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71 Applicant: Rotaflex p.l.c.
Concord House 241 City Road
London EC1V 1JD(GB)

72 Inventor: Herbert, Tony Edward Garfield
11, Stoneham Close
South Malling Lewes East Sussex(GB)

74 Representative: Lerwill, John et al,
A.A. Thornton & Co. Northumberland House 303-306
High Holborn
London, WC1V 7LE(GB)

54 **Elektrical supply connector for continuous outlet track.**

57 A supply connector for an electrical distribution system of the continuous outlet type having a track in the form of a channel (1) housing longitudinally extending conductors (4) is adapted to be inserted through the mouth of the channel and accommodated entirely within the channel. The connector includes longitudinally extending contacts (15) adjustable between retracted positions within the connector housing and operative positions projecting from the housing by a cam member (20) which is slidable in the housing and driven by a rack and pinion mechanism (29, 30), the pinion being formed as a toothed quadrant fast with an operating lever (31).

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Electrical supply connector for continuous
outlet track

This invention relates to electrical supply systems and in particular to such systems of the type comprising a supply track in the form of an elongate channel housing a plurality of conductors
5 extending longitudinally of the channel, a supply connector including terminals for connection of electricity supply leads and contacts connected electrically to the terminals and arranged to contact the track conductors on engagement of the
10 connector in the track for supplying electrical power to the conductors, and one or more adaptors engageable in the track at any selected position along its length and including contacts engageable with the conductors for supplying electric power to
15 an electrical appliance wired to the adaptor. The invention is especially concerned with a novel supply connector for such an electrical supply system.

In electrical supply systems of the kind described above which are currently available on the
20 market, the supply connectors are all fitted to an end of the track by pushing the connector through the open end of the track. Unlike the adaptors which must project to a greater or lesser extent through the open mouth of the track in order that they may be
25 inserted into and removed from the track at will, once

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the supply connector is fitted to the track it is not necessary or usual for it to be removed or adjusted so fitting it into the track through the end of the channel has the advantage that the
5 connector need not protrude through the channel mouth and in some cases can be accommodated entirely within the channel with clear benefits from an aesthetic point of view. Having to push the connector in through the end of the track also has some
10 disadvantages, however. The normal installation procedure is to wire the connector to the electricity supply leads and insert it into the track after the latter has been mounted in position, which means that sufficient space must be left at the end of the
15 track to enable the connector to be fitted to the track. In addition, a certain amount of slack is inevitably left in the supply leads which are not then always easy to conceal and they can be unsightly if left exposed to view.

20 The present invention aims at eliminating or reducing the above disadvantages by providing a supply connector for an electrical supply installation of the kind initially described, which is arranged to be inserted into the track
25 through the open mouth of the channel and to be accommodated substantially entirely within the channel.

By making the connector so that it can be inserted through the open mouth of the channel a space is no longer needed at the end of the track
30 which may be mounted to abut against a wall, for example, should this be desirable in any installation. The slack in supply leads can be reduced and they may be more easily concealed in the track. Furthermore the connector may be positioned away from the track
35 end should this prove convenient or desirable. At

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the same time the advantage of the connector being completely concealed within the track is not surrendered.

Supply connectors for continuous outlet electrical distribution tracks should not be confused with the adaptors which are fitted to the track and serve as current take-off devices for supplying power to electrical appliances. The most fundamental requirement of an adaptor is that it should be insertable into the track through the channel mouth and at any selected position along the track length. This versatility of the adaptors is an important feature of track systems. In contrast supply connectors have in the past always been so made that they must be inserted into the end of the track. The additional advantages which accrue from the extra versatility obtained by making the supply connector so that it can be introduced into the track through the channel mouth have hitherto gone unrecognised, in spite of the fact that supply connectors are used side by side with adaptors. Although it might be thought surprising this confirms the point that supply connectors are as a practical matter looked upon in the art as quite different to adaptors.

In British Patent Specification No. GB 1436707 there is proposed a supply connector which is illustrated in Figures 5-7 of said specification and comprises a generally rectangular body in which are mounted terminals for connection of the current supply leads and elongate contacts extending generally in parallel and longitudinally of the body, each contact having one end connected to a terminal and the other end protruding laterally through an opening in the body. Although the body is adapted to be inserted through the open end of the track member a modification is suggested to enable it to be introduced through the channel mouth. A second component of the connector consists of a mechanical wedge which is

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inserted into the track channel and moved longitudinally to engage with a wedging action between the body and a side wall of the track channel in order to clamp the body to the track and press the contacts into engagement with the track conductors. The wedge includes a portion which projects through the mouth of the track channel to enable it to be displaced and a locking screw must be tightened to hold the wedge and body assembled in the operative position. The supply connector disclosed in the prior specification has several drawbacks. It is suitable only for use with tracks having conductors supported at one side only of the track channel, whereas many supply tracks have conductors at both sides. With the connector being made in two separate parts there is a danger that the wedge may not be assembled properly with the body, or it could even be omitted completely. Since the wedge serves to clamp the body to the track and to press the contacts against the conductors it is difficult to ensure that the correct clamping and contact pressures are achieved. Furthermore, a part of the connector protrudes through the channel mouth and detracts from the visual appearance.

According to the present invention there is provided a supply connector for connecting to a source of electric current the conductors of a current distribution track member having an elongate channel housing a plurality of conductors extending longitudinally of the channel, the connector comprising a generally rectangular housing dimensioned to be received in the channel, a plurality of terminals mounted in the housing for connection of electric current supply leads, a plurality of elongate electrical contacts mounted to extend generally in parallel and longitudinally of the housing, each contact having one end connected to one of the terminals and the other end arranged to protrude laterally through an opening in the housing for engaging a respective conductor of the track

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member, and a cam member movable longitudinally of the housing for adjusting said other ends of the contacts laterally for engaging the track conductors, characterised in that the contacts are resilient and
5 mounted in cantilever manner adjacent said one ends to enable the other free ends thereof to move between retracted positions within the housing and operative positions projecting through the housing openings, the cam member is slidable in the housing and cooperates with
10 the contacts for adjusting the free ends of the contacts between their retracted and operative positions, and drive means is coupled to the cam member for displacing the cam member longitudinally of the housing and contacts and includes an operating member movably mounted to the
15 housing, the connector, with the contacts retracted, being insertable as a unit into the track channel through the mouth thereof after which the operating member is operable to adjust the contacts into their operative positions for engaging the track conductors with the
20 connector supported by and accommodated substantially entirely within the track member.

As the contacts can be selectively withdrawn into the housing contacts can be arranged to project from both sides of the housing for engaging conductors mounted
25 on opposite sides of the track channel. The connector is insertable into the channel as a unit and once in position the mounting procedure is completed in a simple manner by manipulation of the operating member. The connector construction remains comparatively simple
30 through the use of resilient cantilevered contacts.

Most of the supply tracks currently available on the market have channels of such a small width that there is insufficient space available for a rotary cam for acting directly on resilient cantilevered contacts,
35 but by employing a sliding cam member in the supply

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connector of the invention it has been found possible to use such contacts, which are preferred since they preclude the need for separate springs or more complex contact arrangements, thereby simplifying assembly
5 procedures and costs.

In a preferred embodiment of the invention the drive means comprises a rack and pinion drive including a rack connected to the cam member for displacement therewith and a pinion in mesh with the rack and having its
10 axis normal to the housing side walls, the operating member being a lever fast with the pinion and actuatable from outside of the housing for adjusting the contacts between their extended and retracted positions. The rack and pinion drive ensures an adequate mechanical
15 advantage for displacing the cam member which assists to enable the operating parts to be received entirely within the track channel.

The pinion may conveniently consist of a toothed quadrant fast with the lever, and the latter may
20 be L-shaped and have one limb fixed to the pinion while the other limb is arranged to lie against the bottom wall of the housing when the contacts are extended.

In order to easily control the contact pressures between the contacts and track conductors it is preferred
25 that the contacts be urged to the operative positions by their inherent resilience and the cam member be arranged to act on the contacts to cam them inwardly to the retracted positions. To relieve the contacts of load bearing forces the connector is preferably provided with
30 laterally projecting receiving elements for engaging the track to support the connector, and the cam member arranged to hold these elements in firm engagement with the track when the contacts are extended. Conveniently the elements are resilient tongues integral with the
35 side walls of the housing.

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A more complete understanding of the invention will be had from the following detailed description, reference being made to the accompanying drawings in which:-

5 Figure 1 is a side view of a connector in accordance with the invention;

 Figure 2 is a view showing the connector in end elevation and fitted within a track which is shown in cross-section;

10 Figure 3 is a side view of the connector with the adjacent side of the housing removed;

 Figure 4 is a similar view to Figure 3 but showing the connector with the contacts in a retracted condition ready for insertion into or removal from a
15 track;

 Figure 5 is a half section taken along the line A-A in Figure 3, the half not illustrated being a mirror image of that shown; and _____

20

Figure 6 is a section taken along the line B-B in Figure 3.

The supply connector illustrated in the drawing is intended for use with a track of the form shown in Figure 2 and comprising an elongate channel 1 of uniform profile carrying electrically insulating inserts 2 adjacent the inner side walls of the channel, and an earth conductor 3 running along the inner end wall. Each insert 2 supports three longitudinally extending conductors 4 contact with which can be made from the inside of the channel through continuous slots 5 defined by the inserts. The connector of the invention is inserted into the track for supplying electrical power to the conductors 4, adaptors being engageable in the track at any position along its length for connecting the conductors to electrical apparatus or appliances, e.g. lighting equipment wired to the adaptors.

The connector comprises a body 6 moulded from electrically insulating material, and a housing formed by two covers 7, 8 fitted to the opposite sides of the body 6 and held in place by screws or eyelets 9. With exception of an optional polarising element 10 described in more detail below, the connector is symmetrical with respect to its mid-plane. A bifurcated, resiliently bowed earth contact 11 is mounted on the body 6 for contact with the earth conductor 3 of the track, and is held by a screw 12 which acts as a terminal for an earth lead of the supply cable (not shown). At one end (hereinafter referred to as the inner or forward end) the body carries a cable clamp for gripping the supply cable. On each side the body 6 carries three terminal blocks 13, the clamping screws 14 of which are accessible through holes provided in the housing

covers 7, 8. A respective unitary contact element 15 is connected at one end to each terminal block and extends rearwardly in cantilever fashion substantially longitudinally of the connector.

- 5 Each contact includes a resilient stem portion 15a and a comparatively rigid blade portion 15b bent to lie in plane normal to the stem portion. The blade portions 15b are aligned with respective elongated slots 16 formed in the housing for the
- 10 contacts 15 to protrude from the housing to engage the track conductors 4 as seen in Figure 2. The stem portions of the contacts mounted on opposite sides of the body 6 are separated by a flange 17 having longitudinal notches 18 to assist in guiding a
- 15 slide assembly arranged for longitudinal sliding movement.

The slide assembly consists of two moulded members 20, 21, the first of which has three windows 22 through which pairs of adjacent contacts 15

20 respectively pass, and the inwardly facing sides of which define cam surfaces 23 for acting on the respective contacts. The cam member 20 also includes on each side a pair of rearwardly projecting latch fingers 24 with opposed hooks. The second member 21

25 of the slide assembly includes a central part 25 on each side of which is formed a pair of wings 26 aligned with the fingers 24 and extended by tip projections 27 with which the hooks of the fingers 24 engage to hold the two members 20, 21 firmly

30 together, with the part 25 engaged in central slots provided in top and bottom extension tongues 28 of member 20. The member 21 includes a rack comprising a pair of legs 29 extending rearwardly from part 25 and toothed on their upper surfaces. In meshing engagement with the

35 rack is a toothed quadrant 30 journalled on an

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axle provided by a pair of aligned spigots on the housing covers 7, 8 and through which one of the fixing screws or eyelets 9 is fitted. Integral with the quadrant 30 is an L-shaped actuating lever 31 which is movable between the two positions illustrated in Figures 3 and 4 to cause the slide assembly to be driven to and fro within the connector housing by the rack and pinion mechanism 29, 30. The sliding movement of the slide assembly is guided by the body 6 and housing 7, 8, and when driven rearwardly from the forwardmost position (Figure 3) in which the contact blades 15 b protrude through the housing slots 16 due to the resilience of the stem portions 15a, the cam surfaces 23 are moved into engagement with the contacts and press them inwardly to cause the blades to be retracted into the housing through the slots 16.

Each housing cover 7, 8 is provided with a resilient tongue 32 defined by a U-shaped slot and provided with a laterally protruding rib 33 adjacent the free end. These tongues serve to support the connector within the track 1 relieving the contacts 15 of mechanical loads, by virtue of the ribs 33 engaging in the lowermost slots 5 of the track inserts 2, as seen in Figure 2. The tongues 32 are able to deflect inwardly on insertion of the connector into the track, but when the cam member 20 is moved to its forwardmost position to release the contacts to engage the track conductors, it is positioned behind the tongues 32 and locks them in engagement with the track so that the connector cannot be removed from the track without first retracting the contacts 15.

The polarising element 10 (see Figures 2, 3 and 6) is optional and may be inserted either way

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round between the top flanges of the covers 7, 8.
If used and attempt is made to introduce the
connector into the track the wrong way round the
element 10 abuts the earth conductor 3 and prevents
5 complete insertion. If the connector is then
turned around the correct way proper insertion is
possible, as seen in Figure 2.

In use of the connector the supply leads
are connected to the contact terminals 13 and earth
10 terminal 12, after which the connector may be
inserted into the track at either end and either
way round (assuming the polarising element is
correctly inserted if used) through the open mouth
of the track channel. For this purpose the lever 31
15 is moved to its Figure 4 position so that the contact
blades 15b are withdrawn into the housing by the
slide assembly 20, 21. The connector is then pushed
into the track bringing the earth contact 11 into
engagement with the conductor 3, and the ribs 33 of
20 tongues 32 snap into the slots 5 of track inserts
2. The lever 31 is then rotated to the Figure 3
position in which its limbs lie closely against the
end and bottom walls of the housing, respectively, causing
the slide assembly to be driven forwardly
25 releasing the contacts so that the blades 15b move
out through the slots 16 and engage the respective
conductors 4 of the track, and locking the
mechanical securing tongues 32 against release. If
desired means may be provided to retain the lever
30 in the Figure 3 position and may be arranged to
engage automatically with a snap action when the
lever is adjusted to this position.

The use of the lever working in a plane
normal to the mouth of the track to actuate a rack
35 and pinion system ensures an adequate mechanical

advantage to displace the cam assembly controlling the cantilevered contacts, with the result that the connector may be inserted into a track through the channel mouth and be contained wholly within
5 the track.

CLAIMS:

1. A supply connector for connecting to a source of electric current the conductors of a current distribution track member having an elongate channel (1) housing a plurality of conductors (4) extending longitudinally of the channel, the connector comprising a generally rectangular housing (7,8) dimensioned to be received in the channel, a plurality of terminals (13) mounted in the housing for connection of electric current supply leads, a plurality of elongate electrical contacts (15) mounted to extend generally in parallel and longitudinally of the housing, each contact having one end connected to one of the terminals and the other end arranged to protrude laterally through an opening (16) in the housing for engaging a respective conductor of the track member, and a cam member (20) movable longitudinally of the housing for adjusting said other ends of the contacts laterally for engaging the track conductors, characterised in that the contacts (15) are resilient and mounted in cantilever manner adjacent said one ends to enable the other free ends thereof to move between retracted positions within the housing and operative positions projecting through the housing openings, the cam member (20) is slidable in the housing and cooperates with the contacts for adjusting the free ends of the contacts between their retracted and operative positions, and drive means (29-31) is coupled to the cam member for displacing the cam member longitudinally of the housing and contacts and includes an operating member (31) movably mounted to the housing, the connector, with the contacts retracted, being insertable as a unit into the track channel through the mouth thereof after which the operating member (31) is operable to adjust the contacts (15) into their operative

positions for engaging the track conductors (4) with the connector supported by and accommodated substantially entirely within the track member.

2. A supply connector according to claim 1, characterised in that the free ends of the contacts (15) are biased towards the operative positions by the resilience of the contacts, and the cam member (20) acts on the contacts to cam them inwardly to the retracted positions.

3. A supply connector according to claim 2, characterised by at least one pair of contacts (15) mounted to protrude through opposite sides of the housing, an opening (22) in the cam member through which said pair of contacts pass, and cam surfaces (23) at the opposite sides of said opening adapted to cooperate with the respective contacts of said pair.

4. A supply connector according to claim 1, 2 or 3, characterised in that the drive means comprises a rack and pinion drive including a rack (29) fixed to the cam member (20) and a pinion (30) pivoted to the housing to rotate about a lateral axis.

5. A supply connector according to claim 4, characterised in that the pinion is a toothed quadrant (30) and the operating member is a lever (31) fast with said quadrant.

6. A supply connector according to claim 5, characterised in that the lever (31) is L-shaped with a first arm fixed to the quadrant and a second arm adapted to lie against the bottom wall of the housing when the contacts are adjusted into their operative positions.

7. A supply connector according to any one of claims 1 to 6, characterised in that the cam member (20) is guided for sliding movement by the connector housing (7,8).

8. A supply connector according to any one of claims 1 to 7, characterised in that the terminals and contacts are supported by an inner body (6) enclosed by said housing.

9. A supply connector according to any one of claims 1 to 8, characterised by securing elements (32,33) projecting laterally from the housing for engaging the track member to support the connector therein, the securing elements being retractable to enable insertion and removal of the connector into and out of the track member, and the cam member (20) being adapted to locate behind said elements when the contacts are adjusted into their operative positions for retaining said elements in engagement with the track member.

10. A supply connector according to claim 9, characterised in that said securing elements (32,33) are formed integrally with the housing.

11. A supply connector according to any one of claims 1 to 10, characterised in that the housing is symmetrical to either side of a longitudinal plane, and a reversible polarising element (10) is fitted optionally to the housing whereby the housing may be inserted into the track member in only one predetermined orientation of the connector.

12. An electric current distribution system comprising an elongate track member having a channel (1)

housing a plurality of conductors (4) extending longitudinally of the channel, and a supply connector insertable into the channel for connecting the conductors to a source of electric current, characterised in that the supply connector is as defined in any one of claims 1 to 11.

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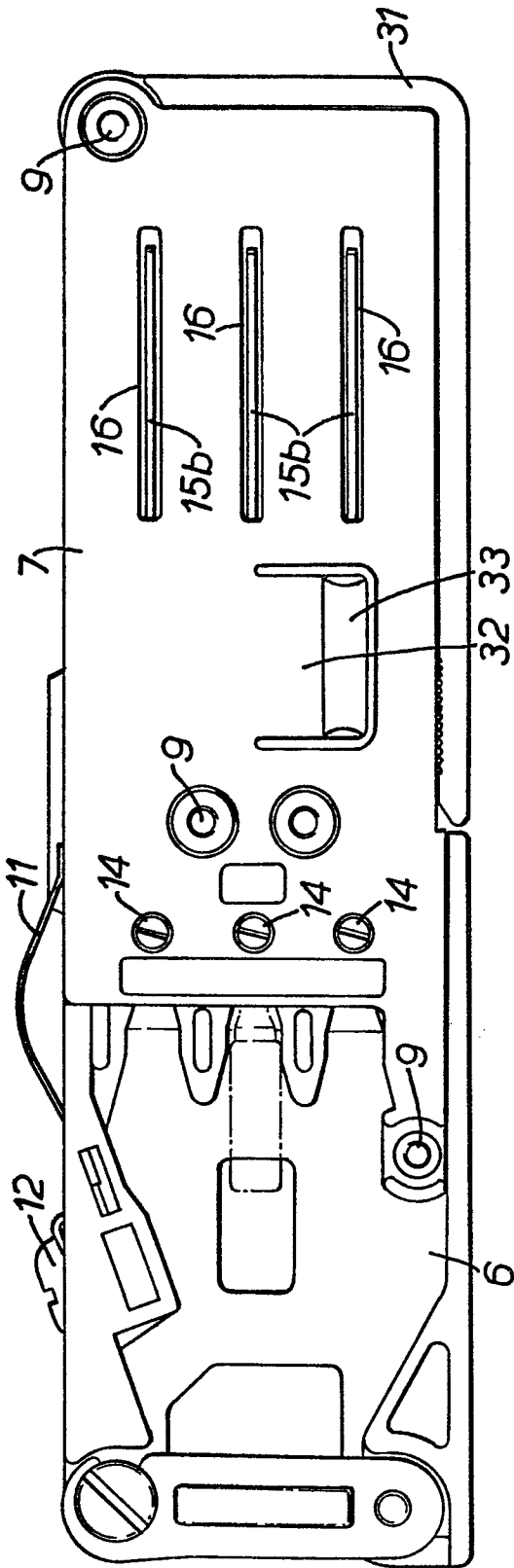


FIG. 1.

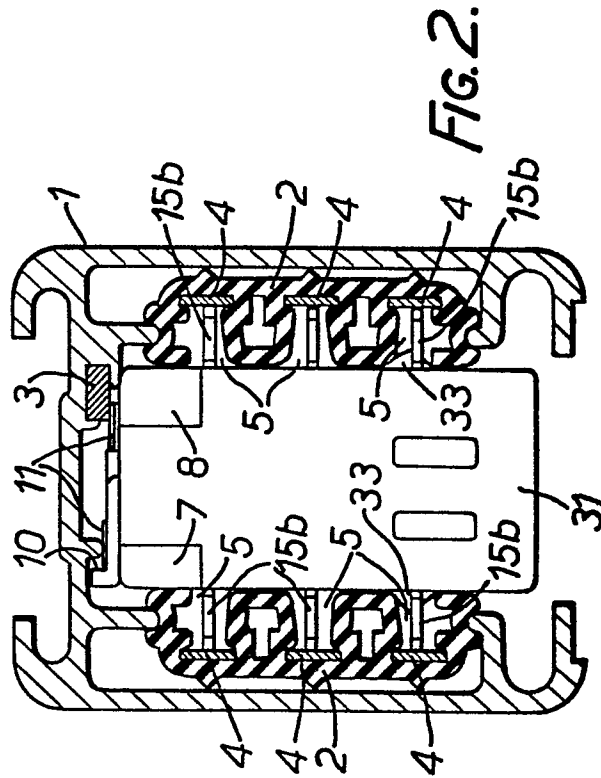


FIG. 2.

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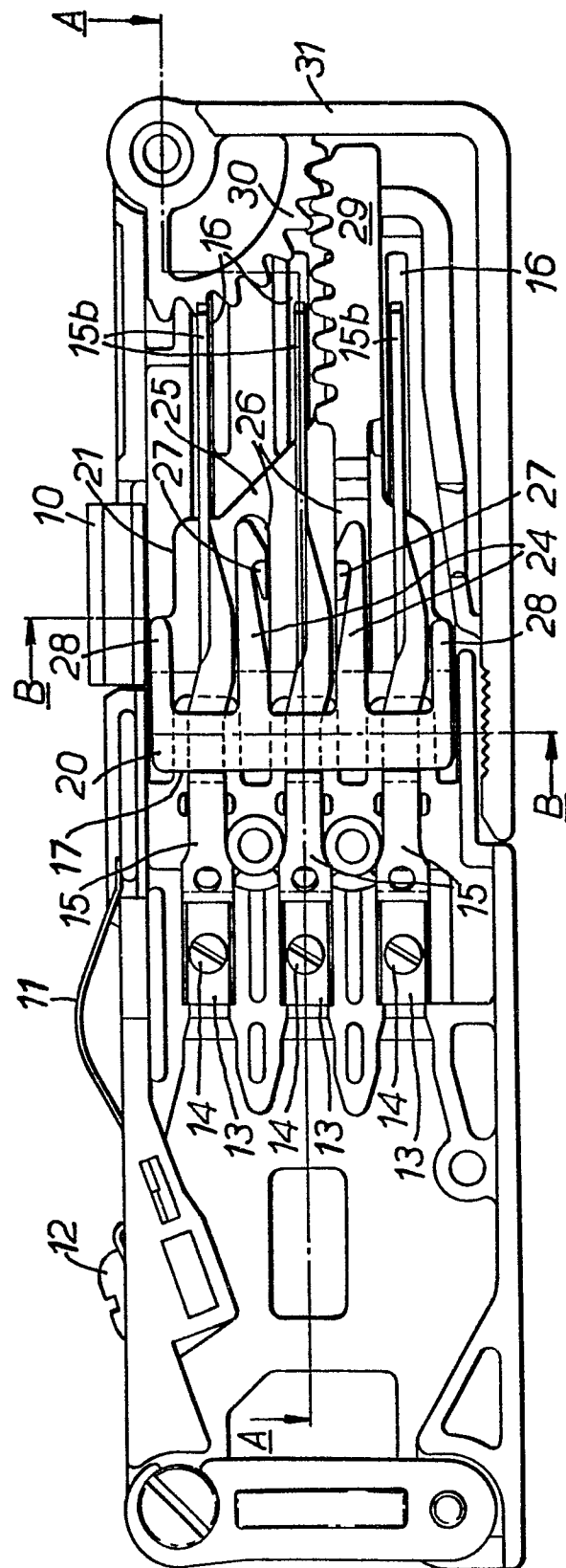


FIG. 3.

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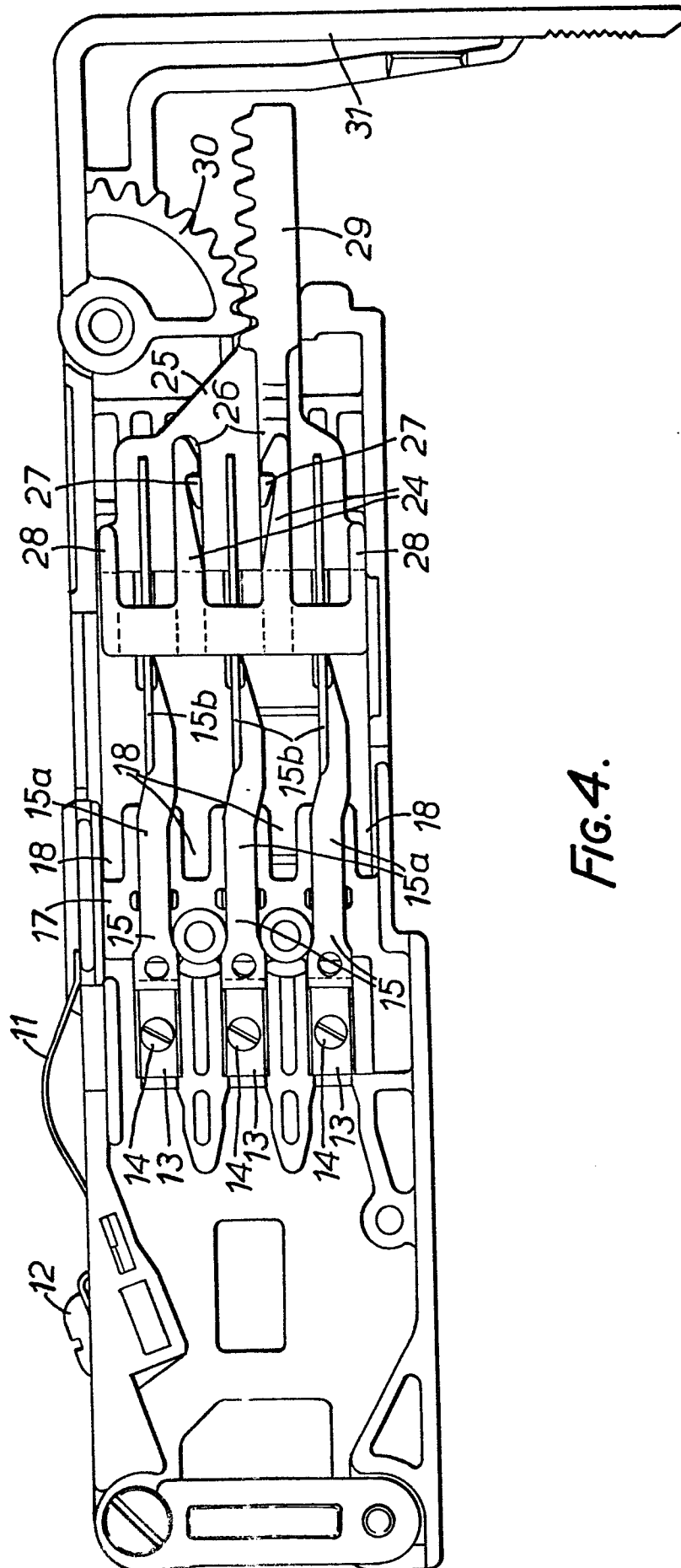


FIG. 4.

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