

(19)



(11)

EP 3 066 649 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

01.12.2021 Bulletin 2021/48

(51) Int Cl.:

G07D 7/00 ^(2016.01)

G07D 11/00 ^(2019.01)

(86) International application number:

PCT/CA2014/000782

(21) Application number: **14858912.0**

(22) Date of filing: **31.10.2014**

(87) International publication number:

WO 2015/061887 (07.05.2015 Gazette 2015/18)

(54) **BANKNOTE VALIDATOR WITH CASHBOX**

BANKNOTENVALIDIERER MIT GELDKASSETTE

DISPOSITIF DE VALIDATION DE BILLETS DE BANQUE AVEC CAISSE

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **04.11.2013 CA 2832600**

(43) Date of publication of application:

14.09.2016 Bulletin 2016/37

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EP 3 066 649 B1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to banknote validators having an associated cashbox and in particular to the connection between the cashbox and the banknote validator allowing banknotes to pass from the validator to the cashbox.

BACKGROUND OF THE INVENTION

[0002] Banknote validators with locking banknote cassettes or non locking cashboxes are well known and have particular application for standalone payment systems where there may or may not be security personnel present. Prior art is disclosed in WO2009/003152A, WO2006/0099725A and US2013/0140756A. US2013/0140756A discloses a medium storage box with an integrated pick up roller. WO2009/003152A and WO2006/0099725A disclose devices for use with vending machines and in exchange for goods or services.

[0003] Banknote validators and associated cashboxes for gaming machines and other applications where the value of the accumulated banknotes is relatively high, typically use a locking banknote cassette. In lower value applications such as vending machine applications, the value of accumulated banknotes received as part of the payment process is significantly less and a more cost effective arrangement of the banknote validator and cashbox is often required. For vending machine applications, it is known to use a plastic cashbox and it is also known to use a plastic cashbox with an open port. This simplified plastic cashbox is significantly less secure relative to a locked banknote cassette however it provides a low cost system. The open port plastic cashbox is typically used where the denomination of the currency being accumulated is relatively low and/or the operator demands a price point for the combination banknote validator and cashbox that is particularly aggressive.

[0004] The present invention relates to a banknote validator having a cashbox of the open port type that has improved properties reducing the possibility of banknote jamming when passed from the validator to the cashbox.

[0005] In banknote validators and plastic cashboxes, the cashbox is generally connected to the banknote validator for feeding of the banknote along one face of the cashbox to overlap with the open port. The banknote is appropriately positioned by the banknote validator in front of the open port and a stacking mechanism forces the banknote through the port and into the cashbox. Typically a banknote validator has an initial banknote evaluating channel of a first generally straight orientation connected to a curved transition followed by a second generally straight segment having a direction generally perpendicular to the first direction. The curved transition is normally a smooth curve defined entirely by the banknote validator and guides the banknote through the change in direction

of travel and connecting with an outlet of the validator. The cashbox is then positioned adjacent the outlet and the banknote is moved or passed along a front face of the banknote receiving port in the cashbox.

[0006] With the prior art arrangement described above, a banknote can become jammed in the banknote validator or at the junction of the cashbox and the banknote validator. Banknote validators can include various arrangements including software arrangements for controlling the drive of the banknote validator to assist in clearing of jammed banknotes, however jamming of banknotes remains a significant problem as the banknote validator is forced to a service required condition. This outage in service typically reduces sales and can frustrate both customers and the service providers.

[0007] It is desired to provide an improved arrangement for processing of banknotes and stacking of the banknotes in a cost efficient and reliable arrangement.

SUMMARY OF THE INVENTION

[0008] A banknote validator according to the present invention comprises a validating head having a banknote processing channel for assessing the authenticity of banknotes and a releasable cashbox connected to the validating head for stacking authenticated banknotes. The validating head includes a banknote inlet at one end of the banknote processing channel and a banknote outlet at an opposite end of the banknote channel. The banknote outlet cooperates with an end of the cashbox to collectively define a curved transition guiding an authenticated banknote through an angle of at least 90° leading to a stacking port in a side of the cashbox. The cashbox and validating head have interfitting surfaces collectively defining an outside guide structure of the curved transition when the cashbox is secured to the validating head. A drive arrangement drives banknotes through the banknote processing channel, and if authenticated, through the curved transition to the stacking port. A stacking mechanism is provided for selectively pushing a banknote through the stacking port and into the cashbox.

[0009] In a preferred aspect of the invention the banknote validator has a particular drive arrangement that includes two lead drive rollers located in the validating head and defining a portion of the curved transition. The drive arrangement further includes cooperating responsive rollers on opposite sides of the processing channel on a front side of the curved transition and a pair of downstream responsive rollers supported in the cashbox adjacent a discharge of the curved transition. Each of these responsive rollers cooperate with the associated lead drive rollers to engage and guide a banknote towards the stacking port of the cashbox.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Preferred embodiments of the invention are shown in the drawings wherein:

Fig. 1 is a vertical sectional view through a banknote validating head and the connected cashbox showing the cooperation of these components and in particular the cooperation defining the curved transition for the banknote drive path;

Fig. 2 is a partial perspective view showing the open port of a cashbox in combination with a top member of the validating head illustrating the guide surface at the curved transition;

Fig. 3 is a partial perspective view showing further details of the particular cooperation of the components shown in Fig. 2;

Fig. 4 is a partial sectional view showing the outer components and their cooperation to form the curved transition;

Fig. 5 is a front view showing the portion of the validating head opposite the port in the cashbox;

Fig. 6 is a partial perspective view showing the interior surface of the curved transition;

Fig. 7 is a perspective view of the lead drive roller; and

Fig. 8 is a perspective view of the responsive roller.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The sectional view of Fig. 1 shows a banknote validator 2 having a banknote validating head 4, and a cashbox 6 where banknotes enter through the banknote inlet 8, pass through the processing channel 10 to the curved transition 12, and if authenticated, are driven to overlap with the stacking port 40 of the cashbox 6. The arrangement of Fig. 1 has a particular drive arrangement and banknote processing pathway which distinguishes it from the prior art. It can be seen from a review of Figures 2 and 3 that the curved transition 12 which forms part of the banknote processing channel is defined between a portion of the validating head 4 and an end portion of the cashbox 6. This curved transition allows an authenticated banknote to be driven and positioned in front of a port of a cashbox. The curved transition essentially joins the two straight segments that have a generally 90° orientation.

[0012] The curved transition is defined by a portion of the cashbox and a portion of the validating head. This is in contrast to prior art arrangements where the curved transition is entirely formed within the validating head and the cashbox abuts with an offset discharge from the validating head after the banknote has been processed through the curved transition.

[0013] It has been found that banknotes may become jammed or lodged at a curved transition in the banknote processing path and/or at the connection to the cashbox. In contrast to the prior art arrangement, the curved transition of the present system is collectively defined between the cashbox and the validating head and thus the separate interface between the cashbox and the validating head is avoided. This reduces the number of locations where a banknote may become jammed and the arrange-

ment has been found to be more reliable.

[0014] As seen in Fig. 2, the validating head 4 includes an outside portion 5 that defines part of the exterior of the curved transition 12. The one end 15 of the cashbox 6 defines a second portion of the curved transition. Basically the cashbox includes a series of interfitting or overlapping surfaces 62 as shown in Fig. 3 which cooperate with the interfitting surfaces 60 of the outside portion 5 of the validating head 4. These interfitting surfaces form stationary parts of the exterior surface of the curved transition.

[0015] It can also be seen in Fig. 3 that the outside portion 5 of the validating head 4 includes two cooperating responsive rollers 24 that engage the drive roller 22 shown in Fig. 1. Basically there are 2 drive rollers on either side of the validating head and positioned within the curved transition as best shown in Fig. 1. A banknote passing through the banknote channel and the curved transition is engaged by each of the drive rollers 22 and the cooperating responsive rollers 24 as part of the validating head and the cooperating responsive rollers 48 that are supported in the cashbox. As illustrated in the sectional view of Fig. 1, the drive roller 22 is engaged by the responsive roller 24 and the responsive roller 48 of the cashbox. With this arrangement, a banknote that is approaching the curved transition is initially engaged in the gap between the responsive roller 24 and the drive roller 22 and the associated drive belt. The banknote is driven through the curved transition and subsequently engaged between the responsive roller 48 and the drive roller 22. This arrangement for controlling of the banknote as it passes through the curved transition has proven to be very effective. With this arrangement the cashbox forms the second portion of the curved transition in combination with an inner surface of the validating head 4.

[0016] The drive roller 22 is oversized relative to the responsive rollers and preferably is of a diameter at least twice the diameter of the responsive rollers. With this arrangement the drive belts and the drive rollers drive the banknote throughout the curved transition. Figures 5 and 6 show a further feature of the present invention. The drive roller 22 is actually a combination drive roller having a drive roller segment 34 which engages roller segment 26 of the cooperating responsive rollers 24 and 48. The drive roller 22 also includes a belt drive gear segment 36 shown in Fig. 7 that cooperates and drives the drive belt 30. With this structure, both the drive belt 30 (and there are a pair of drive belts 30 provided either side of the banknote channel) and the drive roller segment 34 control the banknote as it passes through the curved transition. At the discharge side of the curved transition, the drive belts 30 continue to drive the banknote downwardly as these drive belts are positioned either side of the stacking port 40 in the banknote cassette. It can also be appreciated that the drive roller segments of the drive rollers also force a banknote downwardly so that it can assume an overlapped position with the stacking port 40 of the cashbox 6 to allow stacking therein.

With banknotes of different widths, this has been effective in reducing jamming events. The outside position of the banknote drive belts is preferred as they extend either side of the port 40. A return roller for each drive belt is generally shown as 49.

[0017] Fig. 5 shows a pusher plate 70 that includes its own motor for forcing of the pusher plate through the stacking port 40 and any banknote in front of the stacking port to push a banknote into the cashbox.

[0018] With the present structure, the curved transition is formed between the cashbox and the banknote validating head. The inner portion of the curved transition is defined in the validating head by the banknote channel and the drive rollers 22 and the drive belts. The outer portion of the curved transition is partially defined by the validating head (i.e. the outside portion 5) and the one end of the cashbox such that a banknote is only prone to jamming in the curved transition and the cashbox and validating head have a pass off point that is collectively defined within the curved transition. By positioning the drive roller 22 in the curved transition and of a diameter to allow it to engage the banknote as it enters the curved transition as well as when it leaves the curved transition, the drive roller maintains control over the banknote and provides an effective hand off as the processing channel of the banknote on the exterior thereof changes from the banknote validating head to the cashbox.

[0019] The particular cooperation of the elements in the interlapping surfaces or fingers at the curved transition to collectively form the curved transition reduces jamming and effectively controls the banknote as it passes between the validating head and the cashbox. This arrangement, particularly in combination with the double drive arrangement (rollers and drive belts), provides increased reliability.

[0020] Figures 7 and 8 show additional details of the drive roller and the cooperating responsive roller. Fig. 7 is a perspective view of the drive roller 22 which includes the gear drive segment 36 for engaging teeth on the back surface of the drive belts as well as a drive roller segment 34. This drive roller segment can be of an appropriate rubber material or other suitable material for engaging the banknote as it passes through the curved transition.

[0021] The responsive roller 34 and the responsive roller 48 are preferably of the same design as shown in Fig. 8. A drive roller segment 34 engages the opposite roller segment 26 and a spaced belt drive gear segment 36. These elements cooperate with the outer surface of the belt drive to appropriately drive the banknote with rotation of the roller. It can be seen that the two segments 34 and 36 are separated by a center recessed portion 35. This is preferred to allow each of the segments 34 and 36 to respectively function independently of one another although tied to the rotation of the roller.

[0022] Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the

invention as defined in the appended claims.

Claims

1. A banknote validator (2) comprising

a validating head (4) having a banknote processing channel (10) for assessing the authenticity of banknotes and a releasable cashbox (6) connected to said validating head (4) for stacking authenticated banknotes; said validating head (4) including a banknote inlet (8) at one end of said banknote processing channel (10) and a banknote outlet at an opposite end of said banknote channel (10), said banknote outlet cooperating with an end of said cashbox (6) to collectively define a curved transition (12) guiding an authenticated banknote through an angle of at least 60 degrees leading to a stacking port (40) in a side of said cashbox (6); said cashbox (6) and said validating head (4) each have interfitting surfaces (60, 62) collectively defining an outside guide structure of said curved transition (12) when said cashbox (6) is secured to said validating head (4); a drive arrangement driving banknotes through said banknote processing channel (10) and if authenticated through said curved transition (12) to said stacking port (40); and a stacking mechanism for selectively pushing a banknote through said stacking port (40) and into said cashbox (6).

2. The banknote validator as claimed in claim 1 wherein said drive arrangement includes two lead drive rollers (22) located in said validating head (4) defining a portion of an inside surface of said curved transition (12), and wherein each of said lead drive rollers (22) include a cooperating responsive roller (24) on an opposite side of said processing channel (10) and each of said cooperating responsive rollers include a downstream roller (48) supported in said cashbox (6) adjacent said curved transition (12).

3. The banknote validator as claimed in claim 2 wherein each of said cooperating responsive rollers supported in said cashbox (6) are located to form part of said curved transition (12), and optional wherein said angle of said curved transition is approximately 90 degrees.

4. The banknote validator as claimed in claim 2 wherein each of said downstream rollers additionally includes a drive belt (30) positioned to engage and drive an authenticated banknote at least from said curved transition (12) to a position in front of said stacking port (40) of said cashbox (6).

5. The banknote validator as claimed in claim 4 wherein each drive belt (30) is positioned to engage and drive an authenticated banknote through said curved transition (12) to the position in front of said stacking port (40). 5
6. The banknote validator as claimed in claim 4 or claim 5 wherein each drive belt (30) includes a drive gear connected to and rotated with rotation of the associated downstream roller. 10
7. The banknote validator as claimed in claim 6 wherein each responsive roller in said cashbox (6) is a double roller with a first roller segment (36) cooperating with said drive belt (30) and a second roller segment (34) cooperating with said downstream roller to engage and drive an authenticated banknote. 15
8. The banknote validator as claimed in claim 7 wherein each double roller includes an inwardly recessed portion (35) separating said first and second roller segments (34, 36), and optionally wherein said first and second roller segments and said inwardly recessed portion of each double roller are an integral component. 20 25

Patentansprüche

1. Banknotenvalidierer (2), umfassend: 30
 - einen Validierungskopf (4) mit einem Banknotenbearbeitungskanal (10) zum Beurteilen der Authentizität von Banknoten und eine mit dem Validierungskopf (4) verbundene abnehmbare Geldkassette (6) zum Stapeln von authentifizierten Banknoten;
 - wobei der Validierungskopf (4) einen Banknoteneinlass (8) an einem Ende des Banknotenbearbeitungskanals (10) und einen Banknotenauslass an einem gegenüberliegenden Ende des Banknotenkanals (10) aufweist, wobei der Banknotenauslass mit einem Ende der Geldkassette (6) zusammenwirkt, um gemeinsam einen gekrümmten Übergang (12) zu definieren, der eine authentifizierte Banknote durch einen Winkel von mindestens 60 Grad leitet, der zu einer Stapelöffnung (40) in einer Seite der Geldkassette (6) führt;
 - wobei die Geldkassette (6) und der Validierungskopf (4) jeweils ineinandergreifende Oberflächen (60, 62) aufweisen, die gemeinsam eine äußere Führungsstruktur des gekrümmten Übergangs (12) definieren, wenn die Geldkassette (6) am Validierungskopf (4) befestigt ist; 55
 - eine Antriebsanordnung, die Banknoten durch den Banknotenbearbeitungskanal (10) und, falls sie authentifiziert sind, durch den gekrümm-

ten Übergang (12) zu der Stapelöffnung (40) leiten; und
einen Stapelmechanismus zum selektiven Schieben einer Banknote durch die Stapelöffnung (40) und in die Geldkassette (6).

2. Banknotenvalidierer gemäß Anspruch 1, wobei die Antriebsanordnung zwei in dem Validierungskopf (4) angeordnete Führungsantriebsrollen (22) umfasst, die einen Abschnitt einer Innenfläche des gekrümmten Übergangs (12) definieren, und wobei jede der Führungsantriebsrollen (22) eine zusammenwirkende Reaktionsrolle (24) auf einer gegenüberliegenden Seite des Bearbeitungskanals (10) aufweist und jede der zusammenwirkenden Reaktionsrollen eine stromabwärts gelegene Rolle (48) aufweist, die in der Geldkassette (6) neben dem gekrümmten Übergang (12) gelagert ist.
3. Banknotenvalidierer gemäß Anspruch 2, wobei jede der zusammenwirkenden Reaktionsrollen, die in der Geldkassette (6) gelagert sind, so angeordnet sind, dass sie einen Teil des gekrümmten Übergangs (12) bilden, und optional wobei der Winkel des gekrümmten Übergangs etwa 90 Grad beträgt.
4. Banknotenvalidierer gemäß Anspruch 2, wobei jede der stromabwärts gelegenen Rollen zusätzlich einen Antriebsriemen (30) aufweist, der so angeordnet ist, dass er eine authentifizierte Banknote ergreift und zumindest von dem gekrümmten Übergang (12) zu einer Position vor der Stapelöffnung (40) der Geldkassette (6) befördert.
5. Banknotenvalidierer gemäß Anspruch 4, wobei jeder Antriebsriemen (30) so positioniert ist, dass er eine authentifizierte Banknote ergreift und diese durch den gekrümmten Übergang (12) zur Position vor der Stapelöffnung (40) befördert. 35
6. Banknotenvalidierer gemäß Anspruch 4 oder 5, wobei jeder Antriebsriemen (30) ein Antriebszahnrad aufweist, das mit der zugehörigen stromabwärts gelegenen Rolle verbunden ist und mit der Drehung der Rolle gedreht wird. 40
7. Banknotenvalidierer gemäß Anspruch 6, wobei jede Reaktionsrolle in der Geldkassette (6) eine Doppelrolle mit einem ersten Rollensegment (36), das mit dem Antriebsriemen (30) zusammenwirkt, und einem zweiten Rollensegment (34) ist, das mit der stromabwärts gelegenen Rolle zusammenwirkt, um eine authentifizierte Banknote zu greifen und zu befördern. 45
8. Banknotenvalidierer gemäß Anspruch 7, wobei jede Doppelrolle einen nach innen vertieften Abschnitt (35) aufweist, der das erste und zweite Rollenseg-

ment (34, 36) trennt, und optional wobei das erste und zweite Rollensegment und der nach innen vertiefte Abschnitt jeder Doppelrolle ein einstückiges Bauteil sind.

Revendications

1. Dispositif de validation de billets de banque (2) comprenant

une tête de validation (4) ayant un canal de traitement de billets de banque (10) pour évaluer l'authenticité des billets de banque et une caisse (6) amovible reliée à ladite tête de validation (4) pour empiler les billets de banque authentifiés ; ladite tête de validation (4) comprenant une entrée de billets de banque (8) à une extrémité dudit canal de traitement de billets de banque (10) et une sortie de billets de banque à une extrémité opposée dudit canal de billets de banque (10), ladite sortie de billets de banque coopérant avec une extrémité de ladite caisse (6) pour définir collectivement une transition courbe (12) guidant un billet de banque authentifié selon un angle d'au moins 60 degrés menant à un orifice d'empilement (40) dans un côté de ladite caisse (6) ; ladite caisse (6) et ladite tête de validation (4) ayant chacune des surfaces emboîtables (60, 62) définissant collectivement une structure de guidage extérieure de ladite transition courbe (12) lorsque ladite caisse (6) est fixée à ladite tête de validation (4) ; un agencement d'entraînement entraînant les billets de banque à travers ledit canal de traitement de billets de banque (10) et, s'ils sont authentifiés, à travers ladite transition courbe (12) vers ledit orifice d'empilement (40) ; et un mécanisme d'empilement pour pousser sélectivement un billet de banque à travers ledit orifice d'empilement (40) et dans ladite caisse (6).

2. Dispositif de validation de billets de banque selon la revendication 1, ledit agencement d'entraînement comprenant deux rouleaux d'entraînement principaux (22) situés dans ladite tête de validation (4) définissant une partie d'une surface intérieure de ladite transition courbe (12), et chacun desdits rouleaux d'entraînement principaux (22) comprenant un rouleau réactif coopérant (24) sur un côté opposé dudit canal de traitement (10) et chacun desdits rouleaux réactifs coopérants comprenant un rouleau en aval (48) supporté dans ladite caisse (6) adjacente à ladite transition courbe (12).

3. Dispositif de validation de billets de banque selon la

revendication 2, chacun desdits rouleaux réactifs coopérants supportés dans ladite caisse (6) étant situé pour faire partie de ladite transition courbe (12), et optionnel

ledit angle de ladite transition courbe étant d'environ 90 degrés.

4. Dispositif de validation de billets de banque selon la revendication 2, chacun desdits rouleaux en aval comprenant en outre une courroie d'entraînement (30) positionnée pour venir en prise avec et entraîner un billet de banque authentifié au moins de ladite transition courbe (12) à une position en face dudit orifice d'empilement (40) de ladite caisse (6).

5. Dispositif de validation de billets de banque selon la revendication 4, chaque courroie d'entraînement (30) étant positionnée pour venir en prise avec et entraîner un billet de banque authentifié à travers ladite transition courbe (12) vers la position en face dudit orifice d'empilement (40).

6. Dispositif de validation de billets de banque selon la revendication 4 ou la revendication 5, chaque courroie d'entraînement (30) comprenant un engrenage d'entraînement relié au rouleau aval associé et mis en rotation avec celui-ci.

7. Dispositif de validation de billets de banque selon la revendication 6, chaque rouleau réactif dans ladite caisse (6) étant un rouleau double avec un premier segment de rouleau (36) coopérant avec ladite courroie d'entraînement (30) et un second segment de rouleau (34) coopérant avec ledit rouleau en aval pour venir en prise avec et entraîner un billet de banque authentifié.

8. Dispositif de validation de billets de banque selon la revendication 7, chaque rouleau double comprenant une partie enfoncée vers l'intérieur (35) séparant lesdits premier et second segments de rouleau (34, 36), et optionnel lesdits premier et second segments de rouleau et ladite partie enfoncée vers l'intérieur de chaque rouleau double étant un composant d'un seul tenant.

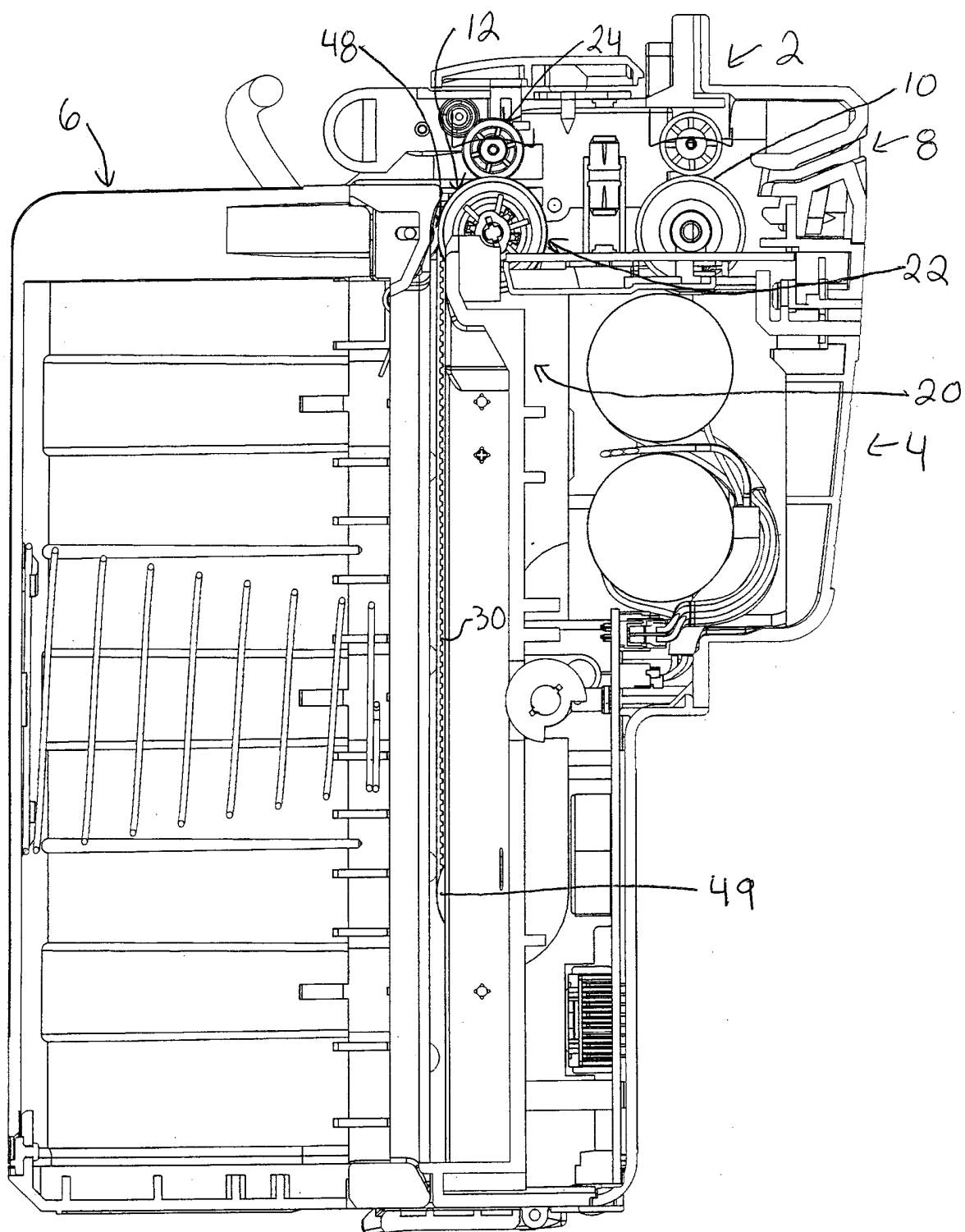


Fig. 1

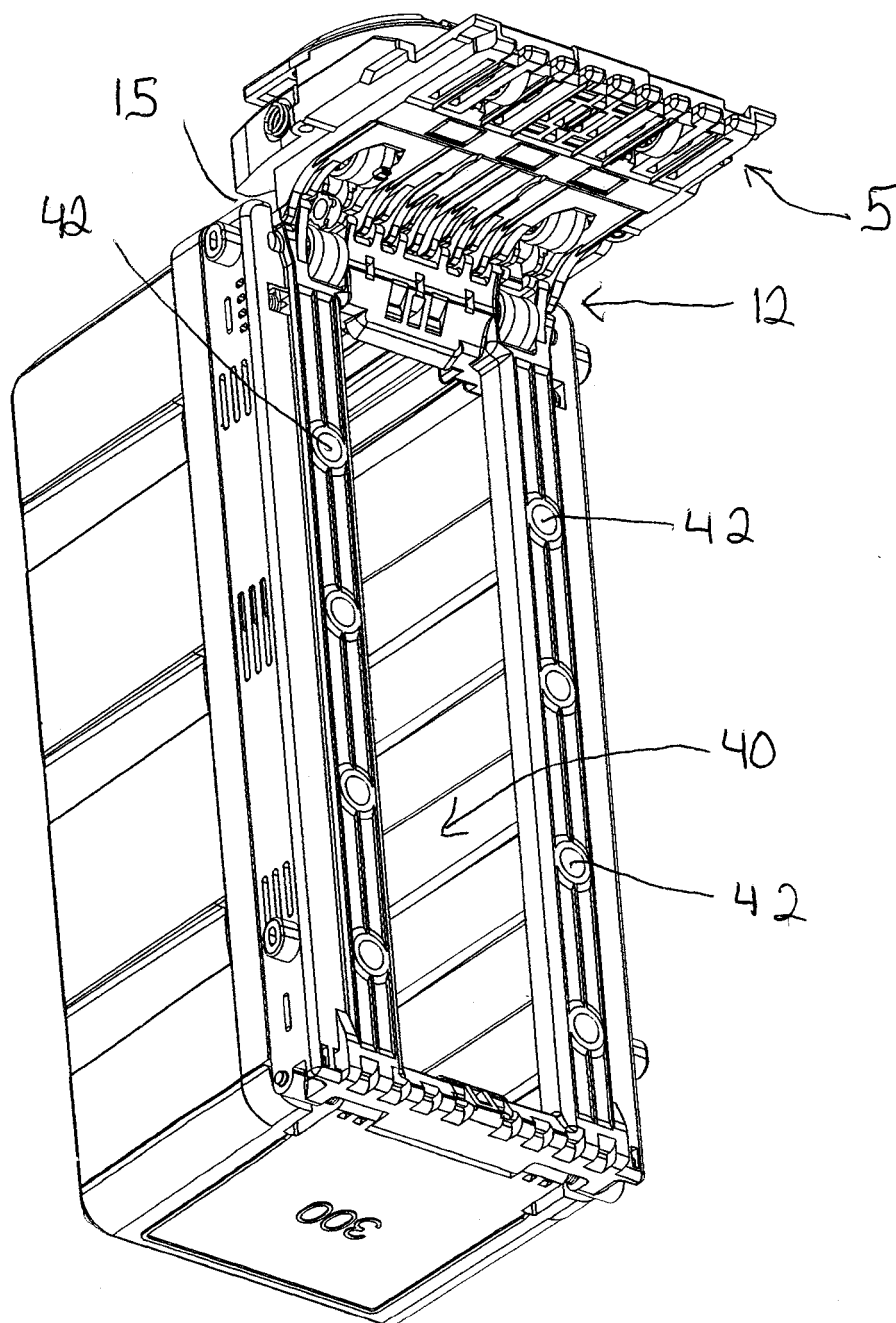


Fig. 2

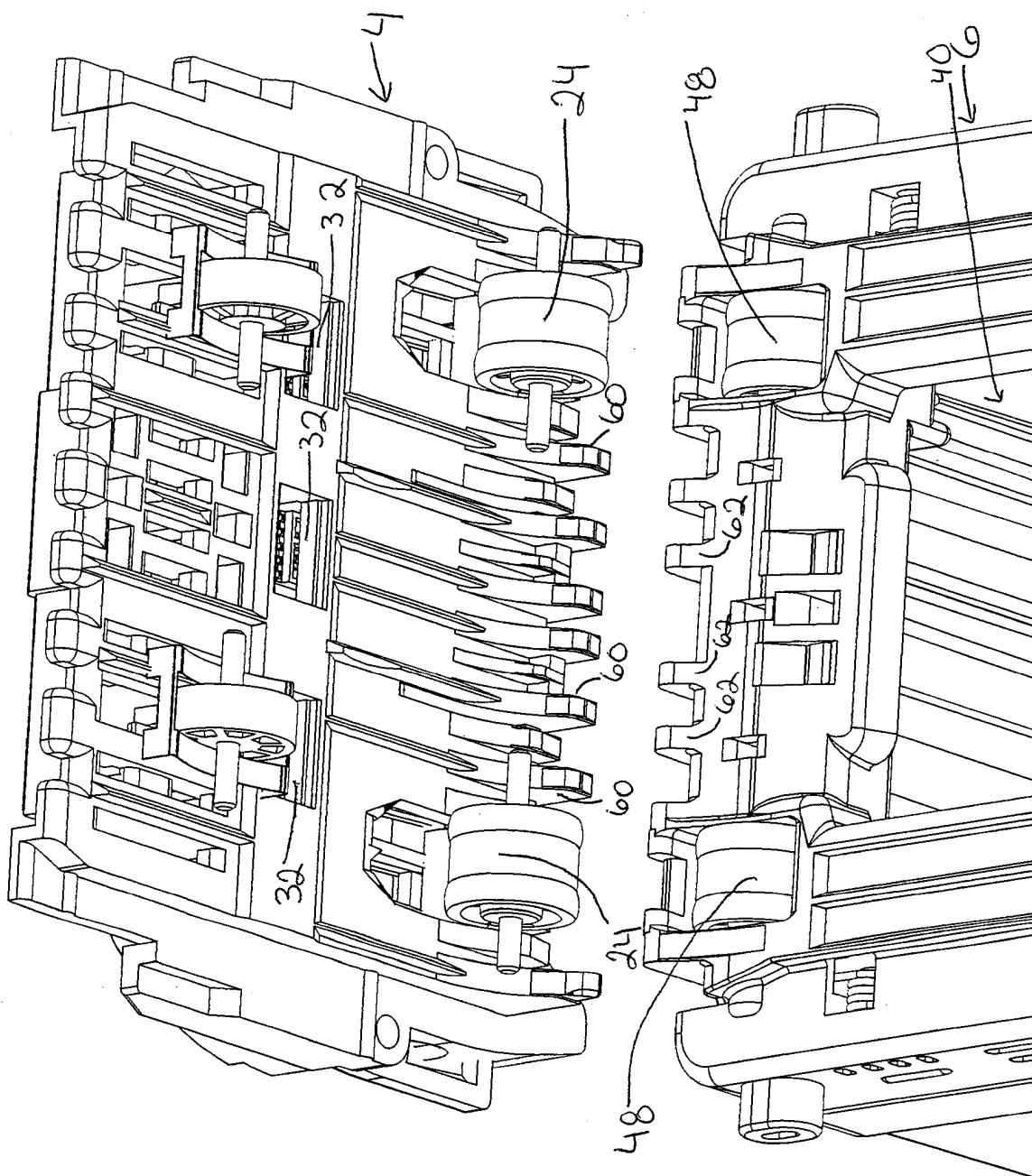


Fig. 3

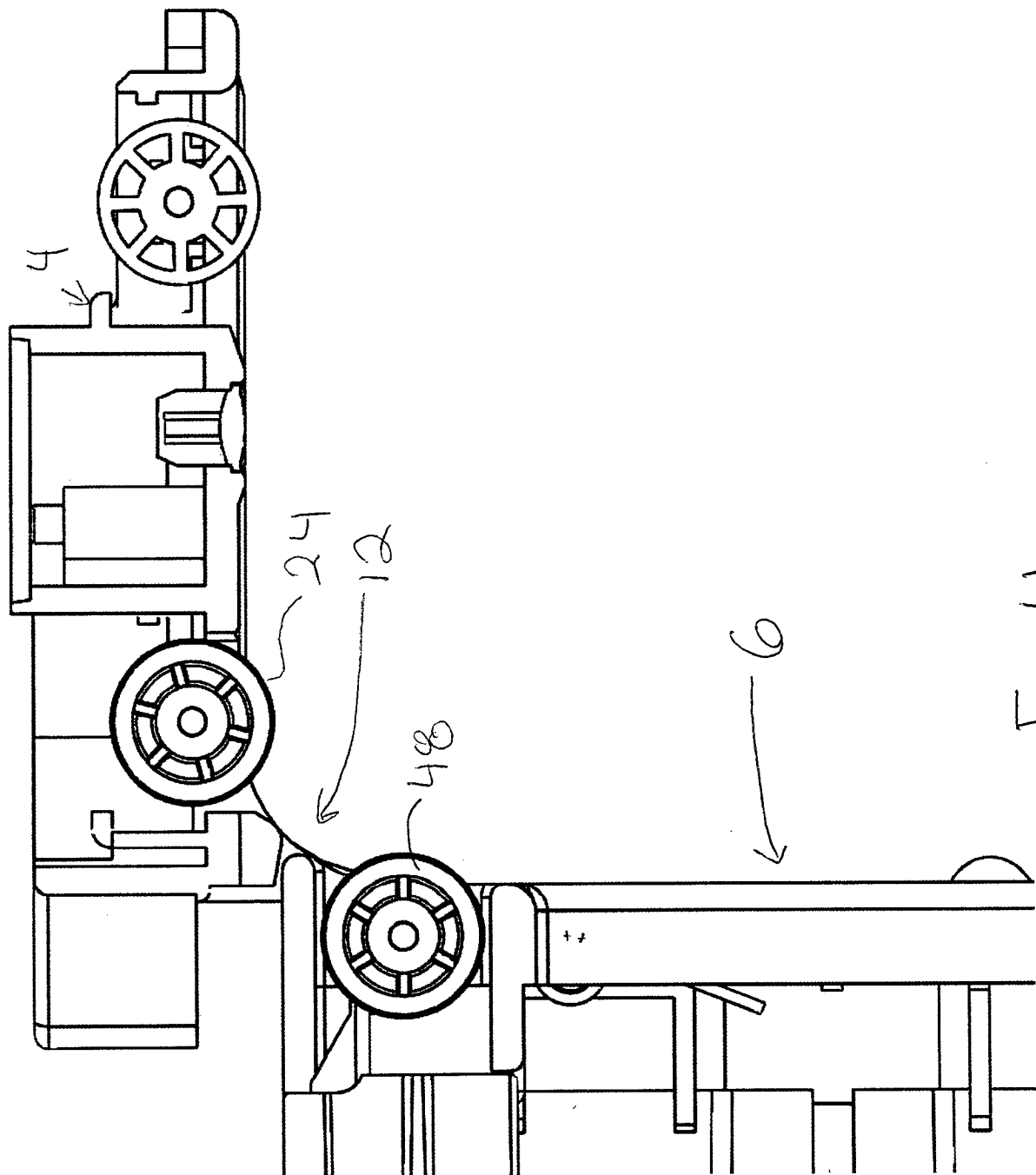


Fig. 41

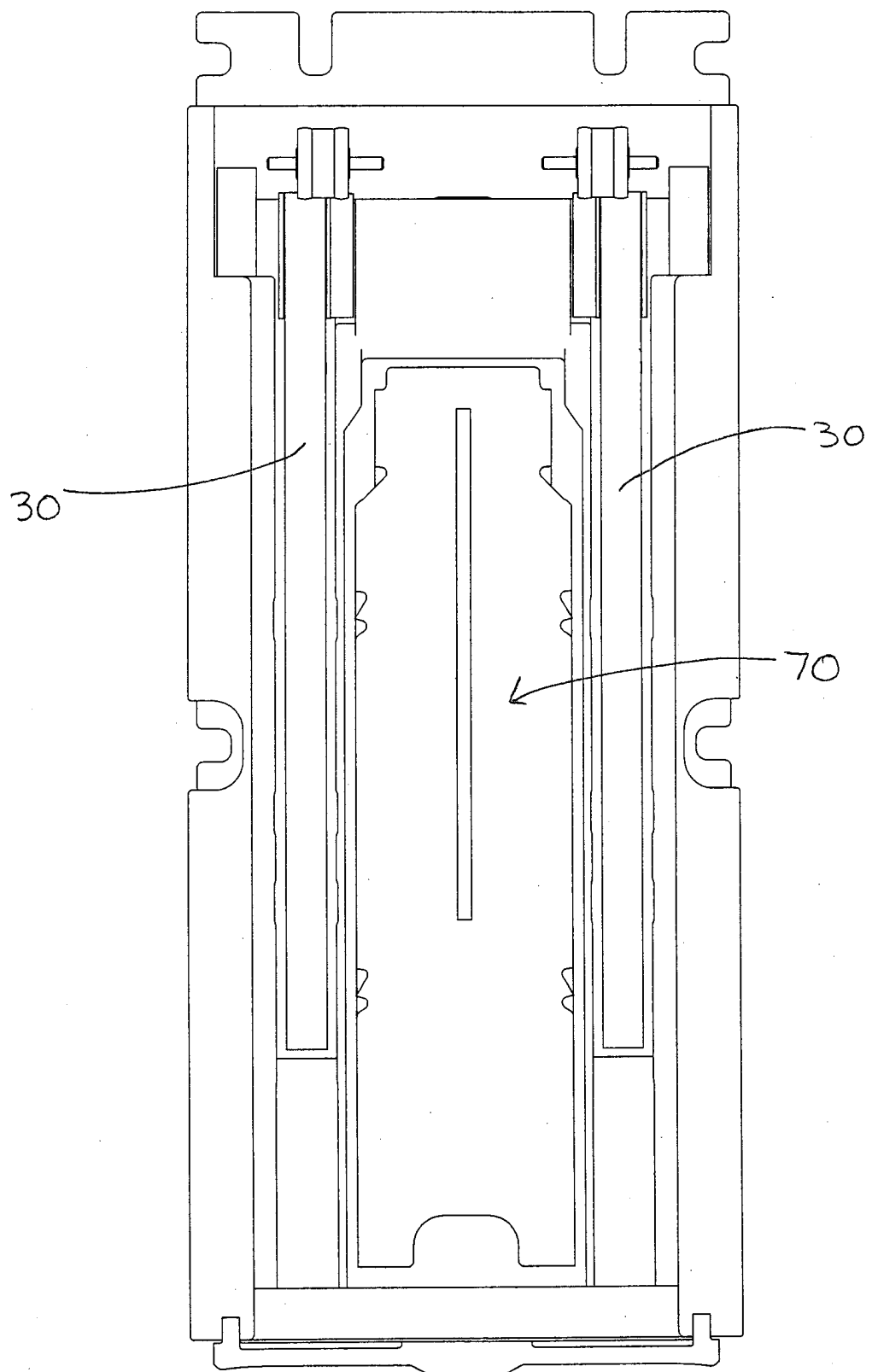
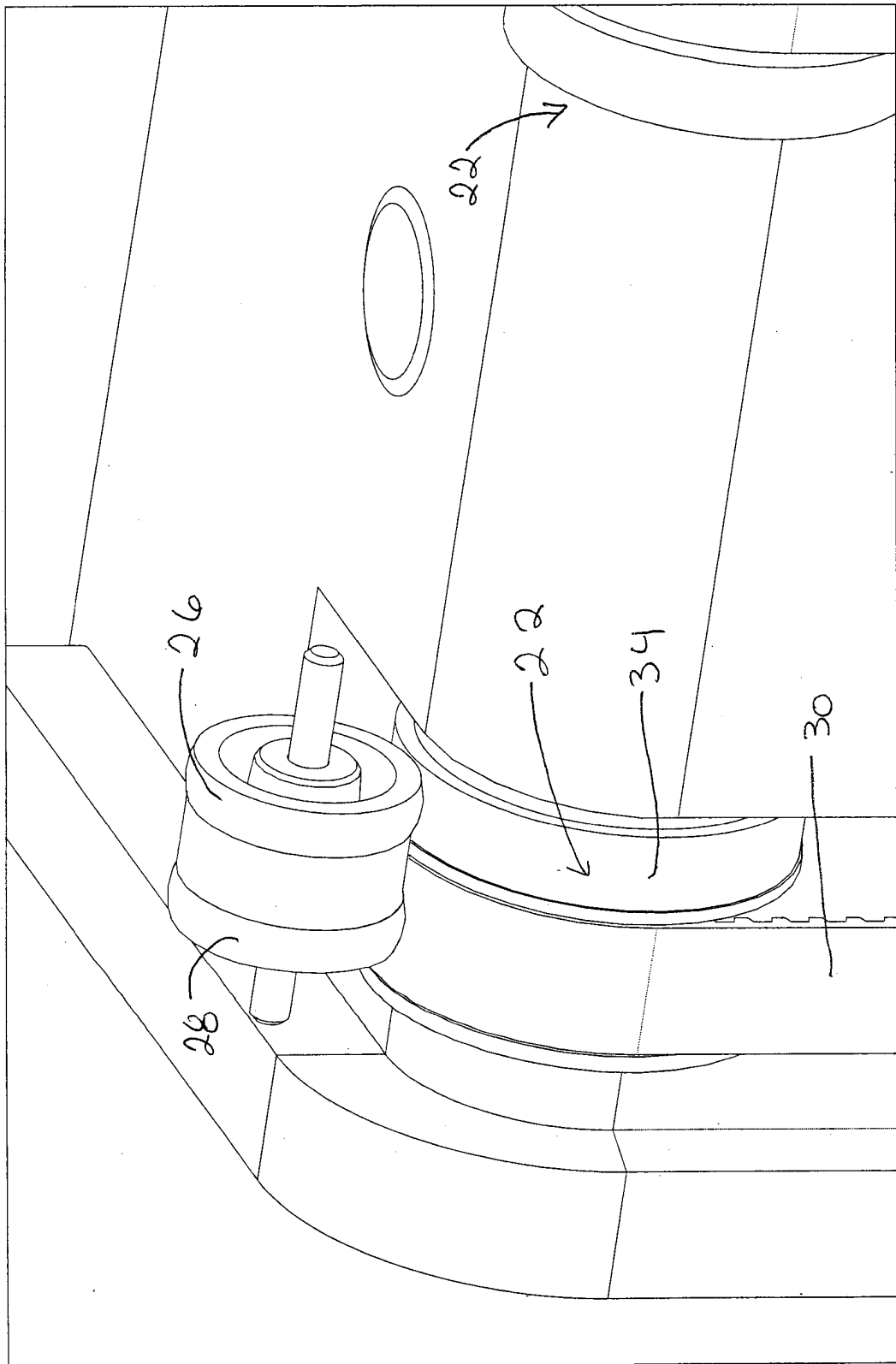


Fig. 5



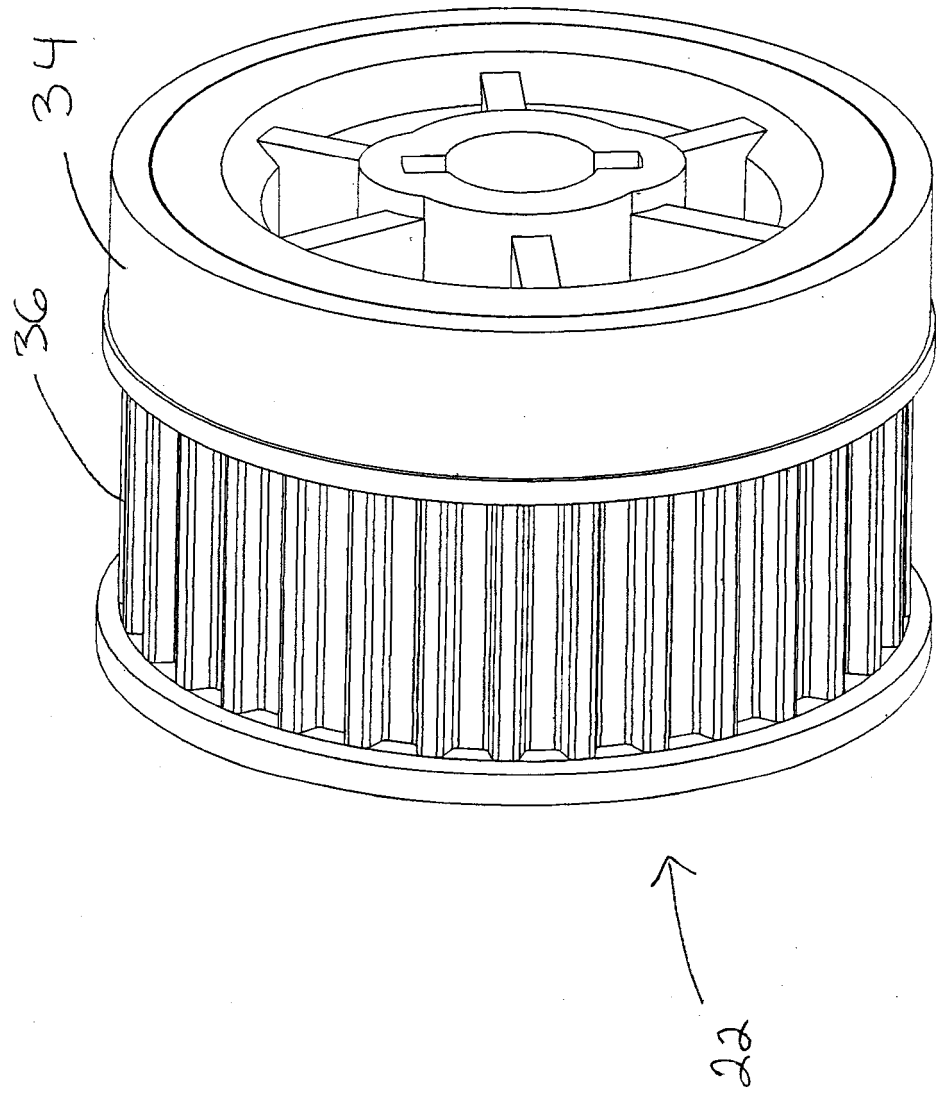
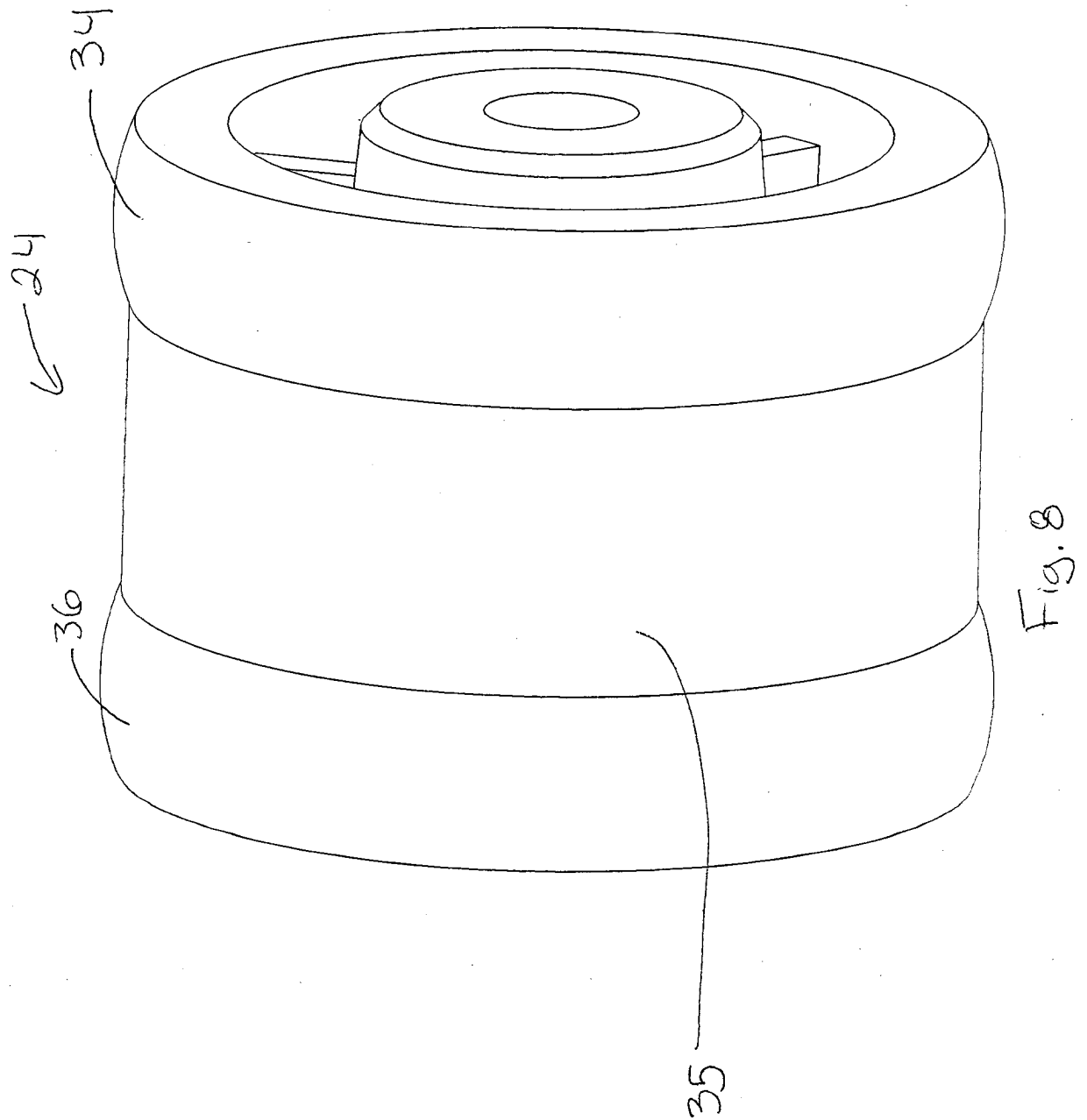


Fig. 7



REFERENCES CITED IN THE DESCRIPTION

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