

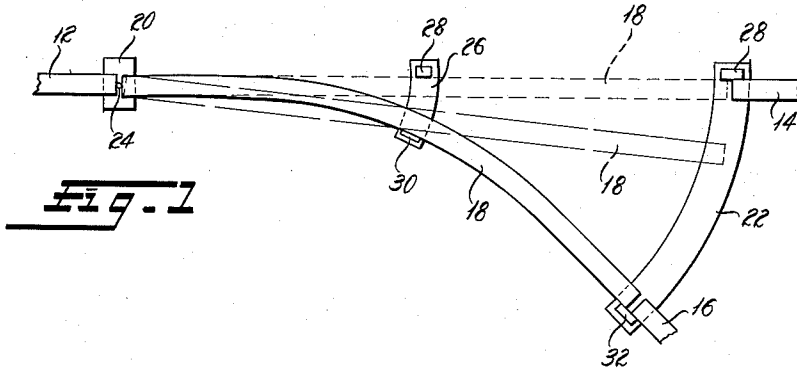
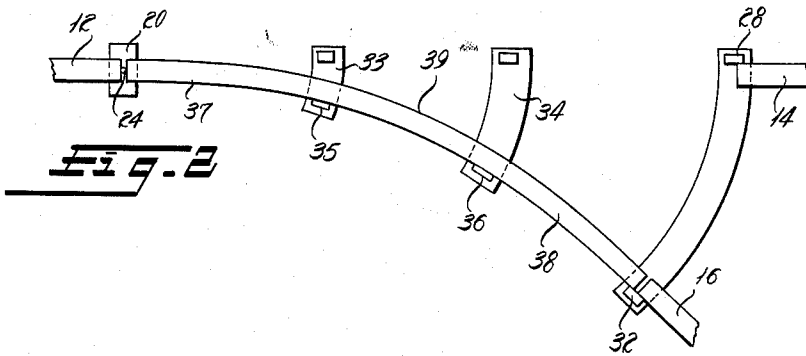
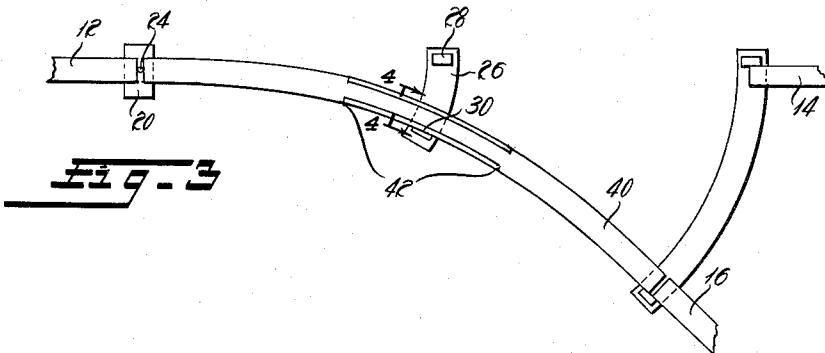
Aug. 22, 1961

K. ROSENBAUM ET AL
MONOBEAM SWITCHES

2,997,004

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4 Sheets-Sheet 1



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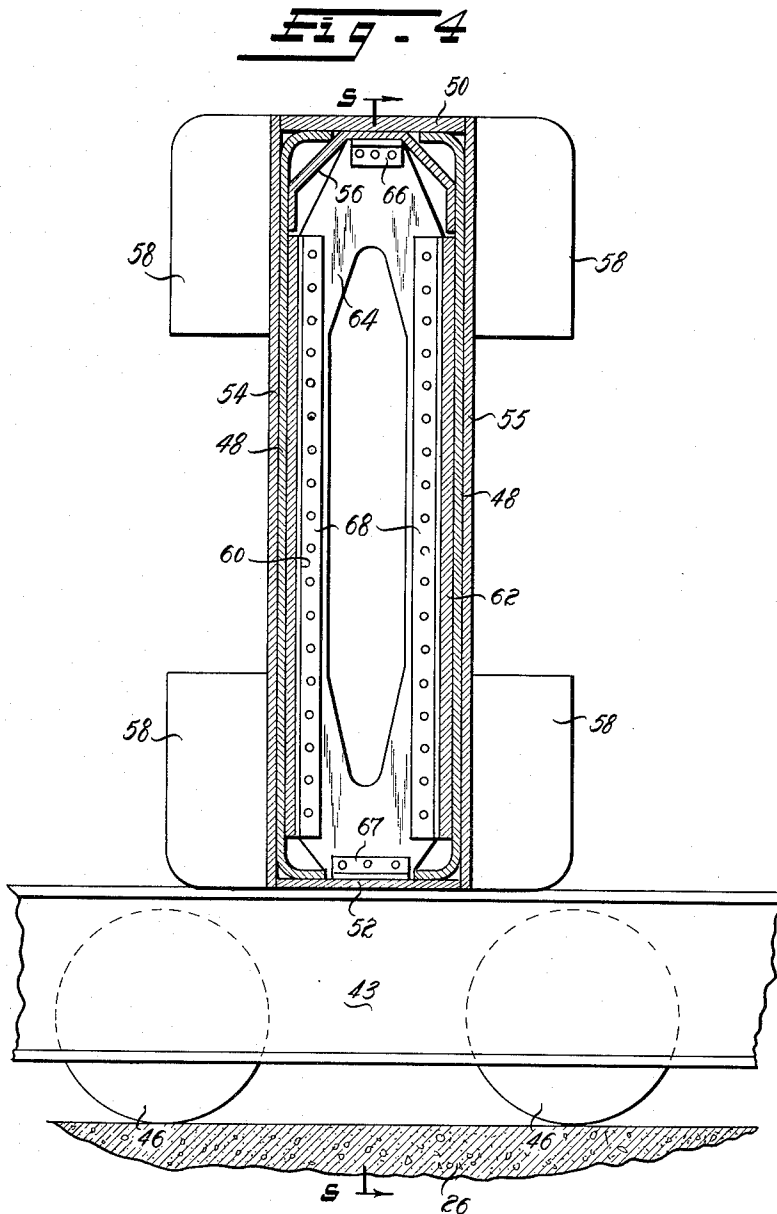
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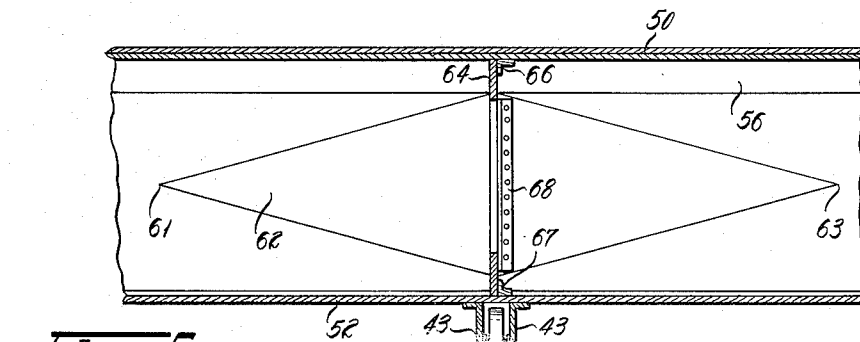
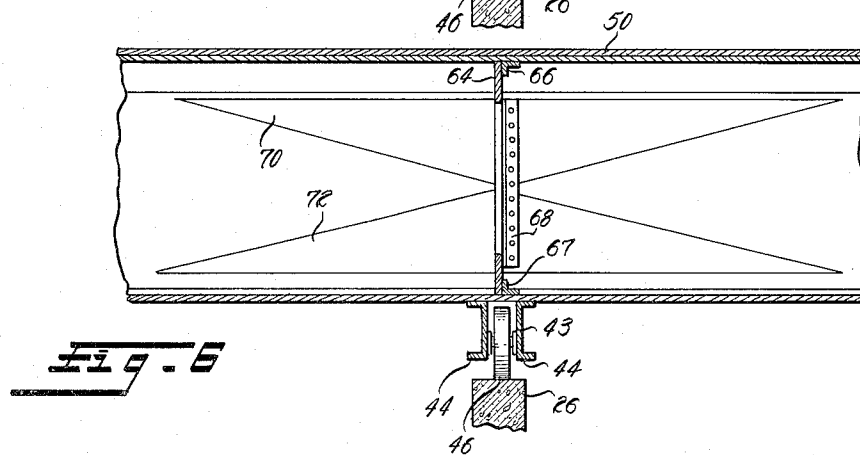
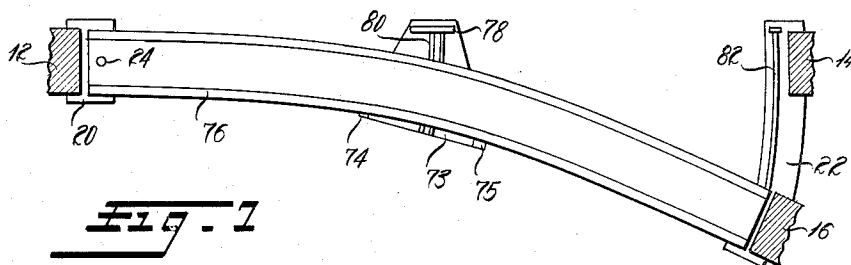
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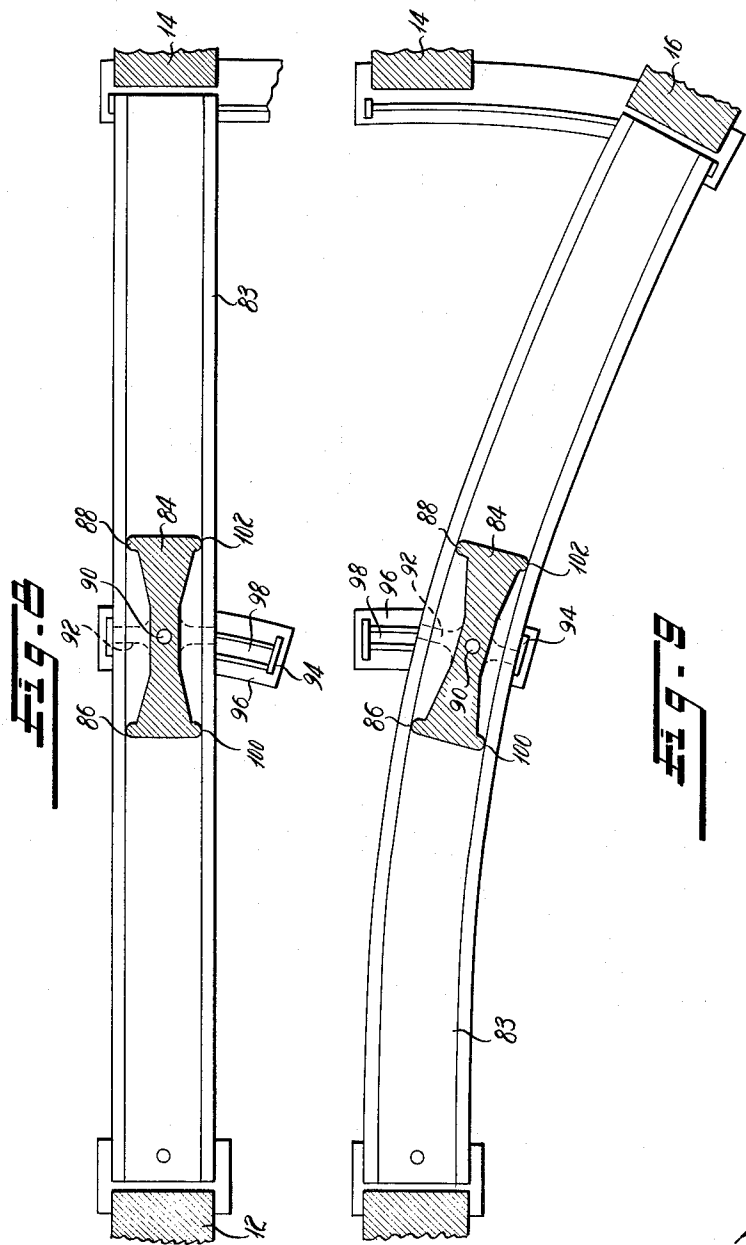
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2,997,004

MONOBEAM SWITCHES

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9 Claims. (Cl. 104—130)

The present invention relates to switch constructions and more particularly to switch constructions for railway systems of the monobeam type. In such systems the track comprises a relatively heavy usually substantially rectangular beam member having top and side running surfaces, the former supporting the load carrying vehicle wheels and the latter engaging upper and lower lateral vehicle wheels which guide the vehicle and transfer tilting forces to the beam. Preferably the track beam is made of a reinforced concrete structure.

In the past switches for this type of railway have been suggested the switch tongue of which consists substantially of an elastic beam section which is bent as a whole from the position connecting a through line to an angularly related branch position. For example, such a switch is disclosed in copending application Serial No. 751,683, filed July 29, 1958. The shape of the switch tongue, when it is deflected, depends on the location of the point of application of the adjusting force to the switch tongue. For example, if an elastic switch tongue is fixedly clamped at one end and the adjusting force acts on the free end, the longitudinal axis of the switch tongue assumes a parabolic form in its branch position, the vertex of the parabola, i.e. the smallest radius of curvature, being at the clamping point. From the point of view of the riding dynamics of vehicles passing over the switch, the greatest lateral acceleration occurs at this point abruptly. This is very unfavorable.

It is the primary purpose and object of the present invention to provide improved switch construction for monobeam type railways which, with respect to riding dynamics of vehicles passing the switch, have a favorable bending line in branch position and in which this is accomplished by simplified, inexpensive structure.

In attaining this primary object and further objects, the invention contemplates the provision of a novel switch construction, the bending line of the switch tongue of which in branch position constitutes two parabolic branches serving as transition curves having a circular arc between them located in the middle part of the switch tongue.

In accordance with one form of the invention this can be accomplished by the provision of a fixed abutment block arranged in such a way that the middle part of the switch tongue is stopped by it during the bending process and the adjusting force acts at the free end of the switch. Thus the switch tongue comes into contact with the abutment block before its free end is in final branch position and is bent about this block during the last phase of operation.

In this case a parabolic bending line is also obtained, the vertex, however, being at the contact point of the switch tongue with the abutment block wherefrom the parabolic branches acting as transition curves extend to both ends of the switch tongue, each with continually increasing radius of curvature. For technical and structural reasons an absolutely rigid clamping of the beam end is very difficult to obtain. Accordingly, the fixed end of the switch tongue may be pivotally supported by means of a king pin instead of being fixedly clamped. During the first phase of operation of the switch, before the switch tongue contacts the abutment block, it will not be bent

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but only pivoted about the king pin, thus an angle is obtained at the king pin during the first phase of operation which disappears during the last phase of operation.

Since the length of the switch tongue often is limited, the radius of curvature at the vertex of the parabolic bending line will become so small that a considerable lateral acceleration will be effected on a vehicle passing over the switch with high speed.

In order to avoid an unduly short radius of curvature of the circular arc and also to assure sufficient length of the parabolic branches serving as transition curves, preferably the length of the circular part of the switch tongue should be chosen such that it is not more than $\frac{2}{3}$ nor less than $\frac{1}{6}$ of the total length of the elastic switch tongue.

Therefore, according to a further feature of the invention, the circularly shaped arc of the bending line of the central piece of the switch tongue can be produced by means of two abutment blocks which are arranged at the ends of the central piece of the switch tongue and about which the switch tongue is bent in branch position. The bending moment of the switch tongue remains constant between the abutment blocks. Accordingly, the portion of the switch beam between the abutment blocks is bent along a circular arc.

In some cases it is desirable to eliminate the two separate supports for the abutment blocks. Also, where possible, the use of cantilevered abutment supports on a single pylon should be avoided. The objectives are achieved by a further embodiment of the invention in which the beam tongue in its center portion and extending along both sides of the contact point of a single abutment block against which the beam tongue is pressed in branch position, is constructed as a beam of "uniform stress" with respect to horizontally acting moments.

In such a beam, i.e. a beam in which the ratio of the section modulus to the bending moment is constant, the bending line constitutes a circular arc.

Additional objects and advantages will become apparent as the description proceeds in connection with the accompanying drawings illustrating typical embodiments of the invention and in which:

FIGURE 1 is a diagrammatic top plan view of a monobeam switch installation with an elastic switch tongue shown in dotted lines in normal position, in dash lines in intermediate position and in full lines in branch position with its central portion against a single abutment block;

FIGURE 2 is a diagrammatic top plan view of a switch having the same switch tongue as FIGURE 1, but laterally supported by two abutment blocks;

FIGURE 3 is a diagrammatic top plan view of a monobeam switch installation, the middle part of the switch tongue being constructed as a beam of uniform stress;

FIGURE 4 is an enlarged cross-section along line 4—4 of the switch tongue of the embodiment shown in FIGURE 3;

FIGURE 5 is a partial longitudinal section along line 5—5 of the switch tongue shown in FIGURE 4;

FIGURE 6 is a longitudinal section through the middle part of the switch tongue showing a modification of the embodiment of FIGURE 5;

FIGURE 7 is a top plan view of a modification of the switch according to FIGURE 2, showing the switch in branch position;

FIGURE 8 is a top plan view of a further modification of an elastic monobeam switch tongue in straight position; and

FIGURE 9 is a top plan view of the switch of FIGURE 8 in branch position.

Referring now more particularly to the drawings and especially to FIGURE 1, the track and switch construction comprises a main line beam 12, a second main line

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beam 14 aligned with the beam 10 and a branch line 16. Preferably those beam lines are of substantially rectangular cross-section and are made of reinforced concrete. The ends of the beams 12, 14 and 16 and the ends of a switch tongue 18 are mounted on supports 20 and 22, the height of which may be chosen according to the special demands of the installation. The switch tongue 18 is elastically deformable, e.g. made of a light metal alloy construction as disclosed in the copending application Serial No. 751,683 to which reference may be made for further details.

One end of the beam tongue is pivotally connected to the support 20 by means of a king pin construction 24 or the like. Intermediate its ends the switch tongue 18 is supported for lateral shifting movement along an arcuate support 26.

The switch may be operated by any suitable driving means which per se does not form part of this invention and is not shown. For example a driving means similar to that disclosed in United States Patent No. 2,903,972 granted September 15, 1959, for Railway Switch Assemblies may be utilized and may act on the free end of the switch tongue 18.

Interposed between the switch tongue 18 and each of the supports 26 and 22 are bogies running on guide rails mounted on the supports 26 and 22, e.g. similar to those shown in the above-mentioned Patent No. 2,903,972 and omitted in the drawings of the present case for clarity's sake. In its straight position shown in dotted lines, the switch tongue 18 connects the aligned beams 12 and 14. An abutment block 28 limits the straight position on the elastic switch tongue. During positioning the switch tongue 18 into the position shown in FIGURE 1, it first assumes the position shown in dash lines and is then bent about a further abutment block 30 mounted on the support 26. At the end of the switch tongue an abutment block 32 limits the movement of the switch tongue end when shifted into the branch position. The bending line of the switch tongue in its branch position corresponds to a parabola having its vertex at the block 30. At this vertex the bending line closely approximates a short circular arc.

FIGURE 2 shows a similar switch construction, intermediate of which, however, two supports, 33 and 34, with abutment blocks 35 and 36 are arranged. The bending line obtained by means of this construction constitutes two parabolic branches 37 and 38 having between them a circular arc 39 extending between the abutment blocks 35 and 36. The circular arc 39 obtained has a greater radius of curvature than that obtained in FIGURE 1 and it insures better properties of riding dynamics for vehicles passing over the switch than those passing over a switch according to FIGURE 1.

In FIGURE 3 the switch tongue 40 is laterally supported by only a single block 30 as in the embodiment of FIGURE 1. However, in this design the switch tongue 18 within the region 42 is constructed as a beam of uniform stress as shown in greater detail in FIGURES 4 and 5. The bogie structure 43, comprising two angle irons 44 and rolls 46 mounted between them, is supported upon the support 26 to facilitate transverse movement of the elastic switch tongue 40. This switch tongue generally is a riveted box-shaped structure comprising normally two U-shaped girder sheets 48 connected to each other by a top plate 50 and a bottom plate 52. Attached to the sides of this box are sheets 54 and 55. Piece 56 serves for stiffening the whole structure. As disclosed in the copending application Serial No. 751,683, the side running surfaces of the structure are formed by blocks 58 made of synthetic plastic, wood or the like and are screwed or cemented to the side sheets 54 and 55. By means of vertical strengthening sheets 60 and 62 mounted to the sheets 48 inside of the box structure, the switch tongue is constructed as a beam of uniform stress in its

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central part. The strengthening sheets are diamond-shaped as shown in FIGURE 5. Thus the section modulus of the beam decreases from the center of those sheets longitudinally in both directions to the pointed ends 61 and 63 respectively.

Transverse partition walls 64 are arranged in spaced distances from each other within the switch tongue and are kept in place by means of angle pieces 66, 67 and 68.

FIGURE 6 illustrates another embodiment of the switch tongue which is the same as the embodiment of FIGURES 4 and 5 except that instead of the above-mentioned diamond shaped sheets 60 and 62, triangular strengthening sheets 70 and 72 are utilized for obtaining a beam of uniform stress.

In the embodiment of FIGURE 7 the central support 73 is adapted to receive two stopping blocks 74 and 75, against which the switch tongue 76 is pressed in branch position. In straight position the switch contacts the block 78. Numerals 80 and 82 designate guide rails for the bogies (not shown) interposed between the supports 22 and 73 respectively and the switch tongue 76. In branch position the bending line of this switch tongue is composed of a circular arc extending between the blocks 74 and 75 and connecting two parabolic branches extending between the blocks and the respective adjacent ends of the switch tongue, said branches serving as transition curves.

FIGURES 8 and 9 show in a more diagrammatic way another modification, FIGURE 8 showing the switch in straight position and FIGURE 9 in branch position. Within the box shaped switch tongue 18 a rigid member 84 is arranged which has contact pieces 86 and 88 serving as inner abutment blocks. The rigid member 84 may be of any suitable structure, e.g., a rigid frame structure or a strong double-T-girder to which the contact pieces 86 and 88 are welded. The member 84 is centrally supported at and attached to the bottom of the box shaped switch tongue, preferably swingably by means of a pivot 90. Underneath the member 84 the usual bogie assembly is arranged as indicated by numeral 92 so that lateral forces acting on the member 84 when the switch tongue is in branch position are transferred over the member 84 on to the bogies 92 to the block 94 arranged on the support 96. Numeral 98 designates guiding rails for the bogie assembly 92.

Opposite the contact pieces 86 and 88 identical pieces 100 and 102 are arranged integrally with the rigid member 84. The pieces 86, 100 and 88, 102 serve as spacers for keeping the correct distance between the side walls of the box-shaped switch tongue and thus between the opposite lateral running surfaces of the switch beam.

In case this switch is used as a three-way switch, i.e. when the switch tongue is adapted to be bent not only to the right as shown in FIGURE 9 but also into a left branch position, the contact pieces 100 and 102 would act as inner abutment blocks and for this purpose a corresponding abutment block identical to the block 94 would be arranged at the other side of the switch tongue.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A switch assembly for a monobeam track comprising a flexible switch beam member adapted to connect a first track section selectively with second and third angularly related track sections, means pivotally mounting one end of said switch beam member adjacent one end of said first track section, means mounting the opposite

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end of said switch beam member for shifting movement from a position of alignment with said second track section to a position of alignment with a third track section, and abutment means interposed in the path of the central portion of said switch beam member for arresting the movement of said central portion before the free end of said switch beam member is aligned with said third track section whereby in the continuing movement of said switch beam member it is bent to dispose its longitudinal axis on a continuous, smooth curve.

2. The switch assembly according to claim 1 where said smooth curve comprises a substantially circular central portion in the region of said abutment means and a pair of substantially parabolic end portions.

3. The combination according to claim 1 wherein said abutment means comprises a single block positioned substantially opposite the midpoint of said switch beam member.

4. The combination according to claim 1 wherein said abutment means comprises a pair of blocks interposed in the path of points spaced symmetrically about the midpoint of said switch beam member.

5. The combination according to claim 1 wherein said switch beam member is of hollow construction and said abutment means is carried internally of said switch beam member in the region of the central portion of said member.

6. The combination according to claim 1 wherein said flexible switch beam member is of hollow construction and has substantially parallel top and bottom walls and substantially parallel side walls, and additional stiffening panels rigid with said side walls adjacent the longitudinal midpoint of said beam, said stiffening panels being of maximum size adjacent the midpoint of said beam and being of progressively decreasing size toward the ends of said beam.

7. A switch assembly for a monobeam track comprising a flexible switch beam member adapted to connect a first track section selectively with second and third angularly related track sections, means pivotally mounting one end of said switch beam member adjacent one end of said first track section, means mounting the opposite end of said switch beam member for shifting movement from a position of alignment with a second track section to a position of alignment with a third track section, and

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abutment means interposed in the path of the central portion of said switch beam member for arresting the movement of said central portion before the free end of said switch beam member is aligned with said third track section whereby in the continuing movement of said switch beam member it is bent to dispose its longitudinal axis in a continuous smooth curve having a substantially circular central portion, the length of said switch beam member, the position of said abutment means and the relative positions of said first and third track sections being such that the length of said circular portion is between one-sixth and two-thirds of the total length of said flexible switch beam member.

8. A flexible switch beam member of hollow construction having top, bottom and side walls and additional stiffening panels rigid with each of said side walls adjacent the longitudinal mid point of said switch beam member, said stiffening panels being of maximum size adjacent the longitudinal mid point of said switch beam member and being of uniformly decreasing size toward the ends of said switch beam member whereby when one end of said switch beam member is deflected and the mid point of said beam is held against movement, the longitudinal axis of the beam adjacent its longitudinal mid point will be curved on a circular arc.

9. An elongated flexible monobeam switch member, said member being of hollow construction and having top, bottom and side walls, a rigid abutment structure of constant length positioned within said beam adjacent the longitudinal midpoint thereof, cooperating means on said abutment structure and said beam for preventing relative longitudinal movement of said abutment structure with respect to said beam, said abutment structure having parts adjacent its ends slidably contacting said side walls to maintain a predetermined lateral spacing between said side walls in the region of said parts and said abutment structure being spaced from said side walls except in the region of said parts to permit the bending of said walls when said switch member is flexed along its longitudinal axis.

References Cited in the file of this patent

UNITED STATES PATENTS

2,792,791	Kreissig	May 21, 1957
2,903,972	Schutze	Sept. 15, 1959