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Device to sort and selectively collect flat products

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### **Abstract**

A device to sort and selectively collect flat products, like despatch pouches, printed materials or production parts, which are placed into allocated collecting containers (4) at collecting positions (2) on the conveying path of a circulating conveyor (3), while the full collecting containers (4') are replaced by empty collecting containers (4) on the transfer section by a pusher device (5). The reversibly driven pusher device (5), moving transversely to the direction of conveying, transports an empty collecting container (4) to the collecting position (2) and at the same time pushes a full collecting container (4') out from the collecting position, while the feed and reversing movement of the pusher device (5) is carried out by means of a carrier (16) fastened on a continuously circulating pulling means (15).

(Fig.2)

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**COMPLETE SPECIFICATION**

**STANDARD PATENT**



**Applicant(s): Siemens Aktiengesellschaft**  
-GRAPHIA HOLDING AG

**Invention Title:**

DEVICE TO SORT AND SELECTIVELY COLLECT FLAT PRODUCTS

The following statement is a full description of this invention, including the best method of performing it known to me/us:

**Device to sort and selectively collect flat products**

The invention concerns a device to sort and selectively collect flat products, like despatch pouches, printed materials or production parts, which at assigned collecting positions are placed into collecting containers below a conveyor on the conveying path of a continuously circulating conveyor, while the empty collecting containers can be moved on a transfer section between a lateral preparing position and the collecting position by means of a reversible driven pusher device which moves transversely to the direction of movement of the conveyor with a guiding arrangement of the transfer section and the filled collecting containers can be pushed out from the collecting position.

A device of the type described in the introduction is used according to EP-A-0 899 026 for sorting flat products like despatch pouches, printed matters or production parts, those products being delivered individually by a conveyor and placed into a plurality of collecting containers at collecting positions or filling stations allocated on the conveying path below the conveyor.

If the loading of the pusher device with empty collecting containers takes place automatically, like, for example, in the European patent application No. 98810308, then the drive of the pusher device is to be constructed correspondingly.

For this reason the object of this present invention is to develop the pusher device in such a manner that it allows in a simple manner an automatic loading with empty collecting containers also.

According to the invention this objective is achieved by that the pusher device is connected in a driving manner with a carrier fastened on a circulating pulling means of a driving device firmly arranged on the stand.

This solution allows a simple embodiment of the pusher device with which the positions can be accurately approached and has good wear resistance and is maintenance-friendly.

5 Advantageous for this device according to the invention is that the carrier is driven on parallel sections of a circulating path of two reversing pulleys positioned at a distance from each other in the direction of movement of the pusher device and it is provided moving in a reciprocating manner in a hollow 10 space of the pusher device transversely to the direction of movement of the latter, the hollow space having walls connected so that to provide a driving effect, allowing the use of simple driving elements.

.....  
.....15 The circulating path of the carrier is preferably determined by the length of the transfer section, which is at least the length of the parallel section of the circulating path.  
.....  
.....

.....20 It is therefore beneficial if the transverse extension of the hollow space accommodating the carrier is at least the width of the circulating path of the carrier in the region of a reversing pulley, so that it has a wear-reducing and noise-dampening effect.  
.....  
.....

.....25 It is a further advantage if the hollow space has two opposing walls, particularly on the parallel sections of the circulating path, the walls abutting against the carrier, on which walls in the circulating region of the reversing pulleys the carrier moves transversely to the direction of the pusher device.  
.....

30 In an advantageous manner the driving device is placed below the pusher device, consequently achieving a compact yet easily accessible construction.

35 The pusher device is preferably divided into a region assigned to the collecting container and a region adjoining it in the direction of movement which is assigned to the guide arrangement or the driving device, so that a convenient

arrangement and division of the individual movement components can be achieved.

It is advantageous when, viewed in the direction of transfer, the region of the collecting containers is behind the region of the pusher device allocated to the guide arrangement or the driving device, so that an optimum driving concept can be achieved between the preparing position and the collecting position.

It is recommended to provide the reversing pulley of the pulling means, which pulley is connected with a motor, between the preparing position and the collecting position of a collecting container, so that a space-saving yet easily accessible arrangement would be achieved.

Provided the preparing position of the collecting container is formed by a conveyor for empty collecting containers, it is advantageous if the rear region, viewed in the direction of transfer, of the pusher device in the initial position extends into the preparing position of the collecting container. If the hollow space, formed as a slot, runs at right angle to the movement of the pusher device, then the velocity of the pusher device is retarded when the carrier enters into the curved track section formed by the reversing roller and it is accelerated again at the reversal point of the section until it reaches the parallel section of the pulling means.

For a continuous change of the movement of the pusher device at the retarding and accelerating ends on the transfer section the guide slot could have also a curved shape, to avoid a damaging impact of the front edge of the pusher device on the collecting container, especially when the filled container is pushed out from the collecting position. Due to the run-out of a motor, in the case of a transversely running straight guide slot is it certainly possible to hold the pusher device in a specific position by means of corresponding technical means (positioning or servo drive) only.

As an alternative to the straight or curved guide slot the hollow space can be so constructed, that the carrier for the driving of the pusher device abuts against a wall provided transversely to the direction of movement of the pusher device, 5 so that when circulating around a reversing pulley its position changes along the wall as well as transversely to the direction of movement of the pusher device and the driving velocity of the pusher device is retarded at the reversal point of the reversing pulley in the affected direction down to zero. From 10 the reversing point on the wall runs approx. at 90° and concentric to the axis of rotation of the reversing pulley and terminates with a wall section which is parallel to the direction of movement, the wall section continuing transversely to the direction of movement of the pusher device and 15 constructed as a stop. As described above, the carrier changes 20 its position on the latter when running around the opposite situated reversing pulley.

Geometrically considered, the hollow space consists of two 25 geometric areas of equal sizes which are situated diametrically opposed about the axis running transversely to the direction of movement of the pusher device, these areas formed from a square and a quarter circle adjoining it and an eye of same positioned inclined at approx. 45°, the pupil of which is constructed by a central guide shaft which defines a track in the region of the quarter circle with the wall of the hollow space.

The carrier, fastened on the pulling means, comprises 30 preferably a preferably cylindrical carrier part protruding into the hollow space and a fastening part which is connected with the circulating pulling means, while the pulling means extends along the axis of the cylindrical carrier part, so that a direct transfer drive is achieved from the pulling means to the pusher device.

35 The fastening of the carrier on the pulling means is carried out by forming a loop of the pulling means which is passed

through by a spindle, the pulling means being connected with the fastening part so that the pulling means is not weakened.

5 In an appropriate manner the loop of the pulling means is anchored in an annular gap formed by the spindle and a bore of the carrier part, so that a reliable driving union is achieved.

10 So that the warping of the pulling means between the reversing pulleys would not affect the position of the carrier part in the hollow space, a support element is provided between the carrier part and the fastening part, the support element being guided on the transfer section.

15 The invention is described in the following by referring to the drawing, in which references are made to all particulars not explained in detail in the description, based on an embodiment.  
The drawings show in:

20 Fig.1 - a top view of a partially illustrated sorting device for selective collection of flat products,

25 Fig.2 - a partial cross-section through the pusher device of a sorting device according to line II-II of Fig.1,

30 Fig.3 - a pusher device for a sorting device according to Fig.1,

35 Figs.4, 4.1 and 4.2 - the schematically illustrated progress of the carrier in a guide slot,

Figs.5, 5.1 and 5.2 - an alternative construction of the hollow space and the progress of the carrier,

Fig.6 - the construction of a carrier, in top view,

35 Fig.7 - the carrier according to Fig.6 in a side view, and

Fig.8 - a section through the carrier according to line VIII-VIII in Fig.7.

Fig.1 shows partially a collection area of a sorting device 1 for flat products, in particular despatch pouches, printed matters or production parts, which are to be conveyed to the collecting positions 2 by means of a conveyor 3 (dot-dash line), which circulates above the collecting area formed from a plurality of collecting positions 2. Such a conveyor becomes apparent, for example, from EP-A-0 638 501. At the collecting positions 2 empty collecting containers 4 are ready to accept the products, into which containers selectively grasped products are thrown for a specified place of despatch. When the holding capacity of a collecting container 4 is exhausted, it is replaced by an empty one, i.e. the full collecting container 4 is pushed out from the collecting position 2 by a pusher device 5 which conveys from the side an empty collecting container 4 on to a conveyor belt or a similar transport device, like the one disclosed in EP-A-0 899 026.

The collecting containers 4 shown in Fig.1 and lined up next to each other along the conveyor 3 are used to explain step-by-step the replacement process of a collecting container 4. The direction of the arrow of the dot-dash line for the conveyor 3 indicates its direction of transport. The illustrated collection area has a preparing section 6 for the collecting containers 4 allocated to the collecting positions 2, which collecting containers can be placed on to the pusher device 5 manually also. The preparing section 6 on the side of the collecting positions 2 is constructed by rollers 7 which can be driven and can provide a continuous preparing place of empty containers 4 along the collection area, i.e. each collecting position 2 can have at any time an empty collecting container 4. The direction of transport of the preparing section 6 may be the same as or the opposite to the direction of transport of the conveyor 3. The pusher device 5, which will be described in detail further on, in position A is in its initial position, in

which the collecting position 2 is occupied by a collecting container 4 below the conveyor 3.

5 In the initial position of the pusher device 5 this receiving area of the collecting container 4 is roughly at level with the top surface of the rollers 7.

10 The collecting positions 2 are constructed as parking places for the collecting containers 4 which are to be charged with products, whereby the pusher device 5, which moves the empty collecting containers 4 into the collecting position 2, on the return movement is pulled out to the initial position under the collecting container 4, which with its rear wall, in the direction of the feed, abuts against an inward pivoted retaining device 9.

15 In position B the pusher device 5, carrying the collecting container 4, has left the initial position on the preparing section 6 with an empty collecting container 4 and at the same time it pushes with its front the fully loaded collecting container 4 from the collecting position 2. The pusher device 5, which pushes out the loaded collecting containers 4', has a wide area on the front pushing edge, so that not to damage the collecting container 4'.

20 25 In position C the retaining device 9 is moved laterally by the empty collecting container 4.

30 In position D the empty collecting containers 4 and the filled collecting containers 4 have reached the collecting position 2 or the position of removal on a conveyor belt; the retaining device 9 is again pivoted inward behind the empty collecting container 4 into the collecting position 2.

35 Position E shows the pusher device 5 during the returning movement, in which the empty collecting container 4, situated in the collecting position 2, abuts with its rear against the

retaining device 9. The retaining position corresponds to the collecting position of the collecting container 4.

5 In position F the pusher device 5 has reached again the initial position and at the same time it extends into the preparing section 6, where a collecting container 4, under which the pusher device 5 moves, waits for it or where it is charged from the preparing section 6 with a collecting container 4.

10 Fig.2 shows a cross-section across the pusher device 5, as well as the associated guiding arrangement 22 and in Fig.3 the pusher device 5 is shown from above.

..... To a carrier plate 10, which is firmly connected with the sorting device 1, a controllable drive motor 11 is bolted. On the vertically disposed drive shaft 12, which passes through the carrier plate 10, a driven reversing pulley 13 is fastened which, with a reversing pulley 14 situated at a distance in the direction of movement of the pusher device 5, drives an endless pulling means 15, e.g. a flat or toothed belt, in accordance with arrow F in Fig.1. An outward protruding carrier 16 is fastened on the pulling means 15, the carrier being joined to the pulling means 15 via a fastening part 17 and protruding with a carrier part 18 into a hollow space 19, which is provided in the pusher device 5 and is formed by wall sections.

25 ..... The wall sections of the hollow space 19 interact with the carrier part 18 of the carrier 16 fastened on the pulling means 15 in a conveying and controlling manner, so that when the pusher device 5 reaches the transporting end of the transfer section determined by the distance between the pulleys 13, 14, 30 the collecting container 4 reverses its direction of movement from the initial position to the collecting position.

35 To move the pusher device 5 from the initial position into the collecting position 2 and back, a guiding arrangement 22 comprising a guide groove 20 and a guide bar 21 is provided on both sides of the pulling means 15, wherein the guide groove 20

is arranged in a profiled bar 23 fastened on the carrier plate 10 and the guide bar 24 moving in the guide groove 20 is arranged on the pusher device 5.

5 The pusher device 5, having a flat construction, is made from a  
wear-resistant material, e.g. synthetic material, advantageous  
for dimensional stability.

10 The driving device 8, comprising the drive motor 11, reversing pulleys 13, 14, pulling means 15 and carrier 16, is arranged below the pusher device 5, so that a compact and low construction is achieved.

On the other hand, the pusher device 5 has several ribs due to its flat construction.

For reasons of manufacturing, in the embodiment illustrated in Fig.3, the pusher device 5 has a multi-part construction. A single-piece format, like the one illustrated in Fig.1, cannot be produced dimensionally accurately by using die-casting. Moreover, a multi-part embodiment, like the one illustrated in Fig.3 by the displaceable extension 25, allows a matching of the length of the pusher device 5 to suit containers with various dimensions, particularly as far as the length of the container is concerned. On its front face the board-shaped rectangular pusher device 5 is constructed for pushing out the fully loaded collecting container 4' from the collecting position 2 and on its underside, set back from the front face, has the hollow space 19 for the carrier part 18 of the carrier 16 running on the pulling means 15 around the reversing pulleys 13, 14.

35 Fig.3 shows an alternative form of the hollow space 19 and the various positions of the carrier part 18 in the hollow space 19 for the continuously running carrier 16.

Adjoining the hollow space 19 the pusher device 5 is constructed with an extendable extension 25 which is necessary

5 to place an empty connecting container 4 on it. The fully extended length of the pusher device 5 can be seen in Fig.1, in which the double outrigger-like extension 25 is visible, which can move between the rollers 7 of the preparing section 6 and at the rear end has a stop 26 to carry with it the collecting containers 4 situated on it.

10 The length of the transfer section is determined by the distance between the reversing pulleys 13, 14 and their diameters and the construction of the hollow space 19.

15 The driven reversing pulley 13 of the pulling means 15 of a pusher device 5, which pulley is connected with a geared motor 11, is situated between the preparing position of a collecting container 4 standing on the rollers 7 and the collecting position 2 at which the collecting container 4 is charged with products.

20 In the initial position of a collecting container 4, illustrated by position A, the rear region, viewed in the direction of transfer, of the pusher device reaches into the preparing position of an empty collecting container 4 via the extension 25.

25 The construction of a hollow space 19 for the carrier part 18 of the carrier 16 may have, for example, the shape of a slot. Fig.4 shows a guide slot 27 as the hollow space 19 which extends transversely to the direction of movement of the pusher device 5 as well it shows as the reversing pulley 14 of the pulling means 15. As soon as the carrier 16, connected with the pusher device 5, reaches the radius of the reversing pulley 14, an increasing retardation of the movement velocity of the pusher device 5 commences down to zero through the following quarter circle, to be immediately increasingly accelerated on the following quarter circle of the reversing pulley 14. This progress of the carrier 16 on the reversing pulley 14 and in the guide slot 27 of the pusher device is illustrated in Figs.4, 4.1 and 4.2.

The carrier 16 fastened on the pulling means 15 moves the pusher device 5 by means of the carrier part 18 protruding into the transversely arranged guide slot 27. Following the position illustrated in Fig.4, the carrier part 18 moves within the 5 guide slot 27 on the quarter arc of the reversing pulley for half the path of its movement up to the reversal point on the reversing pulley and leaves this position for a further half path in the same direction. At the same time the pusher device 10 5 is additionally accelerated in the opposite direction, while the carrier part 18, since leaving the reversal point on the reversing pulley 14, abuts against the opposite wall (see Fig.4.2).

On the opposite situated reversing pulley the same process is repeated in the opposite direction. A control device takes care that the pusher device 5 is stationary or is held in the initial position until the next exchange of a collecting container 4. It is not easy to accurately stop the pusher device 5, which is connected in a driving manner with a freely running or uncontrolled, cost-effective motor, by means of a guide slot 27.

To overcome this disadvantage, instead of a guide slot 27 a hollow space 19 shown in Fig.3 can be used. Such a hollow space 19 is shown in Figs.5, 5.1 and 5.2. The wall sections 28, 28' intended for the moving of the pusher device 5, which are also arranged transversely to the direction of movement of the pusher device 5, are diametrically opposed about a plane running transversely to the direction of movement of the pusher device 5 and are extended by an arc-shaped wall section 29, 29' each, which hold the pusher device 5 at rest at the end of each transfer section, which wall section, together with a centrally provided cylindrical projection 30 forms a track 31 for the carrier 16 or the carrier part 18. Fig.5.2 shows the situation wherein the carrier 16 or the carrier part 18 moves after the reversal point on a track 31 and subsequently reaches the diametrically opposed wall section 28'.

On the angular section  $\alpha$  of the track 31, which due to the necessary track play is less than  $90^\circ$ , the pusher device 5 is held in an arrested position by means of the carrier part 18 and remains in this position or in the collecting position 2 until the carrier part 18 reaches the wall section 28'. This gives the reversing pulley 14 a rotary movement of approx.  $135^\circ$  from the reversal point to the wall section 28', which can be used as run-out play for the geared motor 11, while the run-out play is used particularly for the longer dwelling of the pusher device 5 in the initial position, i.e. in the preparing section 6 of the collecting containers 4.

As it has already been noted, the carrier 16 comprises a carrier part 18 which protrudes into the hollow space 19 of the pusher device 5 and a fastening part 17 connected with the circulating pulling means 15, a flat or toothed belt, as this is shown in Figs.6 to 8.

Fig.7 shows the type of fastening of the carrier 16 on the pulling means 15, wherein a loop 33, formed on the pulling means 15, surrounds in a cylindrical chamber 34 of the fastening part 17 a threaded pin 35 or a spindle fastened in that chamber (see also Fig.8). Between the carrier part 18 and the fastening part 17 the carrier 16 has a supporting member 36, which serves the purpose of maintaining the posture and guiding of the pulling means 15, in particular on the straight sections, where the support member 36 is guided along a batten (not illustrated).

As far as the exchange of the collecting containers 4, 4' on the collection place 2 is concerned, it could be equipped with a device to measure the filled amount, which device is connected with a control device to trigger a signal when the collecting container 4, 4' is due to be exchanged.

For the purposes of this specification it will be clearly understood that the word "comprising" means "including but not limited to", and that the word "comprises" has a corresponding meaning.

**THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:**

1. A device to sort and selectively collect flat products, like despatch pouches, printed materials or production parts, which at assigned collecting positions are placed into collecting containers below a conveyor on the conveying path of a continuously circulating conveyor, while the empty collecting containers can be moved on a transfer section between a lateral preparing position and the collecting position by means of a reversible driven pusher device which moves transversely to the direction of movement of the conveyor with a guiding arrangement of the transfer section and the filled collecting containers can be pushed out from the collecting position, characterised in that the pusher device is connected in a driving manner with a carrier fastened on a circulating pulling means of a driving device firmly arranged on the stand, the pulling means continuously circulating around reversing rollers.
2. A device according to claim 1, characterised in that the carrier, driven on parallel sections of a circulating path of two reversing pulleys positioned at a distance from each other in the direction of movement of the pusher device, is driven moving in a reciprocating manner in a hollow space of the pusher device transversely to the direction of movement of the latter, the hollow space having walls connected so that to provide a driving effect.
3. A device according to claim 2, characterised in that the length of the transfer section corresponds at least to the effective length of the parallel section of the circulating path of the carrier.
4. A device according to one of claims 2 and 3, characterised in that in its transverse extension of the hollow space has at least the width of the circulating path of the carrier in the region of a reversing pulley.

5. A device according to any one of claims 2 to 4, characterised in that the hollow space has two opposing wall sections, particularly on the parallel sections of the circulating path, the walls abutting against the carrier.

6. A device according to any one of claims 1 to 5, characterised in that the driving device is arranged below the pusher device.

10 7. A device according to any one of claims 1 to 6, characterised in that the pusher device has a region allocated to the collecting container and a region which in the direction of movement follows the guide arrangement and the driving device.

15 8. A device according to claim 7, characterised in that viewed in the direction of transfer the region of the collecting containers is provided behind the region of the pusher device allocated to the guide arrangement and the driving device.

20 9. A device according to any one of claims 2 to 8, characterised in that the reversing pulley of the pulling means, which pulley is connected with a motor, is provided between the preparing position and the collecting position of a collecting container.

25 10. A device according to any one of claims 7 to 9, characterised in that the rear region, viewed in the direction of transfer, of the pusher device in the initial position extends into the preparing position of a collecting container.

30 11. A device according to claim 5, characterised in that the wall sections of the hollow space form a guide slot extending transversely to the direction of movement of the pusher device.

12. A device according to claim 5, characterised in that the wall sections allocated to the carrier and intended for the moving the pusher device, which wall sections extend transversely to the direction of movement of the pusher device and are provided diametrically opposed about a parallel plane which is transverse to the direction of movement of the pusher device and are extended by an arc-shaped wall section each, which hold the pusher device at rest at the end of each transfer section, the wall section, together with a centrally provided cylindrical projection, forming a track for the carrier.

13. A device according to claim 12, characterised in that the curved wall section is connected with a wall section which forms an enclosed wall of the hollow space and is parallel to the direction of movement of the pusher device.

14. A device according to any one of claims 1 to 13, characterised in that the carrier has a preferably cylindrical carrier part protruding into the hollow space and a fastening part which is connected with the circulating pulling means, while the pulling means extends at least approximately in the axis of the carrier part.

15. A device according to claim 14, characterised in that the pulling means is connected with the fastening part of the carrier by forming a loop which is passed through by a spindle.

16. A device according to claim 15, characterised in that the loop of the pulling means is provided in an annular gap in the fastening part of the carrier.

17. A device according to any one of claims 14 to 16, characterised in that the carrier between the carrier part and the fastening part has a supporting member.

18. A device according to any one of claims 1 to 17,  
characterised in that the effective length of the pusher  
device is variably constructed in the direction of  
movement.

Dated this 24th day of February 2000

GRAPHA HOLDING AG Siemens Aktiengesellschaft

By their Patent Attorneys

GRIFFITH HACK

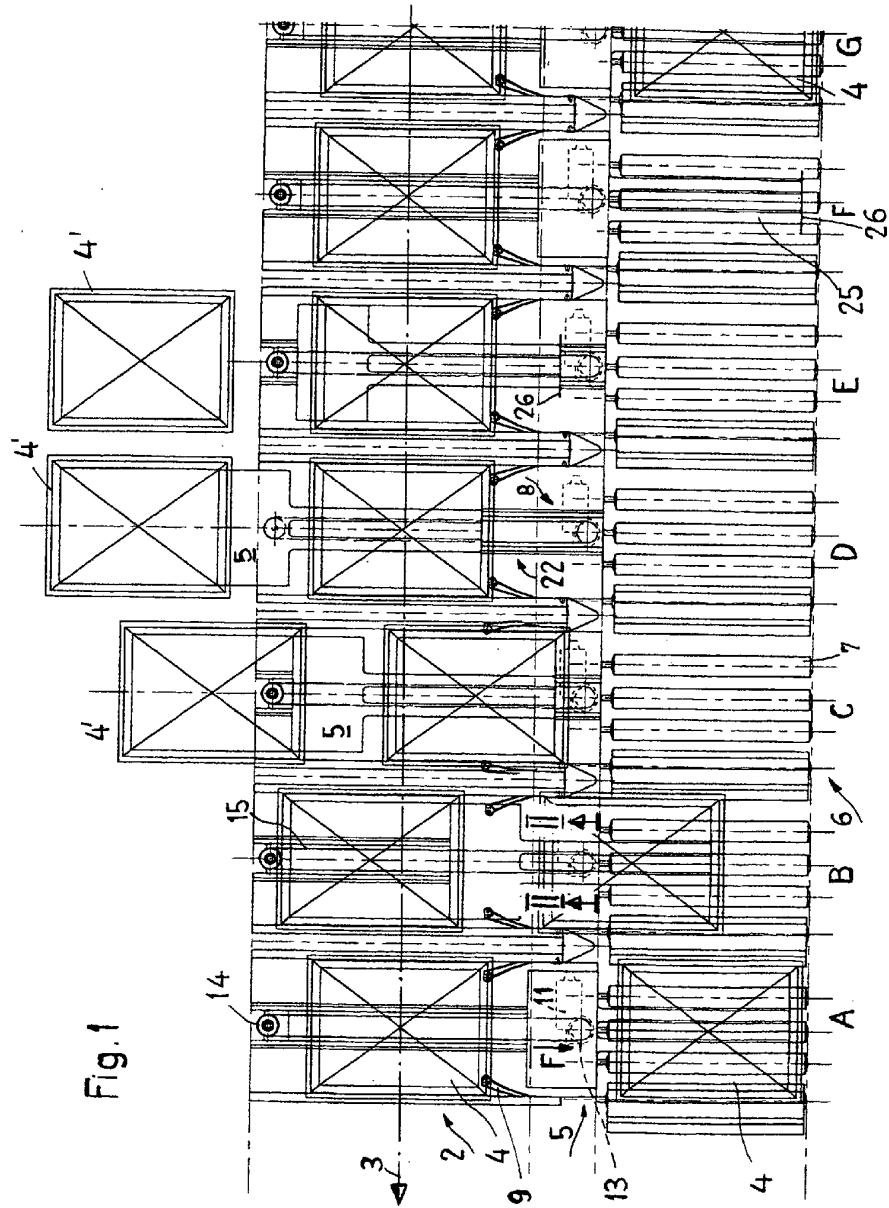
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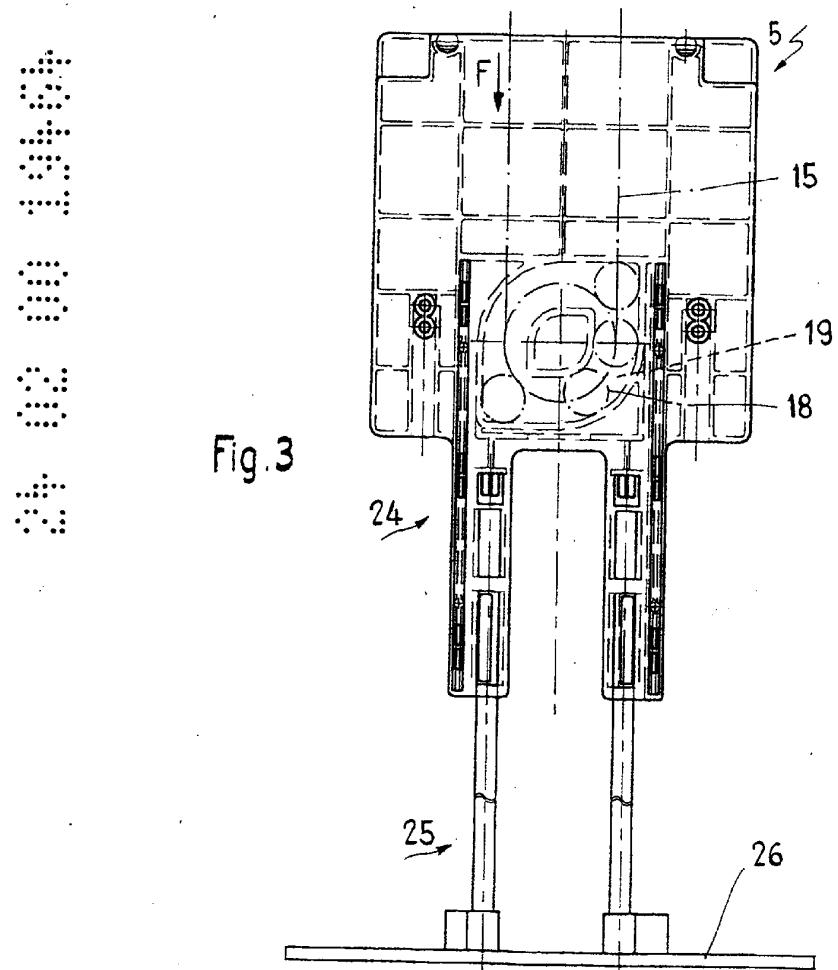
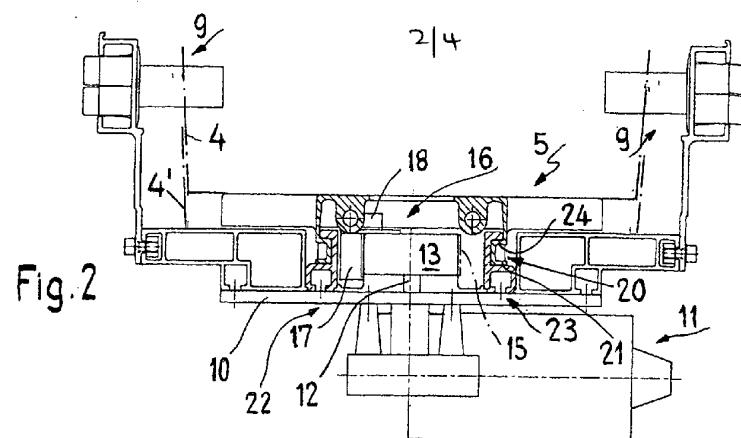


21 32 33 34 35

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Fig. 1





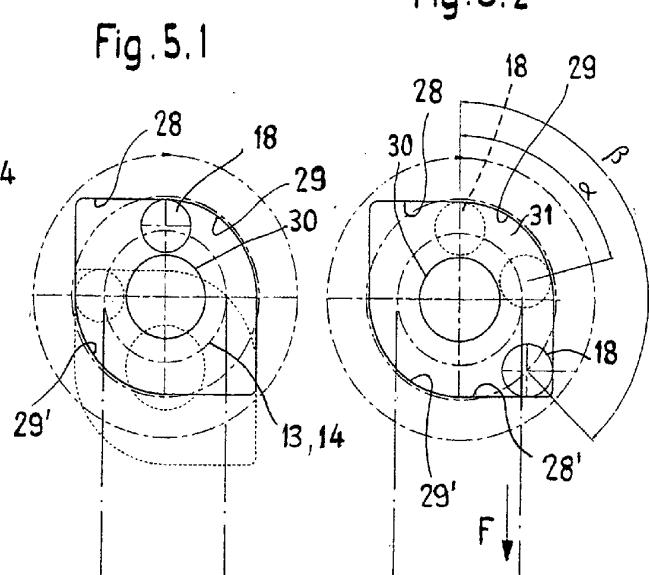
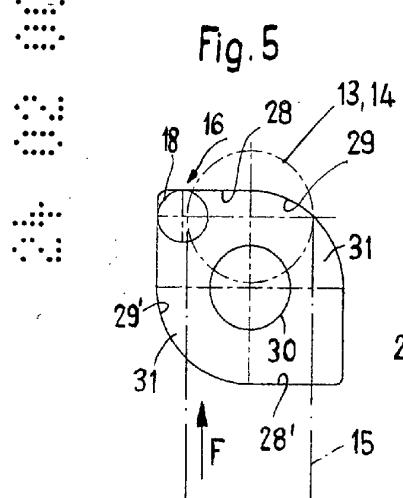
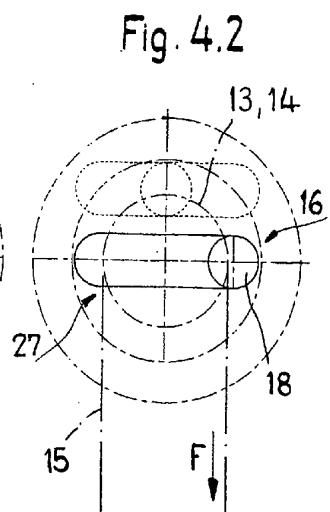
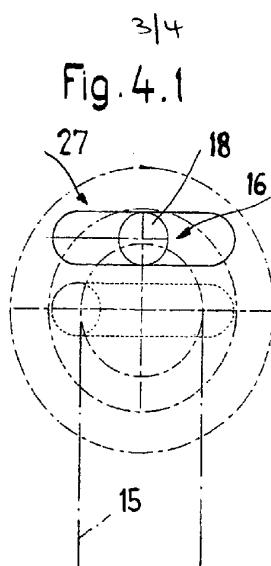
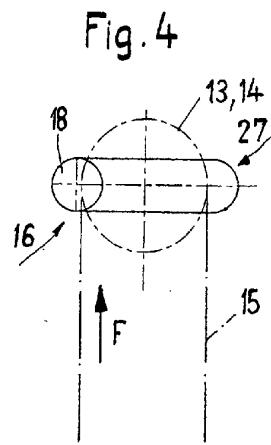


Fig. 7

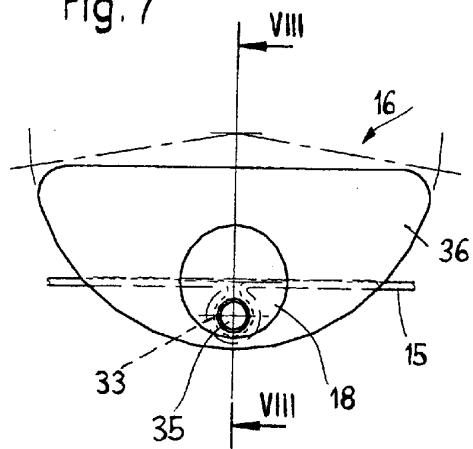


Fig. 6

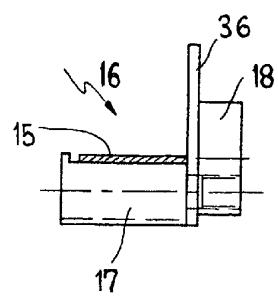


Fig. 8

