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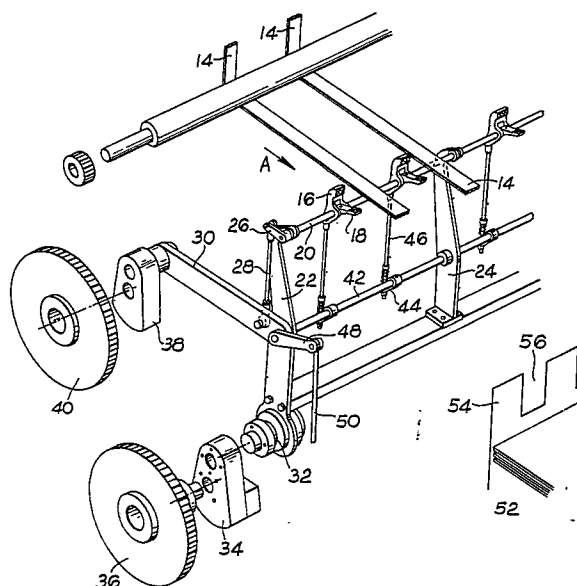
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㉙ **Stacker/palletiser.**

㉚ A stacker is provided in which successive blanks travelling along the feed path are gripped at their trailing ends and decelerated and located in appropriate position relative to a stack before the grippers are released. Figure 1 shows a drive arrangement for the grippers.



1.

DESCRIPTION
STACKER/PALLETISER

This invention relates to stackers used in the treatment of card and like blanks which are fed in succession through treatment apparatus and then collected into stacks, which may be formed
5 on pallets for subsequent ease of handling.

It is known from Patent No. 1340004 to deliver the blanks to a lower run of a series of parallel conveyor belts provided with suction means to draw the blanks against the belts, with means for reducing
10 the belts speed to slow the blank, and an ejector to extend through the interbelt spaces to displace the slowed engaged blanks onto the stack. In such apparatus the oscillating speed of the belt in slowing up, and then accelerating to accept the
15 next blank, places an upper limit on the capacity (blanks per hour) and necessitates certain minimum spacing between successive blanks.

In Patent 1505185 the cyclical variation in suction conveyor speed is avoided and the conveyor
20 can run continuously at high speed. In this case, the ejector takes the form of a link bar which is lowered through the interbelt space to frictionally

contact the blank and slow the same, and then displace the blank towards the stack. This apparatus has also operated successfully, and at high speeds, for example of the order of 8000 blanks per hour, but necessitates certain minimum spacing between successive blanks.

However, there is an incessant demand both for faster operating speeds and for closer spacing between successive blanks.

The object of the present invention is to provide improvements.

In accordance with the invention a stacker comprises a conveyor for supporting blanks between the end of a treatment apparatus and the stack position, and at least one cyclically movable gripper device for engaging the trailing end of the blank and for moving the blank to the stack at the controlled speed of the gripper.

Conveniently the gripper is mounted on an arm which is crank or eccentric coupled and guided so that its free end, carrying the gripper per se, reciprocates in an arcuate path, thus allowing the blank to be moved out of the feed plane and into a second and usually parallel plane defining the top of the stack.

Reciprocation inherently involves acceleration and deceleration, but since this is achieved by constantly rotating drive shafts of the crank(s) and/or eccentric(s) there is little limitation in speed capacity from this source, and it is believed that the apparatus herein described can run at speeds of the order of twice as fast as that of the prior art apparatus as exemplified by that of the said patent 1505185, with greatly reduced

spacing between successive blanks.

Preferably the arms are coupled and guided by second crank or eccentric connections, and then selection of the variables involving the geometry and the relative angular position of the two enable a very fine and accurate control of the shape of the arc through which the gripper moves.

It will be appreciated that the crank or eccentrics are coupled so as to be driven at the rate of one complete revolution, and hence one complete reciprocation of the gripper for each cycle of the treatment apparatus and hence for each blank, and in the event that the blank size varies, it is necessary to retime the stacker with respect to the treatment apparatus, because it is usually the leading edge of each blank which is timed, and it is the trailing edge of each blank which is significant in the apparatus as so far described.

Further important features of the invention will become apparent from consideration of the following description.

An apparatus is now more particularly described with reference to the accompanying drawings wherein:

Figure 1 is a diagrammatic and perspective (and part exploded) view showing a presently preferred apparatus;

Figure 2 is a diagrammatic sectional elevation showing a part of the apparatus;

Figure 3 is a fragmentary plan view on an enlarged scale showing driving arrangements for the apparatus;

Figure 4 is an elevation on a still larger scale showing a gripper;

Figures 5 and 6 are sections on the lines 5-5 and 6-6 of Figure 3, respectively;

Figure 7 is a fragmentary plan view of another part; and

Figure 8 is a side elevation of the arrangements of Figure 7.

5 Referring first to Figure 1, the apparatus
comprises a series of generally parallel belts
14 which extend around a system of drive shafts
and guide rollers, which will be more particularly
described with reference to Figure 3. The blanks
10 are fed in succession from a treatment apparatus
(not shown) so as to extend in a plane containing
the bottom run of the belts 14 (as illustrated)
and the blanks are suction drawn against the belts
and conveyed by the belts in the direction of the
15 arrow A. Figure 2 shows a suction box 10 with
suction apertures 12 on its underside, and the
belts 14 lie closely adjacent to or in those apertures.

A plurality of gripper devices consisting
of upper jaws 16 and lower jaws 18 are mounted
20 on a transverse shaft 20, and the lower jaws are
angularly fast with that shaft. The shaft is journalled
in the free end of arm 22 24 (and others not shown)
and connected by cranks 26 and the links 28 to
a series of second arms 30.

25 The first arm 22 is pivotally connected at
the end opposite to the gripper shaft 20 by a journal
pin 32 to a crank 34 which is driven by gear 36
so that the crank rotates once in each blank feeding
cycle.

30 The arms 30 are similarly connected to cranks
38 driven by gears 40 in fact the gears 36 and
40 can be of the same diameter and connected together
or to the same power source. The end of the arm
30 opposite to that which is crank driven is pivotally
35 coupled to the first arm 22 and a second gripper
shaft 42 is co-axial with that pivotal connection

and carries a series of operating cranks 44 which are connected by link 46 to the upper gripper jaws 16. Shaft 42 is crank connected at 48 to a push rod 50 which is cam driven (not shown) although
5 alternative means may be used to achieve the same results.

In operation, both cranks are driven and this causes reciprocation of the arms, and due to the geometry of the same, the end of the arm 22 carrying
10 the gripper shaft 20 reciprocates through an arcuate path extending generally in the direction of the arrow A (and then in the reverse direction) and generally from the plane of the lower run of the suction belts 14 to a lower plane, and back again.

15 The position of the stack is indicated by the reference numeral 52, and the gate or wall 54 which serves to confine the stack in one direction is appropriately slotted at 56 to allow the grippers to move therethrough.

20 The movement of the arms is timed so that as the trailing edge of a blank moving along with the suction belts 14 is approximately in the position of the letter A on the drawing, the grippers move towards the rear of the blank and as they reach
25 the rear of the blank the two gripper jaws 16 and 18 are closed together as a result of the relative angular movement between the arms 30 and 22 and as a result of operation of the push rod 50. The blank is thus positively engaged by all of the
30 pairs of grippers and its movement thereafter is (constrainedly) the movement of shaft 20 at the end of the arm 22. When the shaft 20 reaches the far point of its reciprocation, it is brought down to low speed before reversing in direction and
35 the respective gripper jaws are at that point displaced to the open position as shown in the drawing so

as to disengage from the blank. The end point
of the arms reciprocation has taken the blank to
a position (for example) immediately over the stack
and shortly above the top plane of the stack, and
5 hence the blank is released at that point and allowed
to fall and join the stack whilst the arms return
to the opposite extreme position before commencing
the next operational cycle.

It is preferred to provide means to locate
10 the leading edge of each blank during the time
that the trailing end is gripped and moved by the
grippers. It would be within the scope of the
invention to utilise similar grippers and generally
duplicate the illustrated arrangement, so that
15 each blank is held at a plurality of positions
along its leading and trailing edges by such grippers.

However, a simpler control system may be used
at the leading end when the trailing end is controlled
as hereinbefore described. Such a simpler system
20 may comprise jaws which locate the blank therebetween,
and these jaws may be carried by endless chains
of which the lower runs extend generally parallel
to the feed plane as defined by the belts 14, and
generally as a continuation of the same. The result
25 may be that whilst the trailing end of the blank
is displaced out of the feed plane and taken towards
the desired position over the stack, the leading
edge is maintained generally in the original feed
plane and this results in each blank assuming a
30 more and more inclined position until released
from the chain so as to fall to the stack. To
this end, it is necessary to provide means to retard
the chain at a timed point in the cycle so that
the leading edge of the blank enters into the appropriate
35 jaws, and to accelerate the chain at a later point
in the cycle so that the jaws move away from the
blank to allow it to fall to the stack. Provisions

for these purposes will now be described with reference to Figure 3.

5 In Figure 3, side plate 60 provides journals mounting shaft 62 and the parallel shaft 64 about which the drive belts 14 (omitted from Figure 3) extend. The general line of two such belts is indicated by the chain dot lines 66. The belts may be driven by drive hubs 68 keyed to shafts 64 and with corresponding hubs 70 freely journalled
10 on shaft 62. A gravity roller 70 is mounted in journals running in guides allowing vertical movement of the roller so that it can rest on the lower run of the belts to tension the same, and prevent them being drawn into the suction box.

15 Shaft 64 also mounts a series of sprockets 72 for a like series of generally parallel chains, omitted from the drawing for clarity, and the general position of one such chain is indicated by the chain dot line 74. The chains extend around sprockets
20 76 on shaft 78. Sprockets are journalled on the shaft 64 so as to be free to turn thereon, so as to enable the position of jaws mounted on the chains to be adjusted relative to the timing of the apparatus, that is according to the length of a blank (and
25 the position of the blank edge as hereinafter explained) involved in any particular use of the apparatus. Sprockets 76 are splined at 80 and associated with drive hubs 82 which are fast with shaft 78, and a sleeve 84 is complementarily splined and engaged
30 with both the hub and the sprocket. Hence in the illustrated position drive is transmitted from the shaft 78 to the sprocket 76, but by displacing the sleeve 84 in the direction of the arrow B, the sprocket may be turned to reposition the chain
35 and then the sleeve return to lock the sprocket in the desired position. A detent 86 is provided to maintain the sleeve in the normal engaged and

locking position.

Drive is transmitted to shaft 78 by a sprocket 88 which is fast with shaft 78 and chain drive from sprocket 90 which is likewise journalled to be rotatable on the shaft 64, and is driven from
5 stub shaft 92 via pinions 94 96.

The drive between shafts 64 and stub shaft 92 comprises pinion 98 fast with shaft 64, pinion 100 which is journalled on shaft 92 and a double
10 pinion 104 journalled on a lay shaft 106 carried by a swinging arm 108. One part of the double pinion 104 engages the loose pinion 100 and the second part of the double pinion drives pinion 110 on the stub shaft 92 via a gear train extending
15 laterally from the shafts. The gear train is journalled on the swinging arm 108. The arm may be cam displaced or moved by an air cylinder or any other convenient means so as to swing about the axis of the stub shaft in appropriate directions at appropriate
20 times in each cycle. During this movement the drive to the sprocket 96 is effectively accelerated or retarded according to the direction of the movement, and this enables the chains to slow down so as
25 the leading edge of a blank at a later point in the cycle, as previously mentioned. The path of the chain drive from the sprocket 90 to the drive sprocket 88 on shaft 78 is indicated by the chain dot line 112 and passes over jockey sprockets 114
30 for chain tensioning.

In practice, blanks being handled are rarely of simple square or rectangular shape. Most usually the leading and trailing edges are not co-linear but often consist of portions at different spacings
35 relative to the feed direction. The invention

provides means for dealing with this problem and
for gripping each blank at a plurality of positions
which are relatively spaced in the feed direction,
and for guiding the leading edges which are similarly
5 shaped.

In the case of the leading edges, it will
be appreciated that all that is necessary is to
adjust the positions of selected ones of the chains
relative to the others. That is to say, the sleeves
10 84 (Figure 3) are displaced to enable the chains
to be individually adjusted so that the jaws carried
by the chains are in a staggered pattern relative
to the length of shaft 78.

To obtain a like effect in case of the grippers,
15 some individual adjustment of these is necessary.
Figures 4 to 6 illustrate one possibility in this
direction. Referring to Figure 4, shaft 20 carries
a series of brackets 120 which carry bearing bushes
122 journalling a shaft 124. Between the bushes
20 122 is a hub 126 with crank like extensions 128,
and the hub is keyed to the shaft so that when
the hub is turned angularly the shaft likewise
turns angularly, and also so that the shaft can
be displaced in the direction of the arrows C Figure
25 4 relative to the hub. The hub is radially split
as seen at Figure 5 and the split parts are clamped
together by a stud provided with a radially extending
locking arm 130. The crank extensions 128 are
pivoted to the part 50 to enable the shaft to be
30 angularly moved.

The shaft is journalled at one end in a bearing
132 and at the other end carries a bevel gear 134
meshed with a complementary bevel gear 136 which
is fast with a displaceable jaw 138 corresponding
35 to the jaw 16 Figure 1. Jaw 140 corresponds to
the jaw 18 of Figure 1.

It will be appreciated that to locate the jaws in a desired staggered pattern across the width of the apparatus, it is only necessary to release the parts 130 to enable the shafts to be individually adjusted for position, then the parts 130 are re-tightened to clamp the shafts in the adjusted positions. Cam actuated displacement of the parts 50 turns the shafts angularly about their axes and via the bevel gears opens or closes the gripper jaws according to the point in the cycle.

Various possibilities exist for use of the apparatus generally as described. In the simplest use, a single stack is formed with every blank being controlled by the trailing end grippers, and if desired also by the leading end jaws. However, by the use of appropriate clutches in the drive systems, the apparatus may be arranged so as to operate on alternate blanks only, and by these means, every other blank is gripped, decelerated and brought to rest as part of a first stack, and the other blanks emerging from the machine can be allowed to form a second stack spaced from the first, and alternative and possibly conventional deceleration and stack forming means may be used to that end, for example an overhead friction or vacuum device to slow the blanks and a back stop against which the blanks come to rest and which may be provided with spring loaded means or a jogger mechanism to ensure that the stack is approximately or precisely vertically aligned, and/or a blower to direct the blanks downwardly to the required stack.

In a modification, alternate blanks have their trailing edge gripped and decelerated as mentioned, and the remaining blanks have their leading edge jaw-engaged for deceleration in like manner. In

another modified apparatus grippers at both ends may be chain linked to move together.

5 Instead of using the chain system of jaws or in addition (specially where two or more blanks are closely spaced but followed by two or more at a wider spacing) the arrangement of Figures 7 and 8 may be utilised to control the front edge of the blank. In this arrangement the jaws (which are merely abutment stops for the board edges) 10 160 are mounted, via independently adjustable carrier rods 162 on a cross bar 164 which is itself adjustable in position to accommodate different sizes of blank. Carrier rod adjustment is via a bolt 166 or like to each rod, and bar adjustment via clamp levers 15 168 at each end of the bar.

The bar ends are supported on connecting rods 170. Each end of each rod carries a roller or cam follower 172, 174, which run in guide slots 176, 178. Drive is by a reciprocating shaft or 20 cranks connection 180 from the crank 22 (Figure 1). Hence the shoes reciprocate in a path corresponding to the guide slot shape. The chain dot lines 182 show the position of the blank leading end.

The slots are formed in plates 184 located 25 at opposite sides of the machine at each required location.

Instead of, or as well as, providing an abutment for the leading edge, different "jaw" designs may act as abutments above the blank between the ends, 30 to prevent unintentional folding about transverse cuts or creases in the blank.

These aspects of the invention are also useful where a rotary die cutter (for example) produces two blanks in immediate succession per revolution,

so that effectively two blanks emerge from a machine one after the other and with an interval (although possibly a very short interval with high speed machinery) before the next two blanks emerge, and
5 so on, but in all cases enable the whole area of a pallet supporting the fed blanks to be utilised.

The two stacks may be placed so as to make maximum use of the available area of the pallet on which the stacks are formed, or they may be
10 closely spaced against a central divider, and joggers may be provided for both stacks arranged to engage against the edges of the boards or blanks forming the stacks and gently nudge individual blanks into the desired alignment. Said central divider may
15 be like the gate 54 of Figure 1 in that a portion of the jaw such as 160, Figure 7 may pass through the divider although the blank passes over it.

The stacks may be provided with finger like supports engaging under the edges of the bottom
20 blank of each stack, and these supports may be arranged to be turned through 90° or to be otherwise retracted and subsequently replaced, and they allow batches of for example ten or twenty blanks to be built up and then released as a batch to fall
25 together, for example towards a supporting pallet or table. These means allow batches of specific quantities to be accumulated when desired, for example for use in subsequent treatment apparatus, and alternatively allow a loaded pallet to be removed
30 and a fresh pallet placed in position whilst the stacks continue to form.

As an alternative to the jogging mechanism mentioned, the edges of the or each stack may be defined by guides in the form of flexible sheet
35 material under tension, and with the supports for such sheet material movable so that the sheets can define a funnel shaped guide into which each

blank can be lowered, and then by movement of the material the newly released blank can be jogged into position before the material returns to the funnel shape ready for the next successive blank.

- 5 In yet another possibility the apparatus is arranged by the use of cam operated clutches at appropriate points so that the deceleration and release of the blank occurs at one of a plurality of possible points in each cycle, and at a different
- 10 one of said plurality of possible points in each successive cycle. By these means, successive blanks can be deposited in successive piles, for example so as to build up three, four or more piles and make maximum utilisation of a pallet.

- 14 -

CLAIMS

1. A stacker comprising a conveyor (14) for supporting blanks between the end of a treatment apparatus and the stack (52) position, and at least one cyclically movable gripper device (16,18) for engaging the trailing end of the blank and for moving the blank to the stack at the controlled speed of the gripper.
5
2. A stacker as claimed in Claim 1 wherein a plurality of gripper devices are provided arranged for synchronous movement and spaced apart across the feed path of the blanks.
10
3. A stacker as claimed in any preceding claim wherein a like set of grippers is provided for engaging the leading end of the blank.
4. A stacker as claimed in Claim 2 or in Claim 3 wherein the grippers are individually adjustable in position relative to one another along the feed path.
15
5. A stacker as claimed in any preceding claim arranged for operation on alternate blanks so as to form two stacks.
20

6. A stacker as claimed in any of Claims 1 to 3 wherein jaws are provided for receiving the leading end of each blank and the jaws are chain (74) conveyed in the feed direction.
- 5 6. A stacker as claimed in Claim 5 wherein a plurality of parallel chains are provided and the position of each chain is adjustable relative to the others (by means 80,82) so as to vary the position of the jaws one to another along the feed path.
- 10 7. A stacker as claimed in Claim 5 or Claim 6 wherein means (98-108) are provided for accelerating and retarding the chains to cause blank engagement with the jaws and release of the jaws from the blanks.
- 15 8. A stacker as claimed in Claim 1 wherein the grippers are mounted on an arm (22) which is crank coupled and guided so that the gripper per se reciprocates in an arcuate path.
- 20 9. A stacker as claimed in Claim 8 where each arm is coupled and guided by two eccentrics or cams (34, 38) so that the path of movement of the gripper can be complex and closely controlled.
- 25 10. A stacker as claimed in Claim 1 wherein additional jaws (160) are coupled to said cyclically movable gripper for engagement of the leading end of the blank and are guided in their reciprocation by rollers (172,174) in guide slots (176,178).

Fig. 1

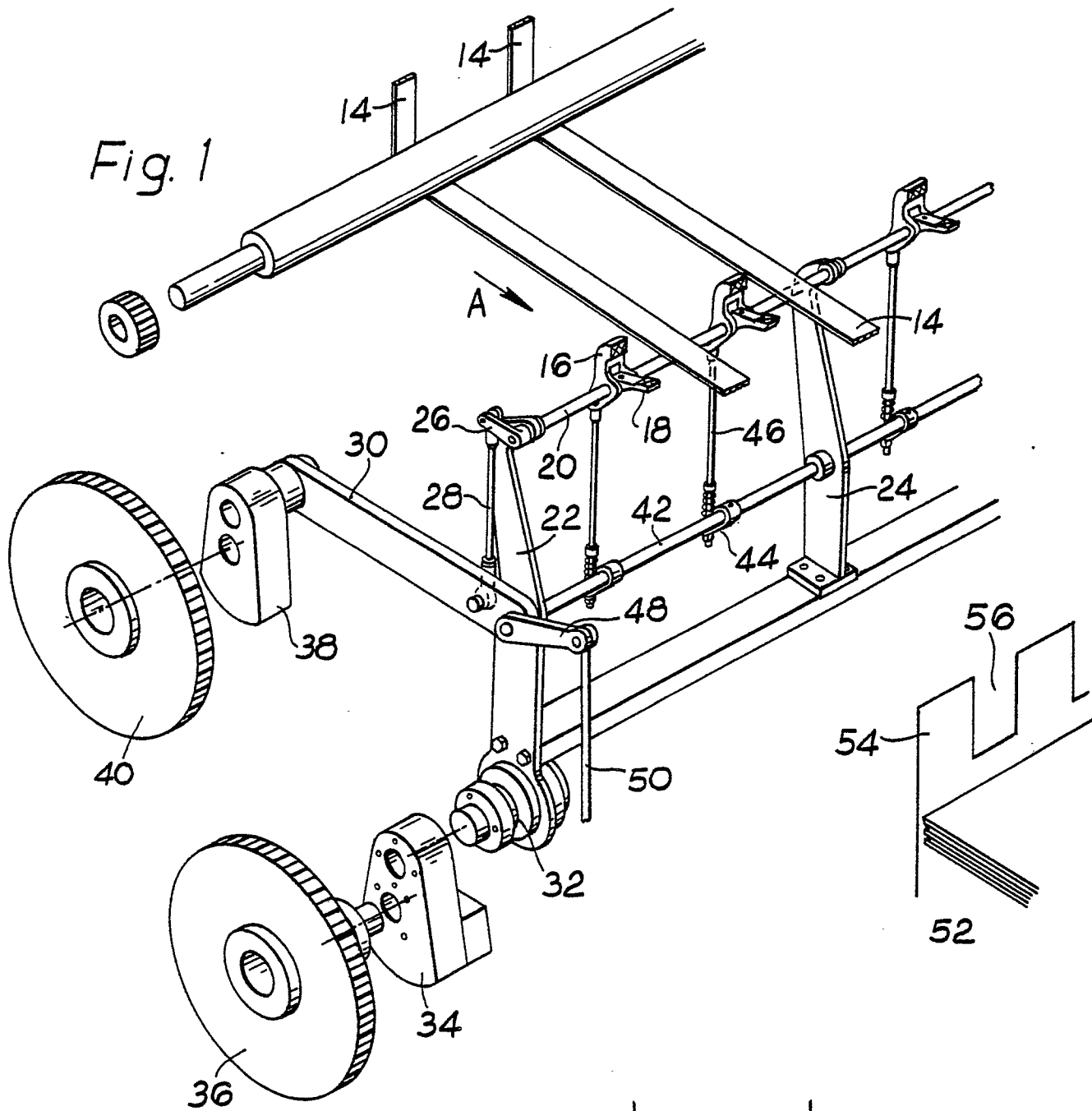
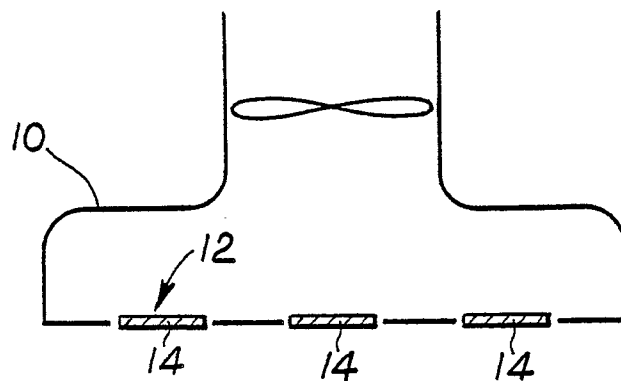
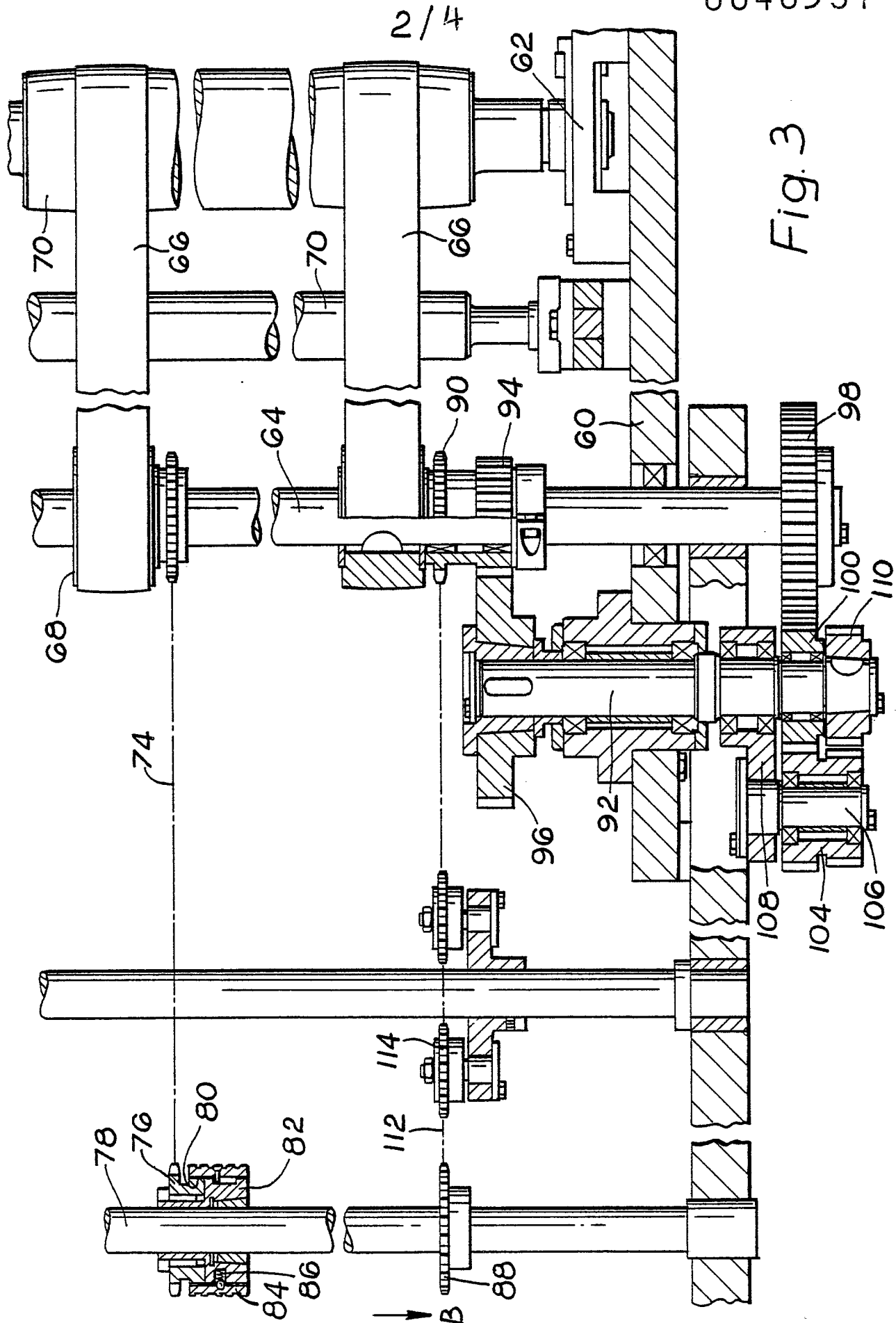
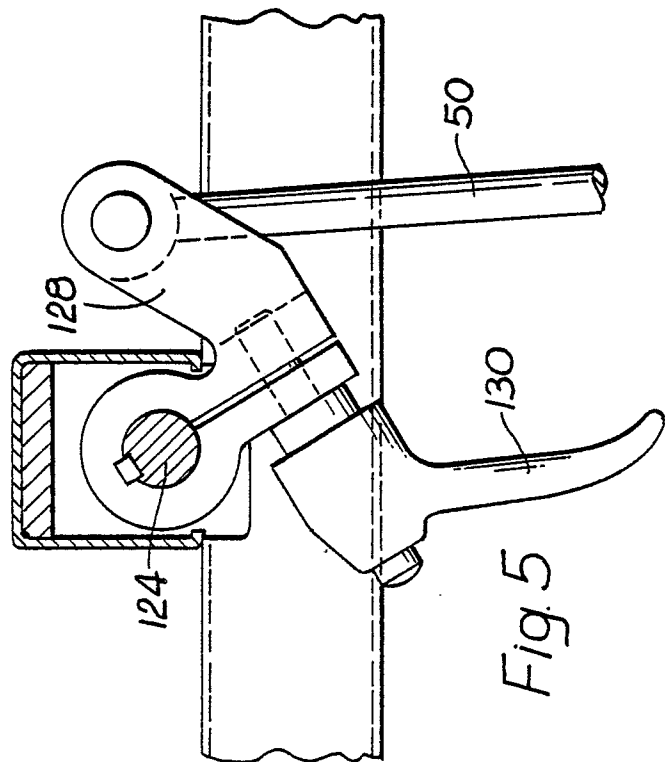
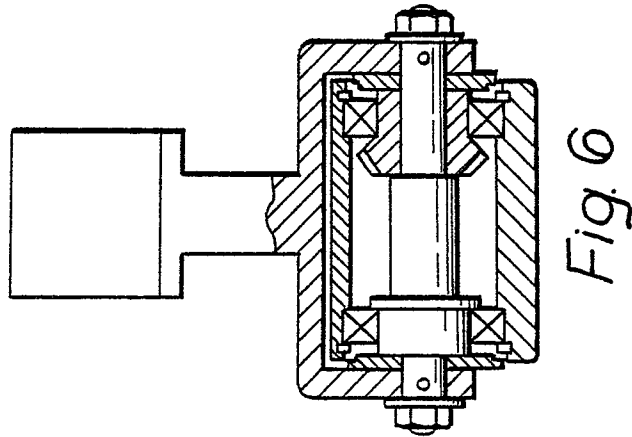
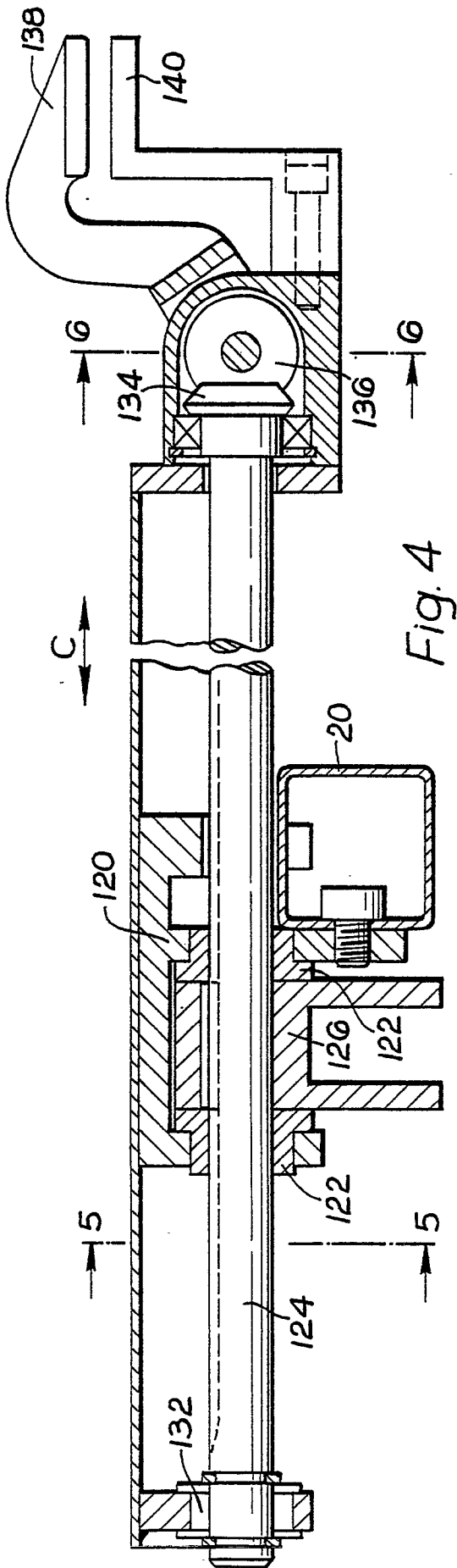


Fig. 2

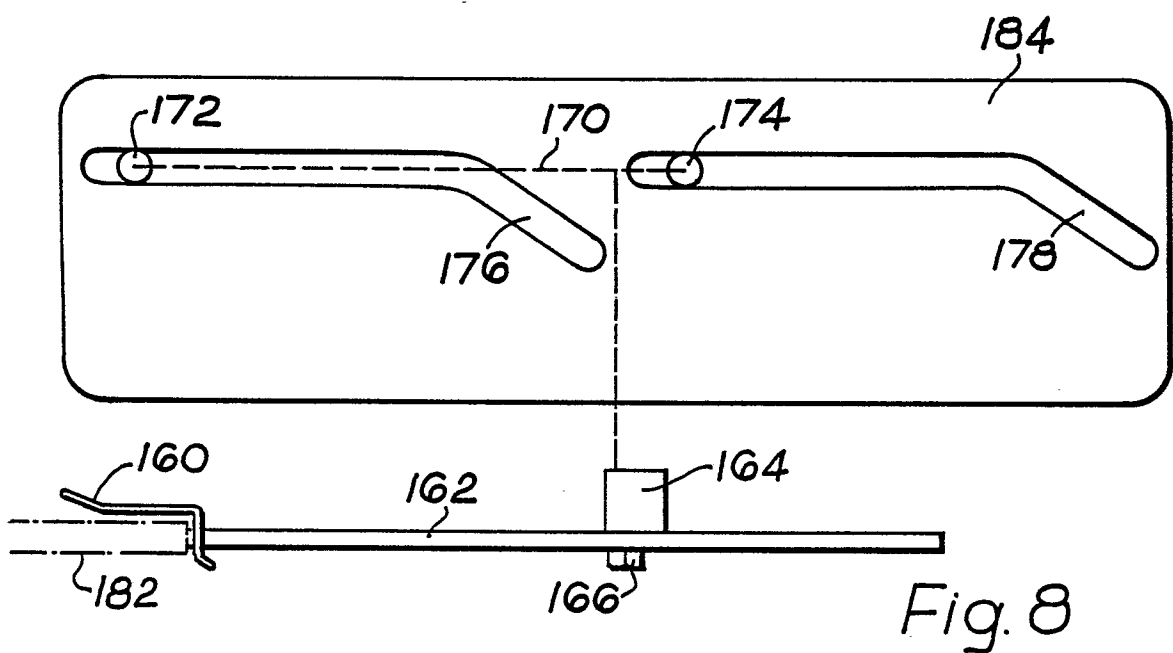
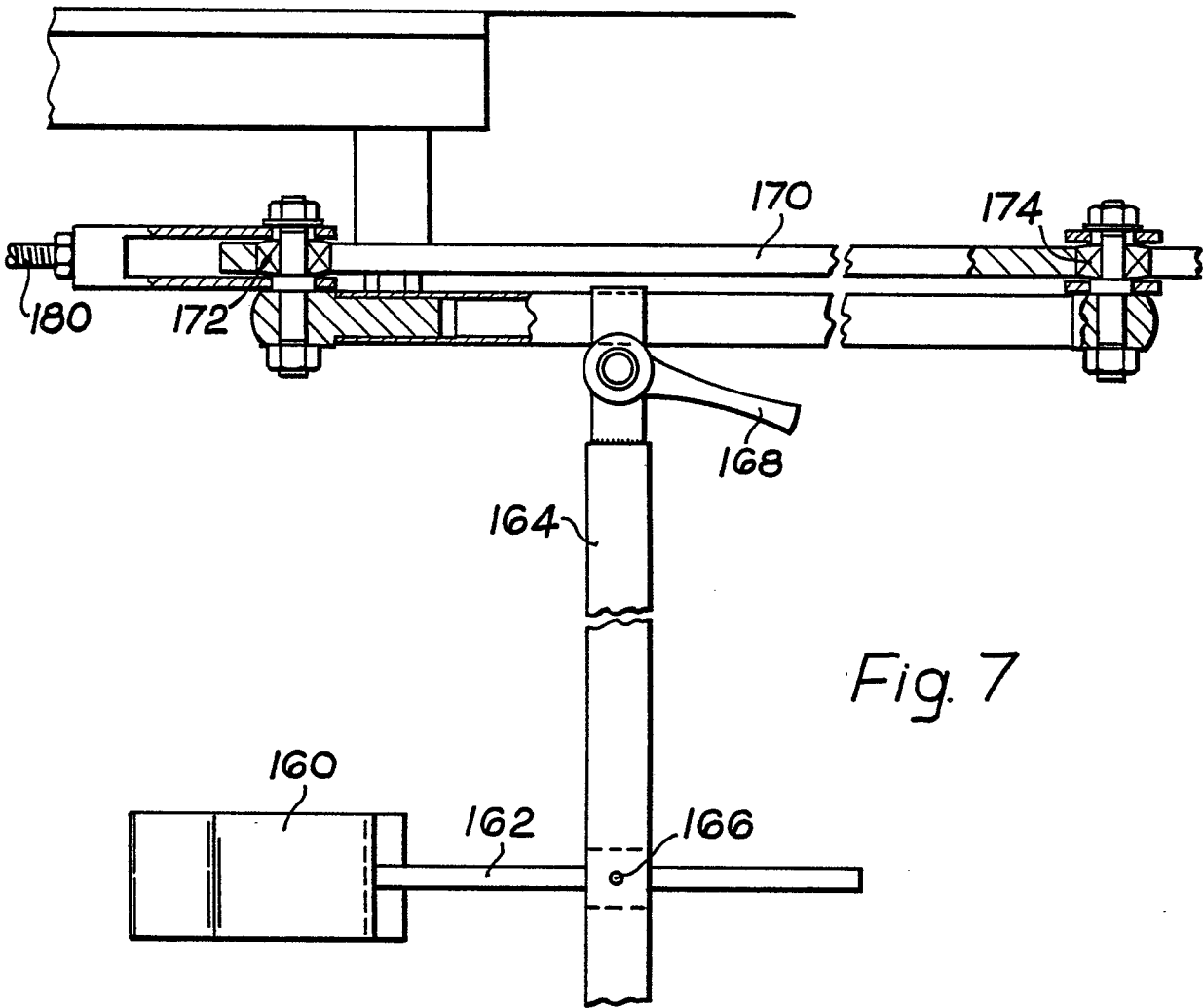




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European Patent
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EUROPEAN SEARCH REPORT

0040937
Application Number
EP 81 30 2167

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 2 093 228 (COTTRELL)</u> * the whole document * --	1, 2, 5, 9	B 65 H 29/68 29/08
	<u>DE - C - 643 980 (MAN)</u> * the whole document * --	1	
	<u>FR - A - 2 147 603 (ROLAND)</u> * the whole document * --	3, 9	TECHNICAL FIELDS SEARCHED (Int. Cl.)
	<u>US - A - 3 730 517 (HARRIS)</u> * the whole document * -----	3, 6, 10	B 65 H
			CATEGORY OF CITED DOCUMENTS
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☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search The Hague		Date of completion of the search 02-09-1981	Examiner LONCKE