proper mechanism of conventional form (not shown) by which it may be vertically reciprocated, and it has a flat bottom of an area substantially the same as that of the inner face of the bottom wall *a* of the blank. The sides 16 of the mandrel or plunger are substantially plain and at right angles to the bottom, but its ends 17 are preferably slanted inwardly from bottom to top and are furnished with vertical channels 18 (Figs. 1 and 2), for a purpose hereinafter disclosed.

Having reference particularly to Figs. 2 to 5, it will be seen that longitudinal frame members 19 are arranged substantially centrally of

the bed frame of the machine, and to these members are adjustably attached bearing brackets 20 which carry the guide members 9, and also attached to these members 20 are detents 21 having pivots 22 adjacent to their upper ends, their lower ends being capable of projection and retraction with respect to the die cavity through slots (not shown) in the guide members 9. The detents 21 are biased to position projecting into the die cavity by tension springs 23 and the extent of such projection may be limited by adjustable abutments 24.

In arrangement transversely of the bed frame of the machine and located in position adjacent to the limit of downward movement or travel of the plunger or mandrel 14 is a pair of rock shafts 25 and 26 each of which has affixed thereto, for oscillatory movement therewith, a pressure plate 27. One end of each of the shafts 25, 26 is provided with a crank arm 28 and these arms are joined by a link 29, which may be either rigid or flexible, but which is preferably adjustably connected with the crank arms 28 as by turn buckles 30 or the like. At its opposite end one of the shafts (25) carries an operating lever 31 connected by a link 32 with the piston rod 33 of an air or vacuum energized cylinder 34 control of energization of which is obtained by suitable actuating mechanism, such as a cam-actuated valve (not shown), functioning in timed relation to the reciprocative movement of the plunger or mandrel 14. If electrically actuated control means are preferred, the cylinder 34 may be replaced by a solenoid magnet, and switch mechanism therefor may be operated in response to reciprocation of the plunger 14.

In operation of the machine the mechanism of the invention will function as follows, having reference particularly to Figs. 3 to 5. As the plunger or mandrel 14 descends into the die cavity with a carton formed thereon but with the hook members *f* and *g* of the hook-end flaps *d* and *e* not fully engaged, as shown in Fig. 9, the ends of the thus formed carton, supported by the mandrel, will cause retraction of the detents 21 (Fig. 3) until the upper edges of the hook-end flaps *d* and *e* pass below the lower ends of the detents, whereupon these detents will be projected under the influence of their springs 23 to overlie the upper edges of the flaps *d* and *e*, the slanted ends 17 of the plunger or mandrel affording room for sufficient deflection of the carton end walls *c* to accommodate the detents in this position (Fig. 4).

It will be understood that this is the limit of downward movement of the plunger or mandrel 14, and it immediately starts its ascent, tending to strip off the formed carton against the holding effect of the detents 21 in engagement with the upper edges of the hook-end flaps *d* and *e*.

After only a very slight ascending movement of the plunger or mandrel has taken place, the control mechanism for the cylinder 34 will be actuated to energize this cylinder to retract the piston rod 33, which will, in turn, through the link and lever mechanism 32, 31, oscillate the shaft 25 and therethrough, by crank arms 28 on the shafts 25 and 26 and their connecting link 29, oscillate the shaft 26 so that the plates 27 will be brought up sharply, with a slap or tap, against the bottom of the carton (Fig. 5), applying pressure thereto, and thereby causing the hook-end flaps *d* and *e* to have their hook mem-

5

bers *f* and *g* fully engaged, their upper edges aligned, and the carton appropriately squared up.

Immediately upon the completion of this function, the cylinder 34 will be deenergized and the shafts 25 and 26 will assume their original, normal at-rest position, as shown in Figs. 2 to 4.

In its continued ascent the plunger or mandrel 14 will strip free of the formed carton, the channels 18 in its ends 17 enabling it to clear the projected detents 21, and the erected carton will be free to drop from, or be ejected from, the die cavity.

Various changes and modifications may be made in the structure, assembly and mode of operation of the mechanism, certain elements as shown being merely representative of those that may be effectively employed, and it will be apparent that such changes will effect no major departure from the basic concept of completing the locking and insuring the alignment of the hook-end flaps of hook-end style cartons by the application of pressure thereagainst while movement is restrained, as hereinafter claimed.

What I claim is:

1. In mechanism for erecting cartons of the hook-end type having a pair of complemental vertically erectable flap members each provided with interhook means, said hook means being interengageable by relative vertical movement of said flap members, means for applying pressure to the carton in the direction of engagement of said hook means, and means functioning directly counter to the direction of such applied pressure for engaging and limiting movement of said flap members under the influence of such applied pressure.

2. In mechanism for erecting cartons of the hook-end type having a pair of complemental vertically erectable end flap members each provided with hook means and adapted for assembly with their hook means interengaged exteriorly of the carton walls and substantially normal to the carton bottom, means for applying pressure to the carton walls in a direction normal to the carton bottom, and means functioning directly counter to the direction of such applied pressure and engageable with the edges of said flap members remote from the carton bottom during the application of such pressure to thus limit movement of said flap members under the influence of such pressure.

3. In apparatus of the forming die-cavity and reciprocable plunger type for erecting hook-end cartons having complemental vertically erectable flap members provided with interengageable hook means, the combination of mechanism including detent means associated with the walls of the forming die-cavity and adapted to overlie the edges of said flap members when said plunger during its carton erecting movement moves the formed carton into the forming die-cavity beyond said detent means, and means for applying pressure to the formed carton in a direction counter to such carton erecting movement and serving to force said flap members against said detent means and thereby accomplish full engagement of said hook means.

4. The combination of mechanism as claimed

6

in claim 3, in which the pressure applying means are actuated in timed relation to the reciprocation of the plunger and subsequent to completion of its carton erecting movement.

5. The combination of mechanism as claimed in claim 3, in which the detent means normally extend through the walls of and into the forming die-cavity but are retractable from extension into said cavity upon movement of a formed carton past them during the carton erecting movement of said plunger.

6. The combination of mechanism as claimed in claim 3, in which the pressure applying means include members movable into and out of engagement with the carton.

7. The combination of mechanism as claimed in claim 3, in which the pressure applying means include members normally remote from the area of the die-cavity but movable into contact with a carton within the die-cavity in timed relation to reciprocation of the plunger.

8. The combination of mechanism as claimed in claim 7, in which the pressure applying means include two oscillatable members having their axes of oscillation fixed with respect to the die-cavity, said members being provided with means serving to insure their simultaneous oscillation.

9. In apparatus of the forming die-cavity and reciprocating plunger type for erecting hook-end cartons having complemental flap members provided with interengageable hook means, the combination of mechanism for insuring full engagement of said hook means including similar detent means disposed at opposite sides of said die-cavity and yieldingly biased to a normal position of extension into the area of said cavity but retractable under the influence of a formed carton passing through said cavity with and during the carton erecting stroke of said plunger, said detent means thus being capable of assuming positions for engagement with the upper edges of said flap members after the formed carton has moved with the plunger past the detent means, and means for thereafter applying pressure to the formed carton in a direction counter to the carton erecting stroke of the plunger to force the edges of said flaps into engagement with said detent means to insure full engagement of said hook means.

10. The combination of mechanism as claimed in claim 9, in which the pressure applying means include a pair of oscillatable members movable into and out of the area of the die-cavity, said members being interconnected for simultaneous actuation and being provided with means whereby they may be thus actuated in timed relation to the reciprocation of the plunger.

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