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Abstract:

The invention relates to a patch panel (8), comprising a patch panel housing (10), at least a first and second electrical connection means (12, 14), which are electrically connected to one another by an electrical interconnection means (16), the interconnection means (16) being designed in such a way that the first electrical connection means (12) can be moved toward and away from the patch panel housing (10).

(Figure 7)

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COMPLETE SPECIFICATION

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INVENTION TITLE:

Patch panel

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

The invention relates to a patch panel having a convenient connection point for telecommunications and data applications according to the preamble of patent claim 1.

Patch panels provide a structure for changing connections in telecommunications and data applications. In local-area network applications, patch panels may be provided between a data hub and a workstation. Connection links may be run from the workstation to the patch panel and from the data hub to the patch panel. The patch panel allows for convenient initial connections and allows for an efficient reorientation and reorganization of the connections between the workstation and the data hub.

Patch panels are known which provide a modular jack interface, particularly with modular jack outlets. The outlets are preferably provided with labels such that a user (e.g. an information system manager) can reorder and reconfigure the various workstation connections to a network data hub. Similar arrangements may be used for telephone systems.

Recent improvements to patch panels focus on the modular jack interface, to improve the electrical performance of the patch panel. This is especially necessary for establishing an electrical link for high-speed data transmission. For this purpose, cabling (wires) have been employed with are also suitable for high-speed transmission. Connection elements (jack plugs, etc.) have also been developed for high-speed transmission.

An important feature of a patch panel configuration is its ability to adapt a system to changes as to the various electrical links (such as changes in connections). Because local-area network physical arrangements are often changed, there is a need to keep cabling on hand for various possible physical connections. This can be especially problematic when new data hubs and the like are added which require cabling of various different lengths

extending from the patch panel to the hub (or between patch panels). The task of purchasing and maintaining on hand various different lengths of high-performance cabling has become quite problematic and results in extremely high costs.

The invention is based on the technical problem, therefore, of providing a patch panel for telecommunications and data applications which enables flexible adaptation to changing links, with little furnishing.

In accordance with the present invention, there is provided a patch panel, comprising a patch panel housing, at least a first and second electrical connection means, which are electrically connected to one another by an electrical interconnection means, the interconnection means being extendible and retractable whereby the first electrical connection means can be moved away from and towards the patch panel housing.

As a result of the above construction, when the positioning of the external devices has altered, the patch panel itself does not have to be altered, that is to say, in particular, no new connection lines have to be used, rather only the first connection means has to be moved to the new position.

In a first preferred embodiment, the electrical interconnection means comprises an electrically conductive wire extending uninterrupted between the first connector and the second connector. At least one spool is preferably provided, with a first wire portion of the second wire being wrapped around a first spool part and a second wire portion of the wire being wrapped around a second spool part. The first portion of the wire is

disposed to be extended from (paid off) the first spool part for changing a position of the first connector means relative to the housing.

The patch panel of the invention provides significant advantages. The structure including the single uninterrupted integral wire extending from the first connection means to the second connection means provides superb performance. The connection allows for high-speed transmission over the length established by the patch panel (between the first connection means and second connection means). The first connection means is able to be moved away from and back toward the patch panel without storage problems as to the length of wire which remains in the patch panel, and without a moving connection such as an electrical connection based on two moving parts or slip rings. This is achieved by the novel storage of the second wire portion in the second spool part or in a spool storage region. The extension of the first wire part and the retraction of the first wire part occurs without significant physical twisting or harm to the wire, thereby ensuring the integrity of the electrical link and providing the capability for high-speed (high-frequency) transmission.

The second wire portion is preferably approximately one half the length of the first wire portion. The electrically conductive wire is an integral, uninterrupted wire, with a transition between the first wire portion and the second wire portion preferably occurring as the wire passes through a center of the spool. As the first wire portion is paid out, the second wire portion remains in the second spool part. This second spool part forms the storage region.

A cartridge case is preferably provided supporting the spool. The cartridge case is positioned within the housing and can be removed from the housing to access the spool and the wire. This allows the user to change the wire if the wire is not providing the proper performance. The cartridge preferably includes

an additional spool mounted therein. The second spool has an additional first connection means, an additional second connection means and an additional electrical interconnection means connected to the first connection means and the second connection means. A plurality of cartridges are preferably disposed in the housing.

The spool is preferably connected to a spring means for exerting a spring force on the spool for maintaining the first wire length in a retracted state. A ratchet means is preferably provided for fixing a rotational position of the spool.

By disposing the second wire portion in the spool storage space and wound in the same direction as the winding of the first wire portion, the second wire portion unwinds in a first rotational direction within the storage space and subsequently begins winding again in a second rotational direction as the first wire portion is moved beyond half of its full extension toward the full extension. This arrangement allows the second wire portion to be approximately half the length of the first wire portion such that less wire is stored than is paid out of the patch panel. The orientation and provision of the second wire portion such that it unwinds in a manner to extend outwardly toward a periphery of the spool storage space before winding at the spool storage space core, in a direction opposite to its original winding direction, provides an orderly transition from a first winding direction to a second winding direction providing a smooth payout of the first wire portion without problems as to the second wire portion. That is, there is no problem with the portion of the wire extending from the first wire portion to the preferably fixed second connection means.

The invention is explained in greater detail below using a preferred exemplary embodiment. In the figures:

Figure 1 shows a schematic view of the patch panel of the invention with various connected devices;

Figure 2 shows a perspective view of the patch panel according to the invention showing the housing and various extendable cable cartridges;

Figure 3 shows a perspective view of an extendable cable cartridge;

Figure 4 shows a perspective exploded view of an extendable cable cartridge;

Figure 5 shows a perspective exploded view of a spool showing spool halves and a spring motor;

Figure 6 shows a schematic cross-sectional view of a cartridge according to the invention;

Figure 7 shows a side view of a cartridge showing the storage spool half with the extendable wire in a fully extended position;

Figure 8 shows a side view of a cartridge showing the stored wire portion, with the extendable wire portion being extended almost 50% of its full extension length, with the stored portion of the wire starting to extend outwardly toward the periphery of the spool storage space prior to winding itself in a direction opposite to its original winding direction; and

Figure 9 shows a side view of a cartridge showing the storage wire portion in a position after the wire has been extended out of the patch panel by a first distance.

Referring to the drawings in particular, the invention comprises a patch panel generally designated

8. The patch panel includes a housing 10 and a plurality of first electrical connectors 12 and a plurality of second electrical connectors 14 (see Figure 6). The patch panel 8 further includes a physical and electrical interconnection means 16. The interconnection means 16 provides a connection line or link between each first electrical connector 12 and each second electrical connector 14.

The interconnection means 16 is formed from a continuous uninterrupted wire 18. Preferably the wire 18 includes a wire formed from at least one integral continuous wire strand. The wire 18 includes an extendable wire portion 18′ and a stored wire portion 18″ (see Figure 4).

The patch panel 8 of the invention may be used in a situation as shown in Figure 1. A plurality of data hubs 20 may be provided. A distance (L1, L2, L3, etc.) between the patch panel and the devices to be connected such as the data hubs 20 is different for each device.

If it is necessary to rearrange the connections between the patch panel 8 and the data hubs 20, the wire portion 18′ may be extended as needed. Various lengths of patch cords are not needed for making the various connections. The invention provides a retractable electrical interconnection means, namely the electrical interconnection means 16 between the first electrical connector 12 and a second electrical connector 14. With this structure, no patch cords are necessary at all. The electrical connection between the first electrical connector 12 and the second electrical connector 14 is via an extendable/retractable cord, namely the extendable wire portion 18′ of the uninterrupted wire 18.

Figure 2 is a representation of the patch panel 8 with a housing generally designated 10. The patch panel 8 includes a front face 22 with a plurality of the first electrical connectors 12. Additionally, the patch panel 8 includes a rear face 24. The rear face 24

also has a plurality of the electrical connectors, namely the second electrical connectors 14 (see Figure 6). The housing 10 supports cassettes or cable cartridges 40. Each cartridge 40 has two first electrical connectors 12 and two second electrical connectors 14.

The invention provides a plurality of cartridges 40 which each support two spools 30. Each cartridge 40 preferably includes a wire management element 42 on a front face 22 and a wire management element 44 on the rear face 24. The cartridge 40 is provided to be extractable from the shell of the housing 10 as shown in Figure 2. In the case of a problem with any of the lines, a cartridge 40 is removed from the shell of the housing 10 allowing the spool 30 to be removed from the cartridge. The wire 18 on the spool 30 may be replaced, or a new spool 30 with a wire 18 may be positioned back in the cartridge, with the first contact 12 and the second contact 14 being disposed at the front face 22 and the rear face 24, respectively. This arrangement provides a practical mechanism for replacing lines which do not function or do not perform to the proper level.

Figure 3 shows the cartridge 40 removed from the housing 10. A front plate 41 covers the spools 30.

As can be seen in Figure 4, each cartridge 40 includes a support structure 43 with a front spool receiving area 46 as well as a rear spool receiving area 48. The two first electrical connectors 12, the two second electrical connectors 14 and the associated wires 18 are provided with each cartridge 40. This arrangement provides for a connector density which is similar to standard patch panels, namely rows of two connectors.

Each spool 30 is connected to the cartridge 40, with an interior surface of its core 31 being supported via a bearing element 50. The bearing element 50 is preferably merely a cylindrical element for supporting the spool 30 in rotation. Additionally, a spring means

17 (see Figure 5) in the form of a spring motor 52 is provided for assisting in retracting the wire portion 18', after it has been extended. The spring 52 provides a rotational bias whereby, as the wire portion 18' is paid out, there is a force exerted on the wire for retracting the wire. To avoid placing the wire under too much stress, a ratchet means 53 is provided associated with both the front spool receiving region 46 and the rear spool receiving region 48. Each ratchet means includes teeth 56 provided on each spool 30 and a pawl element 60 connected to a spring 61. The pawl element 60 can be moved into engagement with the gear teeth of a transmission gear or gear teeth 56, thereby holding the spool 30 in position and also eliminating the rotational biasing force which otherwise would be applied to the wire 18.

The electrical interconnection means 16 according to the invention is based on a single continuous line (wire) 18 which extends from the first electrical connector 12 to the second electrical connector 14. This interconnection means 16 is provided in the form of a wire 18 which is stored in the patch panel 8 until it is used. During use, the wire portion 18' extends out of the patch panel.

The spools 30 pay out the connection wire portion 18' and store the connection wire portion 18". The connection wire portion 18' may be retracted to position it for storage. A feeding and storage means is formed from the spool generally designated 30, a spring means 17 and the ratchet means (including pawl element 60, teeth 56 and spring 61). As can be seen from Figure 6, each spool 30 includes a payout spool half 32 and a storage spool half 34. The payout spool half 32 provides the space for storing the extendable wire portion 18' which is to be paid out, to the extent necessary to connect the first connection means 12. The other half of the wire 18, the stored portion 18", is disposed in the storage region 34. This stored portion 18" in the storage region 34 is approximately equal to

one half of the length of the extendable portion 18' (one half of the maximum amount of wire 18 which can be extended out of the patch cord 10). As the wire 18 is a single, continuous integral wire extending from the first connector 12 to the second connector 14, there is a transition portion 18t between the wire portions 18' and 18" in the core 31 of the spool 30. Further, the length of the wire from the connector 14 to the spool storage space 34 is preferably constant (does not change). This provides a significant advantage according to the invention that a single uninterrupted electrical line is provided from the first connector 12 to the second connector 14. This materially enhances the performance of the device and removes problems with regard to transmission of an electrical signal between moving parts. However, this results in the significant requirement that the maximum payout length of extendable wire 18' is limited by the storage of the remaining portion of the wire 18.

The connector 14 is directly connected to the wire 18 which is fed into the storage space 34 and crosses over into the payout region 32. This distance between the crossover point and the point at which the wire 18t exits the spool 30 substantially corresponds to the distance between the crossover point and the first connection element 12. The same relationship is provided with regard to the rear spool 30 and associated front first connecting element 12, rear first connecting element 14 and interconnection wire 18.

The invention provides a unitary or single wire connecting the first wire connection element and the second wire connection element. In order to use a single uninterrupted continuous wire 18, to provide for the wire interconnection means 16, there must be an amount of wire 18" stored on the spool in the storage space 34 which is less than or equal to the amount of wire stored on the spool in the payout space 32, when the wire is fully retracted. Using an equal length for

storage could lower the performance of the patch panel. This could also be problematic with regard to the physical storage of the portion of the wire 18 which remains fully within the patch panel at all times.

According to the invention, a wrapping technique is used for the stored portion of the wire 18". This allows only approximately half of the wire to be deployed on the storage space side 34 as compared to the payout side 32. The wire 18' which is paid out from the payout space 32 is about twice the length of the wire 18", to be deployed within the storage space 34.

When the wire 18 is approximately extended a half of its maximum distance, a full amount of stored wire 18" has been unwound in the space 34 in a first rotational direction. As the wire 18 is further extended from the patch panel, the stored part of the wire 18 reverses itself from being unwound in a clockwise direction (for example) to being wound in a counterclockwise direction.

Figure 7 shows the state of the stored wire portion 18" and the spool storage space 34 when the extendable part of the wire portion 18' is in a retracted position. As can be seen, the stored wire portion 18" is fully wound. Rotation in a clockwise direction, and extension of the wire portion 18' from the payout region 32, will result in the stored wire portion 18" being unwound, as shown in Figure 8. The distance between the second wire connection element 14 and the periphery of the spool is fixed such that the stored wire portion 18" unwinds within the space 34 but is maintained within the space 34. In Figure 8 the wire 18' is almost 50% extracted from the payout region 32. The wire portion 18" within the storage space 34 is almost fully unwound.

Figure 9 shows the extendable wire portion 18' fully extended from the payout space 32. In this fully extended position, the stored wire portion 18" in the storage space 34 is fully wound about the spool core 31 (center) of the storage space 34 in a second rotational

direction. At this point, the extendable wire portion 18' cannot be further extended from the payout space 32.

The ratchet means 53 allows the wire 18 to be extended to any distance between the maximum extension length and the minimum extension length and then held in that position. This is convenient as the spring force of the spring means 17 is no longer applied to the spool when the pawl element 60 is engaged with the teeth 56 and therefore the wire 18 is no longer strained by the force of the spring motor 52. This is also a practical arrangement such that the technician rewiring or wiring using the patch panel of the invention can extend the wire to the length needed without the wire snapping back into the retracted position.

As the wire 18' returns from its fully extended position back to its retracted position, the portion of the wire in the storage space 34, shown in Figure 9, unwinds as the spools rotate in a counterclockwise direction. Again the unwinding causes the wire to be pushed out toward the periphery of the storage space 34 until the wire is retracted beyond about 50% of its extended state. At this point the wire begins winding again as the spool continues to turn in the counterclockwise direction. This eventually results in a return to the state shown in Figure 7.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

List of reference symbols:

8) Patch panel
10) Patch panel housing
12) First electrical connection means
14) Second electrical connection means
16) Interconnection means
17) Spring means
18) Wire
18') Extendable wire portion
18") Stored wire portion
18t) Transition portion
20) Data hubs
22) Front face
24) Rear face
30) Spool
31) Core
32) Payout spool half
34) Storage spool half
40) Cartridge
41) Front plate
42) Wire management element
43) Support structure
44) Wire management element
46) Front spool receiving area
48) Rear spool receiving area
50) Bearing element
52) Spring motor
53) Ratchet means
56) Teeth
60) Pawl element
61) Spring

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A patch panel, comprising a patch panel housing, at least a first and second electrical connection means, which are electrically connected to one another by an electrical interconnection means, the interconnection means being extendible and retractable whereby the first electrical connection means can be moved away from and towards the patch panel housing.

2. The patch panel as claimed in claim 1, wherein the electrical interconnection means comprises an electrically conductive wire extending between the first and second connection means and comprises at least one spool, the spool being assigned in each case a payout spool half and a storage spool half, the connection wire portion assigned to the payout spool half being extendable from the patch panel.

3. The patch panel as claimed in claim 2, wherein at least one spool is disposed in a cartridge.

4. The patch panel as claimed in claim 2 or 3, wherein each spool is assigned a spring means, which enables the extendable wire portion to be held under a bias.

5. The patch panel as claimed in one of claims 2 to 4, wherein the spool is assigned a ratchet means, comprising teeth and a pawl element connected to a spring.

6. The patch panel as claimed in one of claims 2 to 5, wherein the length of the wire portion assigned to the payout spool half is twice as long as that of the wire portion assigned to the storage spool half.

7. The patch panel as claimed in one of claims 3 to 6, wherein the patch panel is formed from a plurality of cartridges.

8. The patch panel as claimed in one of claims 2 to 7, wherein the wire portion of the storage spool half is wound on in the same direction as the wire portion in the payout spool half.

9. Patch panel substantially as hereinbefore described with reference to the drawings.

DATED this 8th day of October, 2001

KRONE GMBH

By DAVIES COLLISON CAVE
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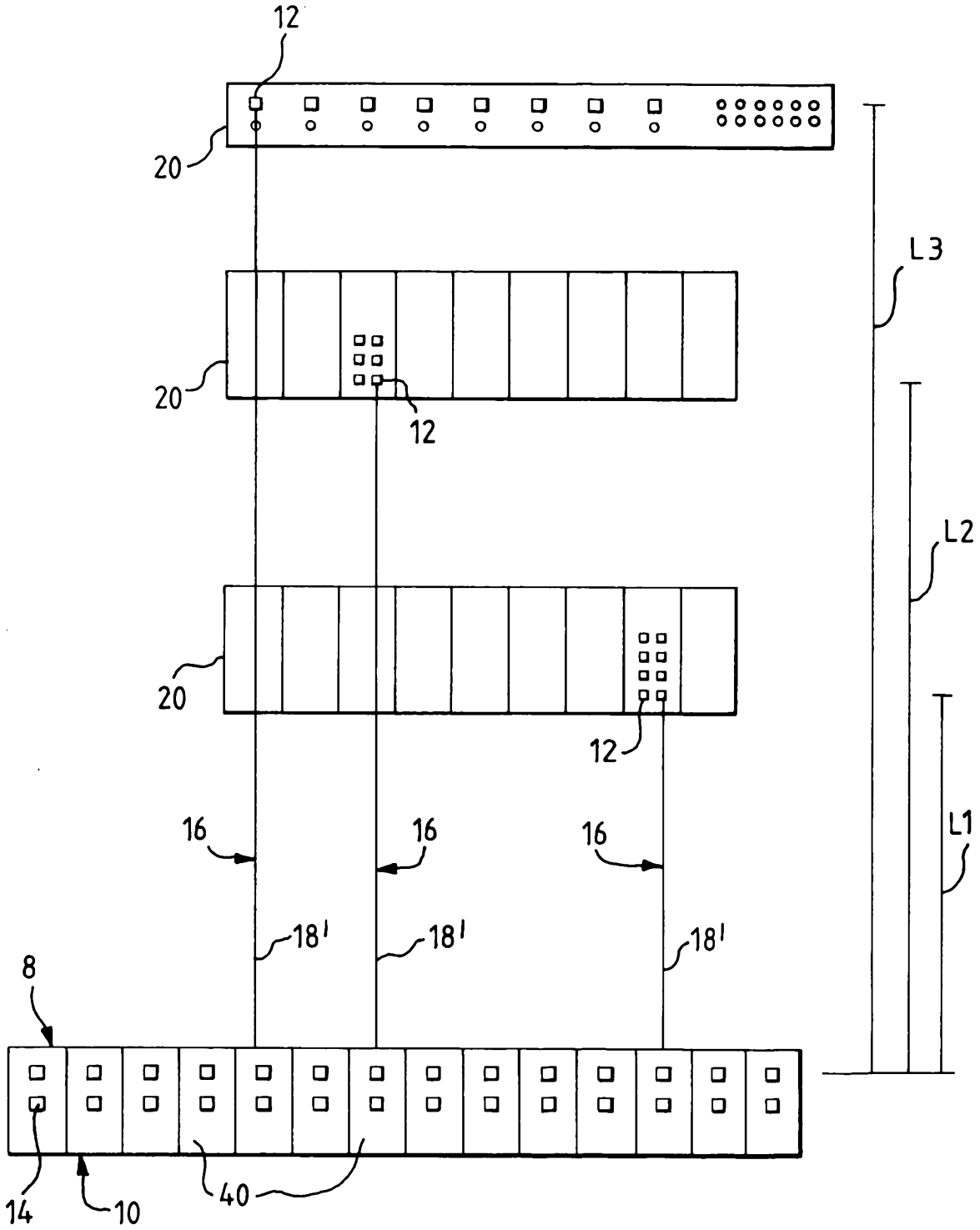
FIG.1



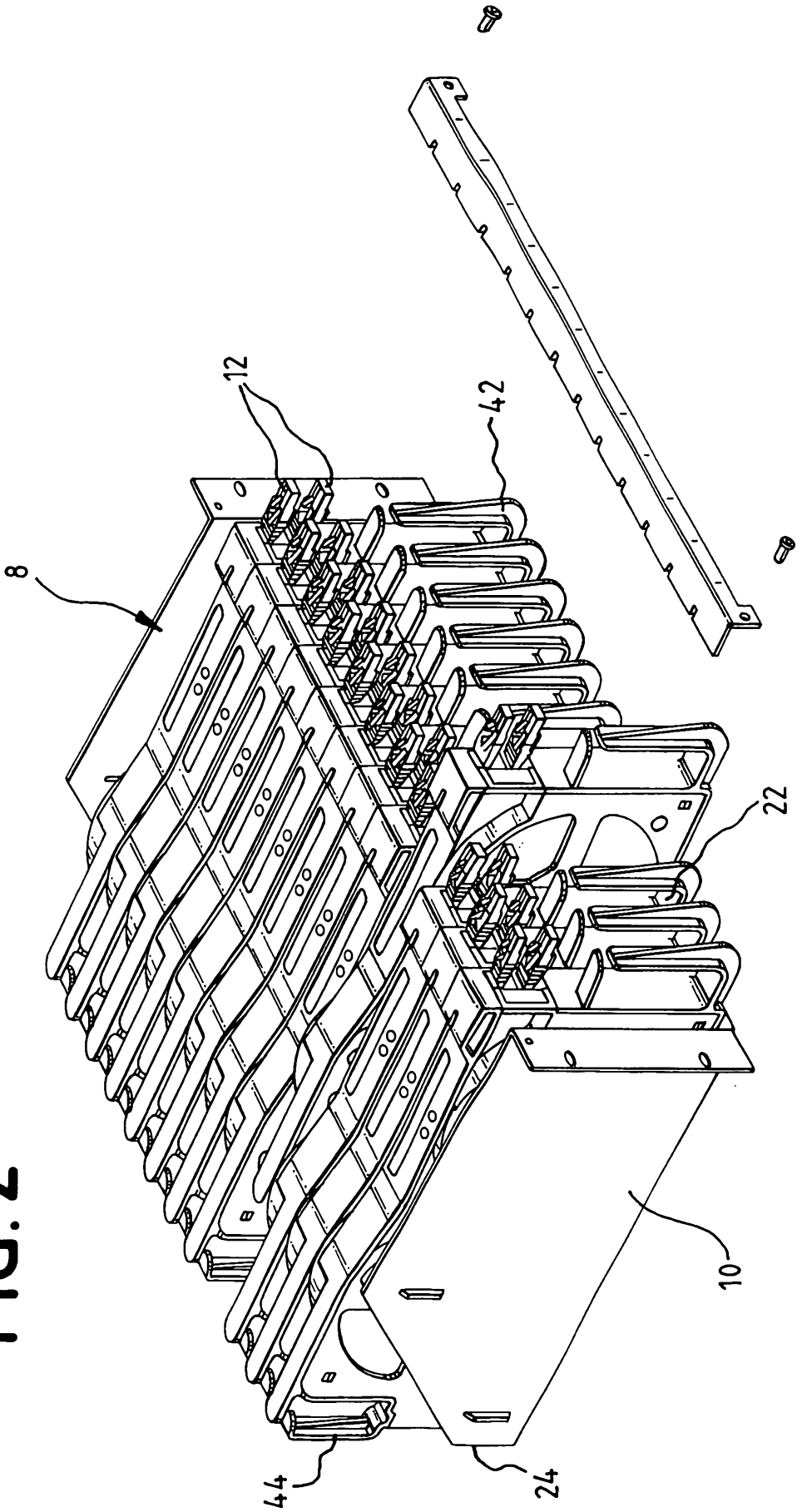


FIG. 2

FIG.3

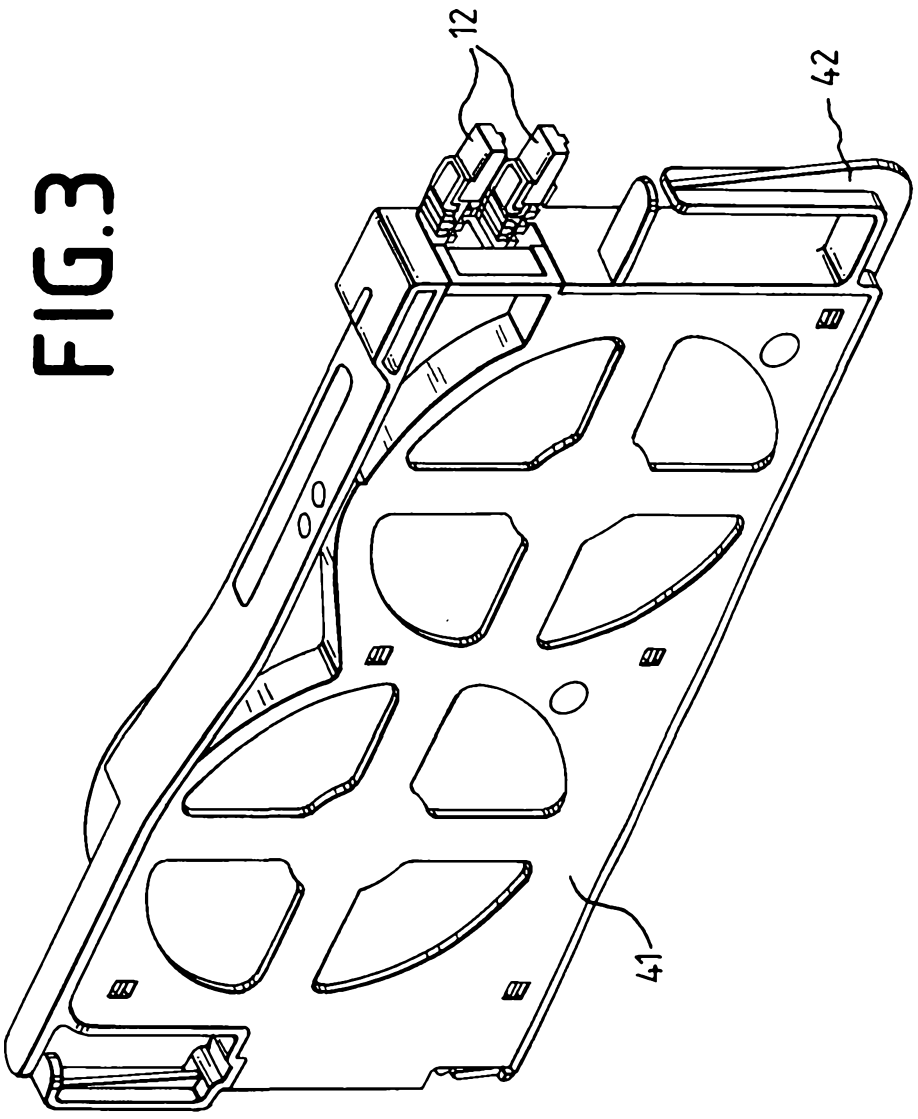


FIG.4

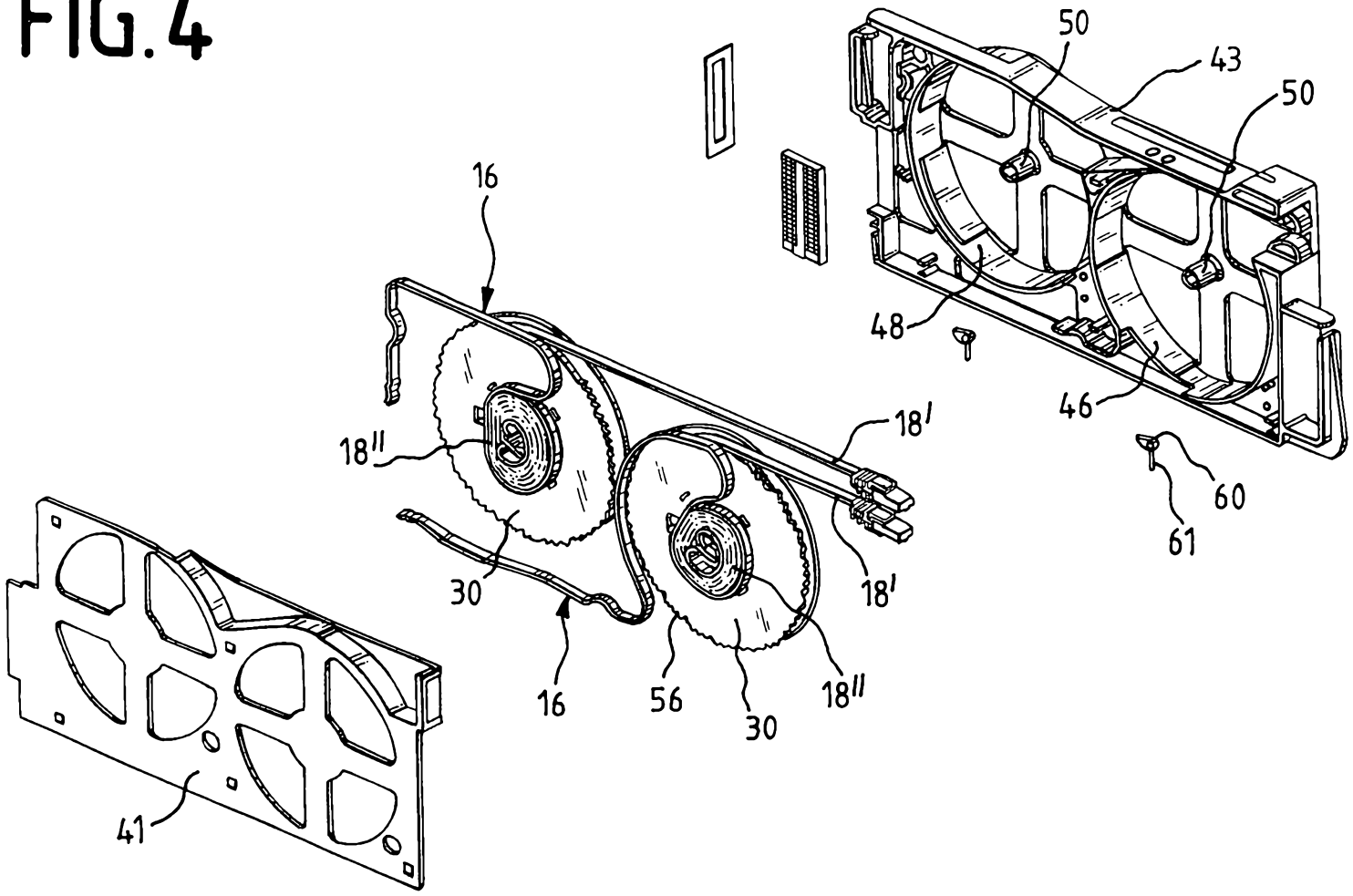


FIG.5

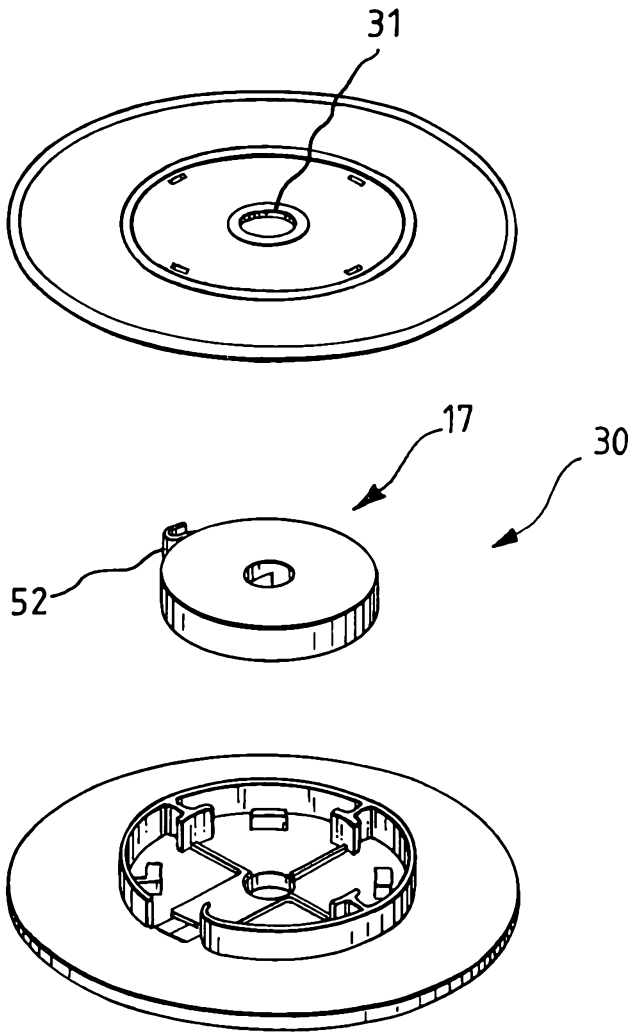


FIG.6

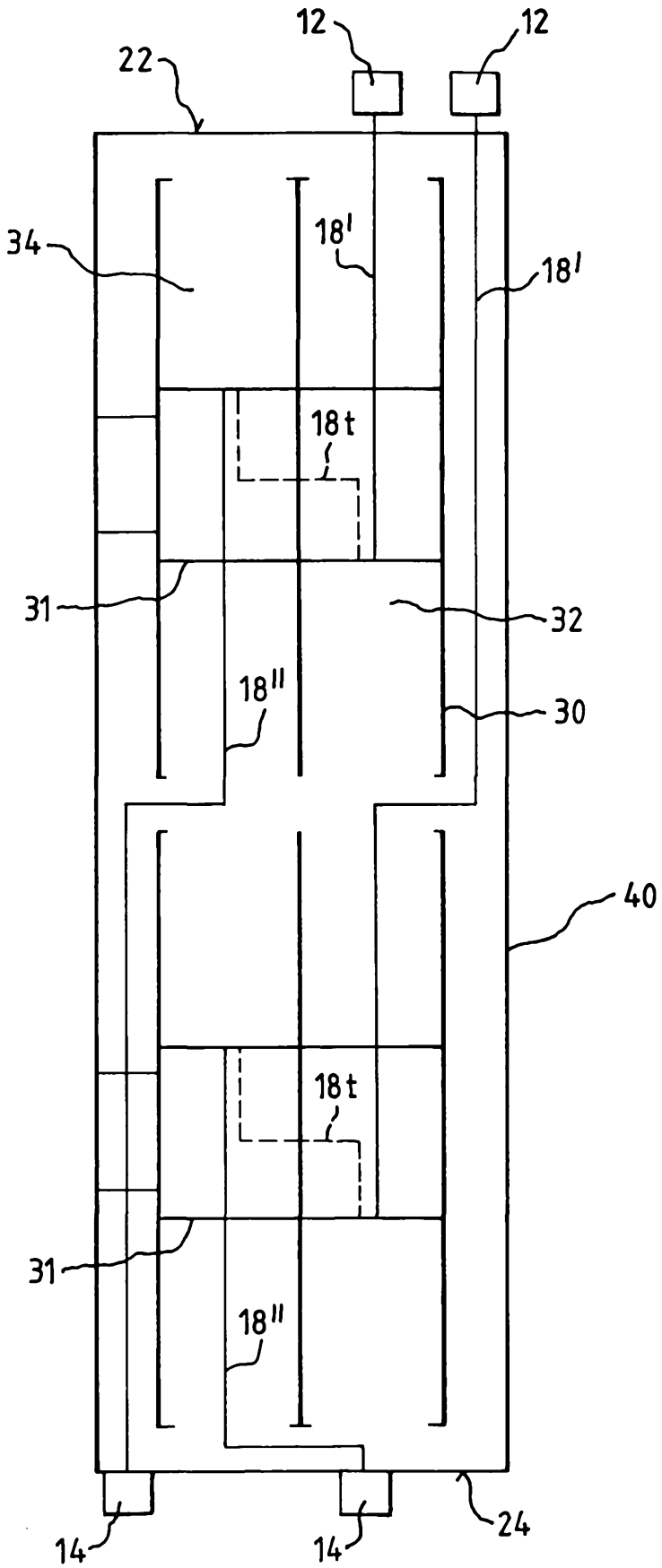
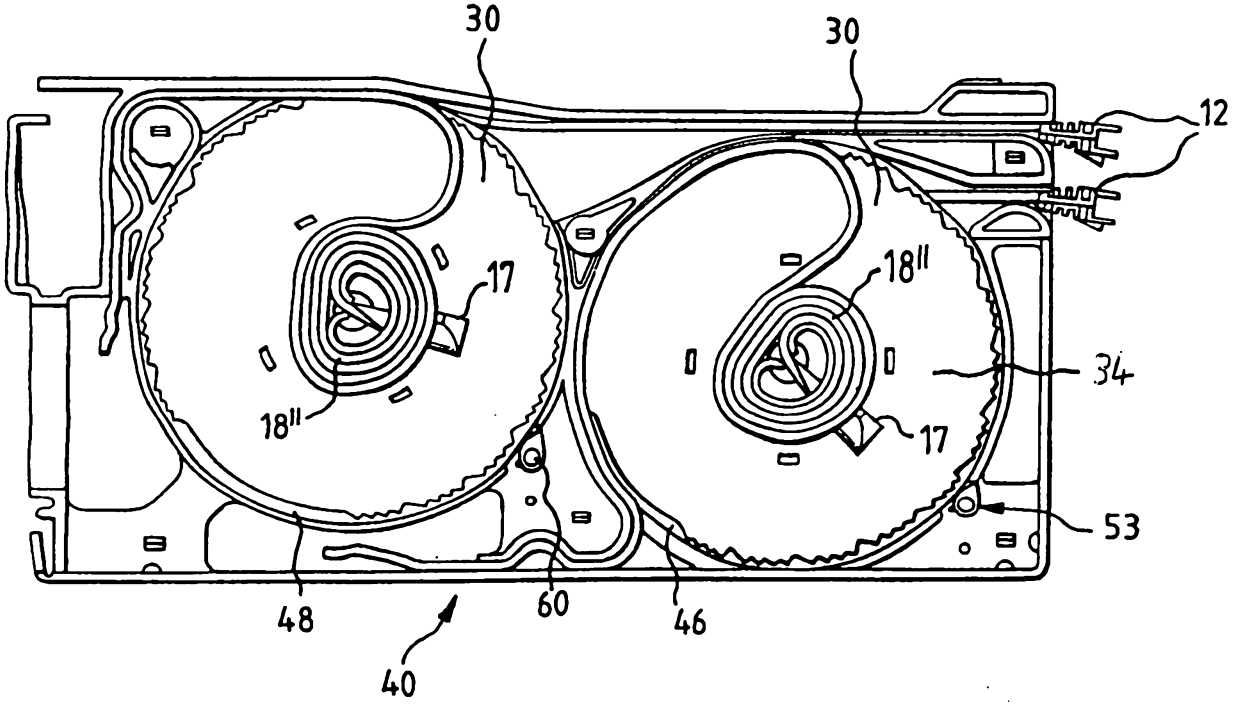


FIG.7



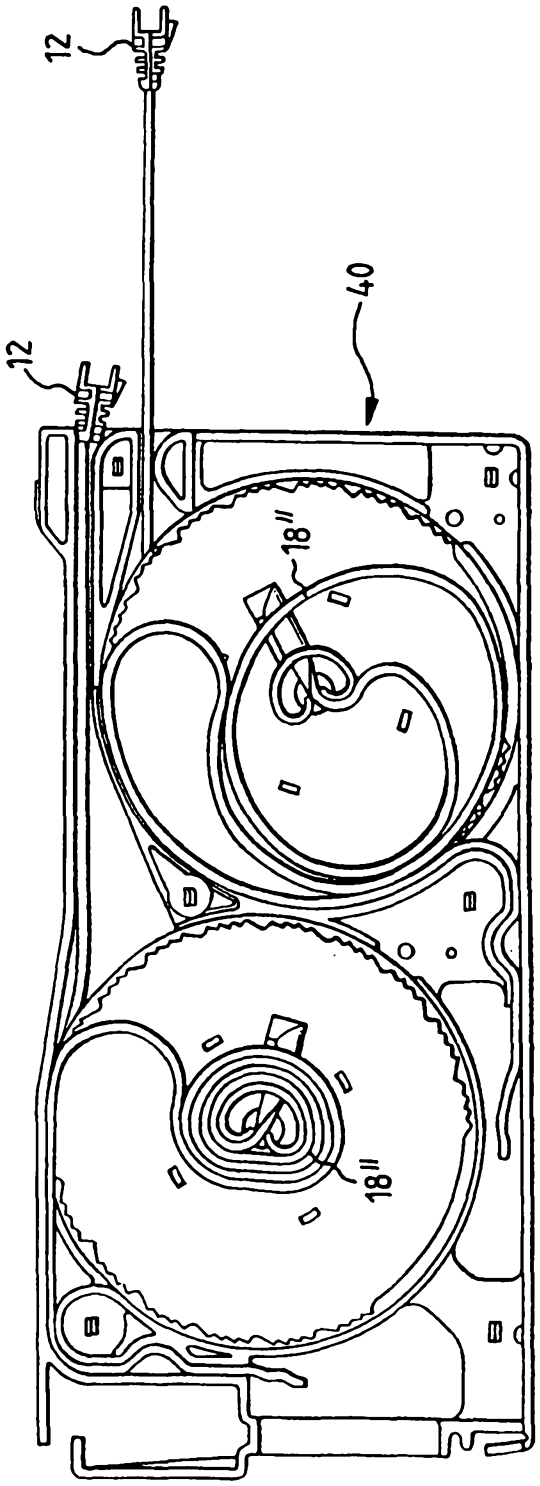


FIG.8

FIG.9