

United States Patent

[11] 3,544,740

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[33]		France				
[31]		116,813				

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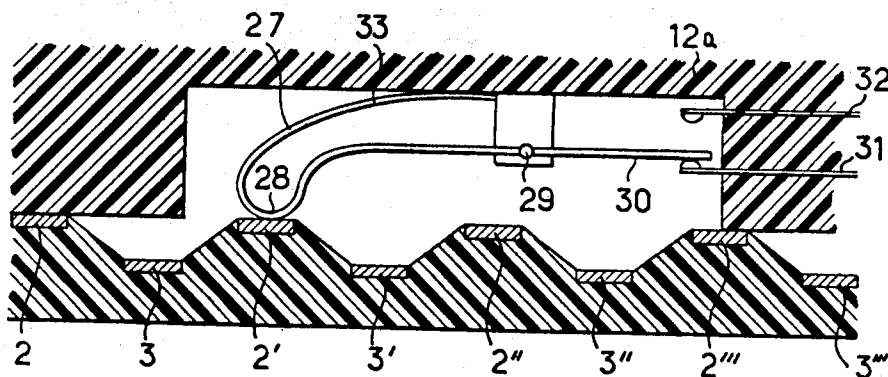
[54] **TRACK PROVIDING A BIPOLAR CONTACT
THROUGHOUT ITS SURFACE AND SLIDING
CONTACT-PIECES THEREFOR**
5 Claims, 8 Drawing Figs.

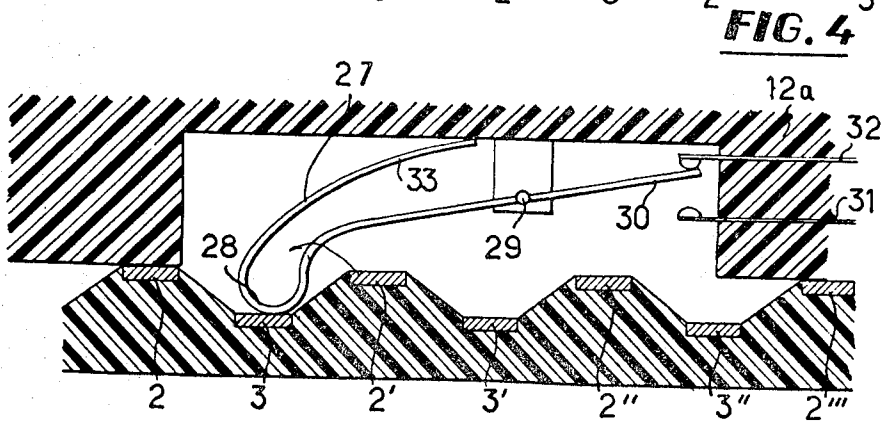
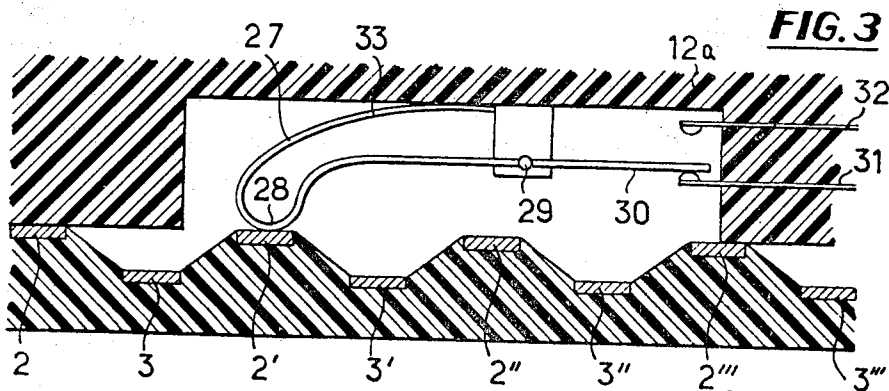
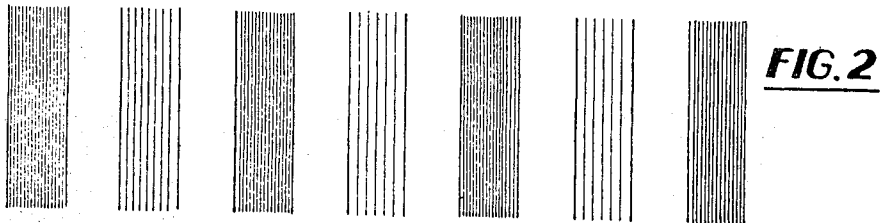
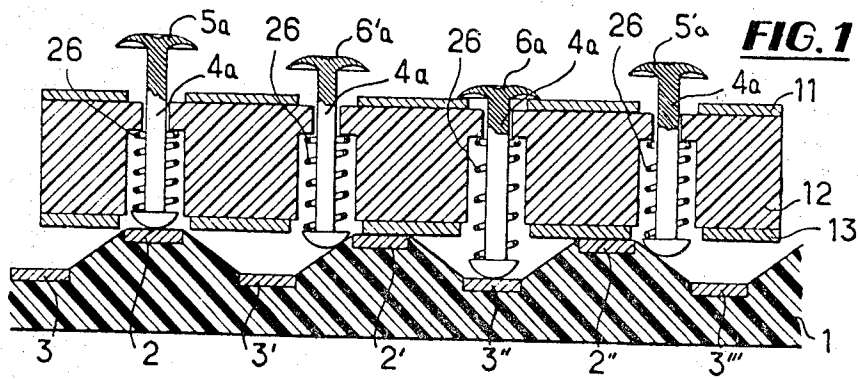
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[50]	Field of Search.....	200/16, 8, 83, 166(ICTS); 317/161(WD)

[56] **References Cited**
UNITED STATES PATENTS

3,238,316	3/1966	Voss.....	200/8X
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ABSTRACT: A track including parallel conductive strips over which an insulating slider carrying contact pieces is adapted to slide to feed with d.c. a circuit incorporated with a toy vehicle or the like movable part carried by the slider. The contact pieces are associated with switching means in a manner such as to always feed current of the same polarity into the circuit. This is obtained by distributing the conductive strips alternately at two different levels or by making them alternately magnetic and nonmagnetic or again by inserting each strip between diodes of the same polarity.





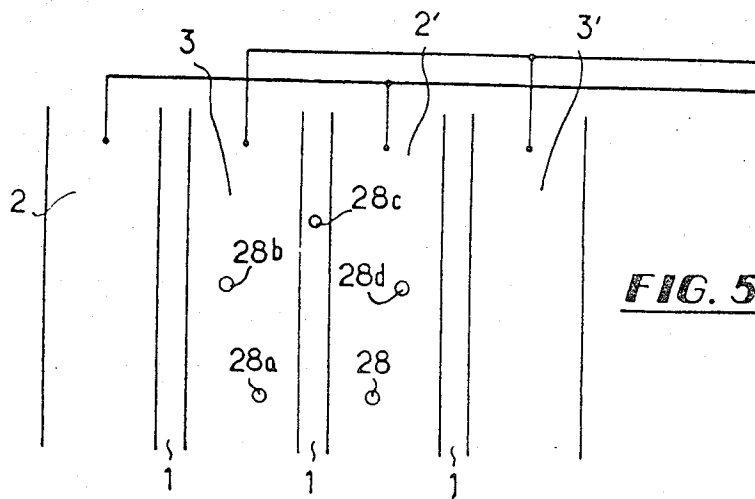


FIG. 5

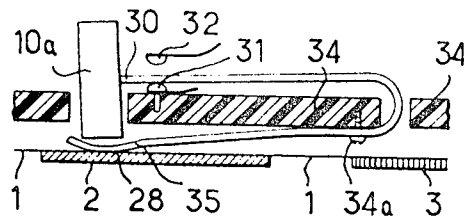


FIG. 6

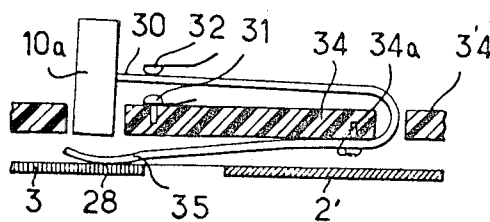


FIG. 7

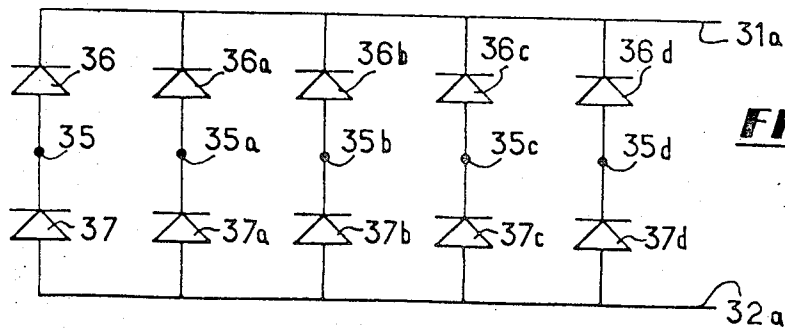


FIG. 8

TRACK PROVIDING A BIPOLAR CONTACT THROUGHOUT ITS SURFACE AND SLIDING CONTACT- PIECES THEREFOR

My invention has for its object an arrangement for feeding electric current to a movable part through the agency of contact pieces carried by the surface over which said movable part is to progress. My invention covers more particularly an arrangement for feeding toy vehicles moving over a track, of the type including outwardly a plurality of metal areas connected alternately with the two poles of a supply of voltage, said areas being separated from one another by insulating gaps, each area being located thus between two areas of an opposite polarity.

It is generally possible to resort to metal areas constituted by parallel strips but obviously such areas may be distributed as well in chessboard or staggered relationship.

Said tracks cooperate with sliders carrying a plurality of contact pieces or brushes distributed in a manner such that, whatever may be the angular setting of said sliders with reference to the area carrying one of the tracks, there is always at least one contact piece or brush operatively connected with each pole.

A switching system carried by the slider provides for the connection of each contact piece or brush with one of the collectors adapted to be respectively connected with the two poles feeding the track.

According to a first embodiment, the pole with which a brush or contact piece is in contact may be readily defined by the more or less raised position of said brush or contact piece with reference to the track.

As a matter of fact the metal areas connected with one of the poles are located at a lower level than those connected with the other pole. In said embodiment, there is no magnetic action exerted and instead there is a spring provided for each contact piece or brush which urges the latter downwardly as soon as it faces a recessed part of the track, that is a part carrying the metal areas lying at a lower level.

According to a second embodiment, the metal areas are all located in a same plane and the areas corresponding to one of the poles are made of a magnetic material, while the others, inserted alternately with the former, are made of nonmagnetic material. In such a case, the slider includes a magnet which may be attracted by the magnetic area of the track, so as to provide for the switching between one collector and the other according as to whether the corresponding brush is in contact with the magnetic material corresponding to one pole or with the nonmagnetic material corresponding to the pole of an opposite polarity.

Lastly, according to a third embodiment, the slider includes for each of its brushes rectifying diodes which allow to use it with the so-called random contact pieces while two collectors are constantly connected with two d.c. poles of opposite polarities, whatever may be the brushes in contact with either of the poles of the stationary supply of energy. However, the operation of said rectifying slider is only possible for feeding the electric circuits on the vehicle with d.c. or rectified current, the switching being then performed in a static manner, depending on the polarity of the metal areas respectively in contact with the different brushes on a same slider.

Other features of my invention will be readily understood upon reading of the following description of three embodiments of tracks and cooperating sliders in accordance with my invention, said embodiments being given by way of a more exemplification and described hereinafter with reference to the accompanying diagrammatic drawings wherein:

FIG. 1 is a sectional view of a track according to my invention, wherein the polarity of the different metal areas is defined by a difference in level, said FIG. 1 illustrating for sake of clarity four contact pieces aligned in a same cross-sectional plane, whereas in practice the various contact pieces are generally arranged in staggered relationship or at the apices of a regular polygon, as disclosed hereinafter;

FIG. 2 is a view of the same track as seen from above the parts wherein the hatching is constituted by spaced lines cor-

responding to the metal strips located at the higher level while the parts wherein the hatchings are constituted by close lines correspond to the metal strips located at a lower level, the nonhatched parts corresponding to neutral parts of the track;

FIG. 3 is a cross section similar to that of FIG. 1, but where a brush is substituted for one of the contact pieces engaging a metal area at a higher level;

FIG. 4 illustrates the same track as FIG. 3 and shows a brush in contact with a lower section of said track;

FIG. 5 is view from above of a flat track corresponding to a second embodiment thereof, wherein the metal strips are alternately magnetic and nonmagnetic, said track being in contact with four out of the five brushes of a slider;

FIG. 6 illustrates a brush provided with a magnet in contacting relationship with a magnetic strip on the track of FIG. 6;

FIG. 7 illustrates the same brush in contacting relationship with a nonmagnetic metal strip of the same track; and

FIG. 8 is a wiring diagram of a rectifying slider for a track with random contact pieces.

Turning to FIGS. 1 and 2, the track illustrates includes an insulating support provided with parallel metal strips 2, 2' and 3, 3', 3'', 3'''.

The upper surface of said insulating support is thus constituted by a succession of straight prisms the base of which is constituted by isosceles trapeziums, the gap between any two successive prisms being equal to the small base of said trapezium.

Said support defines consequently rectangular areas, which are equal and parallel and located in alternation in two parallel planes extending at different levels and connected with one another along oblique planes.

Metal strips 2, 2', 2'' are secured over the upper rectangles forming the upper smaller bases of the trapeziums, said strips being electrically connected with one another and with one of the poles of the supply.

To the lower rectangles at the lower level of the track there are secured metal strips 3, 3', 3'', 3''' which are also electrically interconnected and connected with the other pole of the feeding supply.

The slider is constituted by an insulating support 12 in which a number of perforation 4a are provided inside which rivet shaped contact pieces are adapted to move vertically said contact pieces being designated by the reference numbers 5a, 5'a, 6a and 6'a.

When said rivet shaped contact pieces are in their uppermost position against the action of the springs 26, said contact pieces are completely collapsed within the insulating support 12, while said springs 26 urge said rivet shaped contact pieces downwardly into a position for which their upper projecting head engages the metal plates 11 extending over the upper surface of the insulating support 12.

It should be remarked that the contact pieces such as 6a when projecting downwardly beyond the plate 13 which is also conductive and is rigid with the lower surface of the insulating support 12 corresponds exactly to the difference in level between the strips 2, 2', 2'' on the one hand and 3, 3', 3'', 3''' on the other hand.

In the metal plate 11 there are provided perforations for the passage of the contact pieces, the diameter of said openings being such that said contact pieces can engage the plate 11 only through their upper head when the contact pieces are downwardly urged, as illustrated for the contact piece 6a.

The lower metal plate 13 is also provided with openings of a diameter sufficient for preventing the contact pieces from engaging the plates 13 whatever may be their position.

When the slider is in position over the track and provided the stress exerted by the springs 26 on the contact pieces is always less than the weight formed by the slider, said plate 13 is constantly in contact with one of the metal strips 2, 2', 2'' which provides a permanent electric connection between said movable plate 13 and the pole of the supply connected with the strips 2, 2', 2''.

On the other hand, the above-mentioned contact pieces 5a, 5'a, 6a, 6'a should be in a sufficient number and arranged in a manner such that there is always one of them in a lowered position such as the illustrated for 6a in FIG. 1. Under such conditions, the lower head of the contact piece is in contacting relationship with one of the strips 3,3',3'',3''' while its upper head is in contacting relationship with the upper plate 11 of the slider.

When the slider is caused to move in parallelism with the metal strips, the rivet shaped contact piece considered provides for a connection with the pole connected with the strips 3,3',3'' and the plate 11 of the slider.

In contradistinction, if the slider is caused to move obliquely or perpendicularly with reference to the strips, the different contact pieces pass in succession through the positions illustrated at 5a, 5'a, 6a, 6'a and there is always one of them in a position corresponding to the position 6, 6a so as to ensure a continuous electric connection between last-mentioned pole and said upper plate 11.

As a modification, it is possible to obtain multipolar connections by multiplying the number of levels and also the number of rivet shaped contact pieces, the contact with the different lower strips being obtained only for the levels of a corresponding vertical location.

FIGS. 3 and 4 illustrate a modified brush adapted to replace the rivet shaped contact pieces 5a, 6a, etc... As a matter of fact, the proper operation of a track of the above-described type requires accurate measurements which are difficult to obtain with a sufficiently low cost price.

The brush illustrated in FIGS. 3 and 4 ensures simultaneously a yielding contacting and a switching corresponding to an electric connection provided in succession with either of both collectors.

The slider is constituted by an insulating block 12a associated with a number of brushes sufficient for obtaining, whatever may be the position of the slider over the strip, at least one brush in the operative position illustrated in FIG. 3 and another brush in the position illustrated in FIG. 4.

Each brush is constituted by a bent i.e., hairpin-shaped blade or wire 27, as illustrated in FIGS. 3 and 4, said blade or spring being pivotally carried by a transverse spindle 29 rigid with an insulating plate carried by the slider 12a. An arcuate portion 28 of said blade 27 is adapted to engage the track, while its end 30 provides for a contact with metal parts or collectors 31 and 32 rigid with the insulating block 12a. The other end 33 of the blade 33 acts as a spring urging constantly the brush against the track.

The insulating block 12a includes furthermore a lower flat section defining the unvarying distance between the spindle 29 and the track; when a brush occupies a position illustrated in FIG. 3, it is held in position by the spring 33 and its arcuate portion 28 is in contact with an upper metal strip such as the illustrated at 2'.

By reason of its pivotal connection round the spindle 29, the end 30 of the brush engages then the collector 31 and ensures an electric connection between the latter and the upper strips 2,2',2''.

When the slider and consequently the brush is shifted over the track, the arcuate portion 28 of the brush after it has slid over the strip 2' sinks along a sloping surface and the end 30 of the brush rises under the action of the spring 33, so as to cut off the contact with the collector 31 until the arcuate portion 28 engages the strip 3 at a lower level, the end 30 of the brush reaching simultaneously its uppermost position so as to engage the other wire or collector 32. There is thus obtained through the agency of a sufficient number of brushes a permanent electric connection between the strips 2, 2' and 2'' and the collector 31 and simultaneously between the strips 3,3',3'',3''' etc... and the collector.

The track illustrated in FIG. 5 includes also parallel metal strips 2,2',3,3' but said strips are all located in the same horizontal plane, the insulating support 1 filling the gap separating said strips. In said modification the track is pro-

vided no longer with any differences in level and is flat, which leads to a very low cost price and excellent running conditions for the vehicles moving over the track.

The strips 2,2',2'', etc... are electrically interconnected and made of a magnetic material such as mild iron for instance coated with a thin layer of nickel, so as to prevent corrosion, while the strips 3,3', which are also interconnected are made of a nonmagnetic conductive material such as copper or brass for instance.

FIG. 5 shows at 28, 28a, 28b, 28c, 28d, the contacting points provided by a typical slider.

It is an easy matter to mathematically show that for a track including strips the breadth of which is equal to four units of length and which are separated from one another by gaps the breadth of which is equal to one unit of length it is possible with five contact pieces arranged at the apices of a regular pentagon the sides of which measure four units of length and whatever may be the position of the slider to obtain at all moments a simultaneous contact with two successive strips.

FIG. 6 illustrates cross sectionally a brush cooperating with such a track. An insulating plate 34 carried by the slider is held at a substantially constant distance from the track including said strips 2,2',3,3' separated from one another by the insulating block 1.

Said plate carries five identical brushed brushes constituted each chiefly by a yielding blade 35, 30 folded in U-shape and of which the central part is secured to the insulating plate 34 through the agency of a screw 34a. The lower part of said blade is bent so as to produce a proper sliding contact at the point 28, while the contacting part of the blade is possibly stamped so as to assume a part spherical shape, which may be silvered outwardly.

The upper part 30 of the blade carries at its end a small magnet 10a of which one pole registers accurately with the contacting point 28. In order to allow said magnet to pass through it, the insulating plate 34 is provided with a corresponding aperture. To either side of the blade, there are provided collectors 31 and 32 which are connected with the collectors corresponding to the four other brushes provided on the slide. When the yielding end of the brush is in its inoperative position, that is at a distance from the magnetic strip, the blade 30 is normally in contact with the collector 32 as illustrated in FIG. 7. In contradistinction, if a strip of magnetic material is in contacting relationship with the contacting point 28 of the blade, the magnet 10a is attracted and produces a bending of the blade the end of which 30 moves away from the cooperating collector 32 so as to engage the collector 31.

Since there is always one brush on the slider which is in contact with a magnetic strip 2 and another in contact with a non-magnetic strip 3, the connection between the said strips and the cooperating collectors 31 and 32 is a permanent one.

It should be remarked merely that when calculating and adjusting the yielding blades of the brushes a switching is performed as soon as the brush reaches the insulating gap separating the successive strips 2 and 3; in the case of a connection to be established between a track and a slider for movable electric circuits fed with d.c. or rectified current, it is possible to resort to the modification illustrated in FIG. 8. In this modification, the track includes also parallel strips 2,2' and 3,3' similar to those illustrated in FIG. 5, but said parallel strips need no longer be made of a magnetic material. In the case illustrated the slider includes a number of brushes constituted simply by contacting blades similar to those 35 of FIGS. 6 and 7. Each blade 35, 35a, 35b, 35c, 35d is associated with two diodes 36 to 36d and 37 to 37d connected as a polyphase well-known Graetz bridge. Thus, whatever may be the number of brushes in contact with the strips 2 or with the strips 3 of the track, there is always a positive pole at 31a and a negative pole at 32a. The track may in fact be fed with a.c. voltage since such an a.c. voltage would be automatically rectified by the above-mentioned diodes 36 to 36d 37 to 37d.

Obviously the embodiments which have just been described may be subjected to various modifications, improvements or

additions within the scope of the accompanying claims and a number of parts may be replaced by equivalent ones, without modifying thereby said scope. It is possible in particular to modify as required the number and arrangement of the brushes and also the desired number of sliders.

I claim:

1. In an arrangement for feeding a part moving on a stationary track with current fed from the two poles of a voltage supply source, the combination comprising an insulating support on said track, two alternating series of parallel spaced conductive metal strips carried by said support, said series of strips located at upper and lower levels respectively on said support and each of the strips at the upper level being spaced from the adjacent strips at the lower level by an inclined surface on said support, said series of strips being connectable respectively to the poles of said voltage supply source, a slider having a body of insulating material faced with upper and lower cover plates of conductive material, said slider being carried by the movable part and adapted to move in all directions over said track and over said support and with said lower conductive cover plate always in contact with at least one of the strips at the upper level, a plurality of parallel spaced contact pieces extending transversely through said slider in correspondingly located openings therein, and spring means biasing said contact pieces downwardly such as to always establish contact of the lower end of one of said contact pieces with a strip at the lower level and contact of the upper end of that contact piece with the upper conductive cover plate on said slider.

2. In an arrangement for feeding a part moving on a stationary track with current fed from the two poles of a voltage supply source, the combination comprising an insulating support on said track, two alternating series of parallel spaced conductive metal strips carried by said support, said series of strips being located at upper and lower levels respectively on said support and each of the strips at the upper level being spaced from the adjacent strips at the lower level by an inclined surface on said support, said series of strips being connectable respectively to the poles of said voltage supply source, a slider made of insulating material, said slider being carried by the movable part and adapted to move in all directions over said track and over said support, and a plurality of spaced contact pieces in the form of conductive hairpin-shaped spring blades pivotally secured to the underside of said slider and biased towards said support such as to always establish contact of the loop portion of one hairpin contact piece with a strip at the lower level and to always establish contact of the loop portion of another hairpin contact piece with a strip at the upper level, and a pair of spaced collectors carried by said support individual to and cooperative with a blade of each of said contact pieces, the hairpin contact piece in contact with a strip at the upper level having a blade thereof in contact with one of said collectors and the hairpin contact piece in contact with a strip at the lower level having a blade thereof in contact with the other of said collectors.

3. In an arrangement for feeding a part moving on a stationary track with current fed from two poles of a voltage supply source, the combination comprising an insulating support on said track, two alternating series of parallel spaced conductive metal strips carried by said support, said series of strips being located at the same level on said support and connectable respectively to the poles of said voltage supply

source, the metal strips of one series being magnetic and the metal strips of the other series being nonmagnetic, a slider plate made of insulating material, said slider plate being carried by the movable part and adapted to move in all directions over said track and over said support, and a plurality of spaced contact pieces in the form of hairpin-shaped spring blades secured adjacent the loop portion thereof to said slider plate such that an upper blade of a contact piece lies above the plate while a lower blade lies below the plate, said lower blade being biased to always establish contact between the end thereof and one metal strip of one or the other of said two series of strips, a pair of spaced upper and lower collectors carried by said support plate individual to an cooperative with said upper blade of each contact piece, and a magnet secured to the end of said upper blade said magnet being arranged for movement in an opening through said support plate so as to be attracted towards a magnetic strip when alined with the same and establish engagement of said upper blade with said lower collector, said magnet occupying an upper position when alined with a nonmagnetic strip and establishing engagement of said upper blade with said upper collector, and the special arrangement of said contact pieces in relation to said alternately positioned magnetic and on nonmagnetic strips being such that one contact piece always engages one of said magnetic strips and another contact piece always engages one of said nonmagnetic strips.

4. An arrangement as defined in claim 3 for feeding a part moving on a stationary track with current fed from two poles of a voltage supply source wherein each of said conductive strips has a width equal to $4x$ wherein x equals one unit of length, said strips are separated from each other by gaps having a width equal to x , wherein five of said contact pieces are provided on said support plate, and the ends of the lower blades of said contact pieces are spacially located at the apices of a regular pentagon whose sides each have a length of $4x$.

5. In an arrangement for feeding a part moving on a stationary track with current fed from two poles of a voltage supply source, the combination comprising an insulating support on said track, two alternating series of parallel spaced conductive metal strips carried by said support, said series of strips being located at the same level on said support and connectable respectively to the poles of said voltage supply source, a slider plate made of insulating material, said slider plate being carried by the movable part and adapted to move in all directions over said track and over said support, a plurality of spaced contact pieces in the form of contact blades secured to said slider plate and adapted to establish contact with different ones of the metal strips of said two series of strips as said slider plate is moved over said track and support, the spacial arrangement of said contact blades in relation to said alternately positioned metal strips of the two series being such that one blade always engages a strip of one series and another blade always engages a strip of the other series, each said blade being connected between first and second diodes on said slider plate poled in the same direction and said diodes being connected respectively to first and second collectors on said slider plate, all of said first collectors being connected together and all of said second collectors being connected together thereby to establish a Graetz bridge which always provides a pole of one polarity at said first collectors and a pole of opposite polarity at said second collectors.