Dec. 24, 1940. R. H. MILLER 2,226,287

MAGNETIC COUPLER

Filed Oct. 26, 1938

Fig. 1.

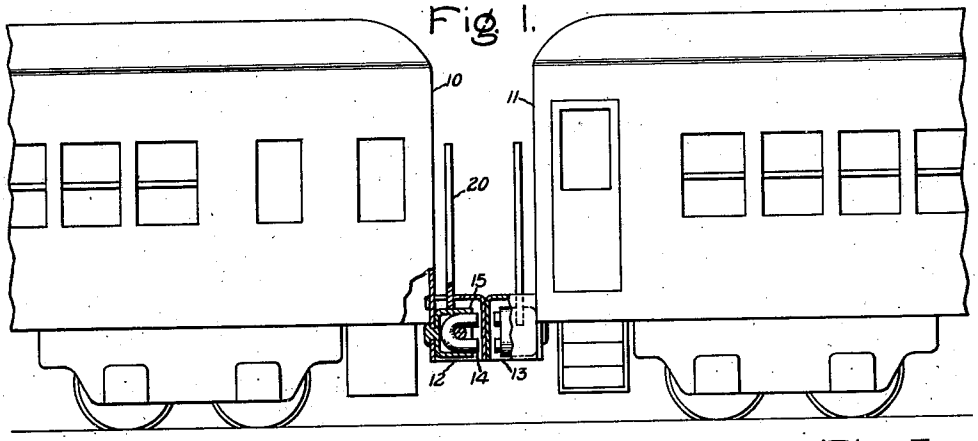


Fig. 2.

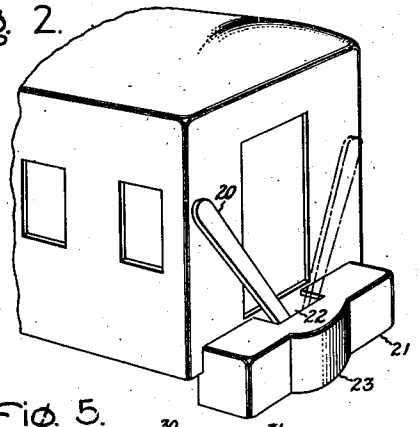


Fig. 3.

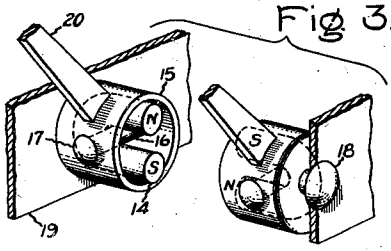


Fig. 4.

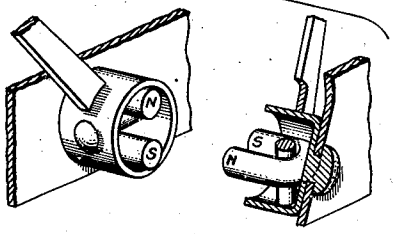


Fig. 5.

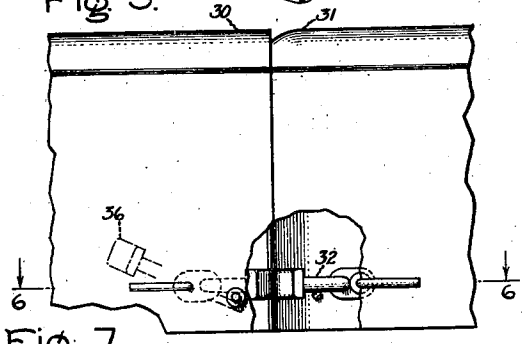


Fig. 6.

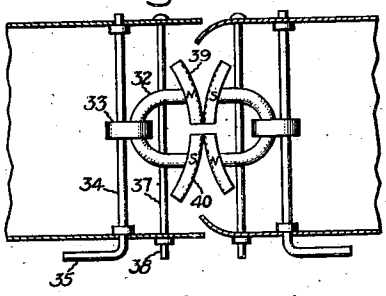
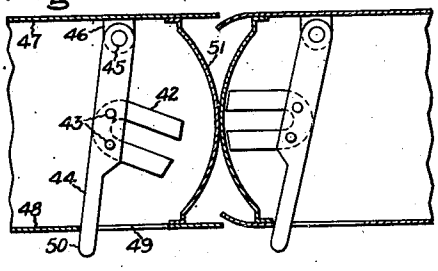


Fig. 7.



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MAGNETIC COUPLER

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7 Claims. (Cl. 213—75)

This invention relates to toy trains and small vehicles and more particularly to means for releasably coupling the ends of adjacent cars together.

Because of the limited clearances between the ends of adjacent cars in toy trains, it is a difficult matter to couple and uncouple the cars provided with the conventional hook and eye type of connectors. It is frequently necessary for the operator, usually a child, to lift the cars from the track and to observe closely the cooperating parts to properly fit them together. The operation often results in the spilling of the train and is anything but realistic. Furthermore, a car provided with a hook at one end and an eye at the other is not reversible with respect to the other cars of the train.

It is an object of this invention to provide a new and improved magnetic draft coupling for toy trains which can be operated by means of levers extending from the sides of the cars in a realistic manner.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto taken in connection with the accompanying drawing.

Referring to the drawing, Fig. 1 is a side elevation of the ends of a pair of toy train cars provided with couplings according to my invention, parts thereof being broken away to bring out certain structural details; Fig. 2 is a perspective view of the end of one car illustrating the operation of the coupler control lever; Figs. 3 and 4 are fragmentary sectional perspective views of pairs of coupling devices in different relative positions of adjustment; Figs. 5 and 6 are views illustrating a second modification of the invention; and Fig. 7 is a view illustrating a third modification of the invention.

Referring to Fig. 1 of the drawing, 10 and 11 represent the ends of adjacent toy train cars each of which is provided on the abutting ends with similar coupling devices 12 and 13 according to my invention. Since the coupling devices are similar in all respects, only one need be described in detail. A permanent magnet 14, preferably formed in the shape of a horseshoe, is arranged within a surrounding cup 15 of non-magnetic material. Any suitable permanent magnet may be used such as one of an alloy containing iron, nickel and aluminum as its essential ingredients and which is characterized by its high coercive force and high residual magnetic strength, and commonly known by the trade name Alnico. A pin 16 extending between the poles of the magnet secures the closed end thereof against the end wall of the cup, the ends of the pin 16 being riveted on the outer sides of the cup as shown at 17. The cup is loosely secured to the end wall of the car so as to allow the magnet to be rotated about its longitudinal axis. The end wall of the cup 15 may be centrally provided with an outwardly extending lug portion 18 adapted to extend through an aperture provided in the lower portion of the end wall 19 of the car. The head of the lug portion 18 may be peened over the edges of the aperture to retain the cup and magnet in position. If desired, the lug 18 may be substituted by any other fastening means desired such as by a bolt passed through the aperture in the car end wall and threaded into the end of the cup 15. An operating lever 20 secured onto the side wall of the cup 15, as by welding or soldering, extends perpendicularly and upwardly with respect to the axis of rotation of the cup and magnet by means of which the cup may be rotated through an angle of approximately 90 degrees as indicated by the dotted lines in the second position in Fig. 2. If desired, a non-magnetic cover 21 may be provided for the coupler which may be secured onto the end wall of the car in any suitable manner. An opening 22 is provided in the upper surface of the cover portion through which the lever 20 may extend, the opening being of such size as to allow the lever to be moved from side to side to effect the above described adjustment of the coupler. As indicated, the cover 21 is provided with an outwardly extending curved portion 23. These portions of two coupled cars form surfaces which may rock across each other to allow the cars to negotiate turns in the track without breaking the couplers apart. It is understood, of course, that the aligned magnets have sufficient attractive force to hold the ends of adjacent cars together even though the magnet poles be somewhat separated while the cars are negotiating turns.

As illustrated in Fig. 3, the adjacent ends of cars may be connected together by so adjusting the couplers with respect to each other that dissimilar magnetic poles are aligned. The cars will then be held together by the magnetic attraction between the poles. The uncoupled position is shown in Fig. 4, in which the magnets are rotated about their longitudinal axes with respect to each other by means of the operating levers 20 until the poles are sufficiently separated and the mag-

netic field between them so weakened that the cars may be readily moved apart. With this coupler, it is not necessary that the operator watch closely the alignment of connector parts, since the cars are coupled by merely bringing the ends of adjacent cars in close proximity to each other with the magnets in the proper relative position of adjustment. Although the cars may, of course, be separated by merely pulling them apart, it is preferred to embody suitable operating levers for shifting the magnets relative to each other, in order that a more realistic operation of the train may be retained. It is further obvious that the cars may be reversibly arranged with respect to the others of the train.

In Figs. 5 and 6 is shown a modification of the invention which adapts itself readily for use in connection with toy train cars to a modern stream-lined design. The ends of adjacent cars 30 and 31, which are adapted for telescopically fitting into each other as shown, are provided with magnetic couplers arranged somewhat differently than in the previous embodiment. The couplers each comprise a permanent magnet 32 secured at the closed end by a connection 33 upon a transversely extending control rod 34. The rod is loosely mounted in the side walls of the car, one or both ends of the rod 34 being provided with a crank portion 35 by means of which the magnet may be rotated in the vertical plane from the coupling position, shown in full line, to the uncoupled position, shown in dotted lines 36 (Fig. 5). The magnet may be supported in the coupling or horizontal position by means of a transversely extending rod 37, one end of which 38 extends beyond the side wall of the car so as to provide a stop for the crank 35 when the magnet is shifted to the inoperative position. The ends of the magnet 32 are preferably provided with arcuate pole pieces 39 and 40 of such a configuration that the pole pieces of adjacent couplers may rock over each other to allow the cars to shift with respect to each other while negotiating a turn without causing too wide a separation of the magnet poles.

In Fig. 7 is shown a still further modification of the invention in which the coupling devices each comprise a permanent magnet 42, secured as by pins 43 to a control lever 44. The lever is pivotally secured as at 45 to a portion 46 affixed to the car wall 47. The opposite car wall 48 is provided with a slot 49 through which the end 50 of the control lever is adapted to extend for manipulation. A non-magnetic portion 51 forms a part of or the entire end wall of the car, the corresponding portions of adjacent cars being adapted to abut against each other during the coupled condition of the cars. The portions 51 are outwardly curved so that the ends of adjacent cars may rock across each other while the train is negotiating turns. To uncouple the cars, one or both levers 44 are shifted so as to cause a sufficient separation of the magnet poles so that adjacent cars may be moved apart.

It is obvious that it is not essential that permanent magnet couplers be provided on both ends of each car. If desired, a piece of magnetic metal may be so arranged on one end of each car which will be attracted by the magnet on the end of the adjacent car to hold the cars together. The coupling may be broken, of course, either by pulling the cars apart or by shifting the magnet by some such means as described in connection with the last two modifications.

It is further obvious that couplings, for example, of the type shown in Figs. 1 and 2 may be readily attached to the ends of cars previously provided with other forms of coupling devices. For this purpose, the riveting lug 18 may be replaced by a bolt or other suitable fastening means.

Thus, with my invention I have accomplished an improved coupling arrangement for small vehicles such as toy trains which comprises a permanent magnet member for attachment to one such vehicle and a magnetic member for attachment to the other of such vehicles in cooperative relation with the permanent magnet member. With such arrangement the vehicles may be held in physical engagement or abutment during movement of one of them by the action of the magnetic pull. My arrangement in addition includes means associated with at least one of the magnetic members for adjustably supporting and moving such member relative to the other member to reduce the magnetic pull between the members and thereby uncouple the permanent magnet coupling.

Having described the principle of operation of my invention together with the apparatus which I now consider to represent the best embodiments thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with a pair of miniature cars, a coupling means between said cars, said coupling means comprising a permanent magnet secured to the abutting end of one of said pair of cars, a magnetic member secured to the abutting end of the other of said pair of cars, said magnet and said member so arranged that said cars are normally held together by magnetic attraction between said magnet and said member, and means mounted on one of said cars operative for causing a relative separation between said magnet and said magnetic member.

2. In combination with a pair of toy train cars, a coupling means between said cars, said coupling means comprising a horseshoe magnet movably secured to the ends of each of said cars for holding said cars together by the magnetic attraction between the adjacent dissimilar poles, and means for rotatably shifting one magnet with respect to the other about the longitudinal axis thereof.

3. A coupler for miniature vehicles comprising a horseshoe permanent magnet, a cup of non-magnetic material, means for securing said horseshoe magnet in said cup with the closed end of said magnet adjacent the closed end of said cup, means for supporting said cup so as to allow said cup and magnet to be moved about its longitudinal axis, and lever means secured to said cup for shifting said cup and magnet about said axis.

4. In combination with a pair of toy cars, a coupling means between said cars, said coupling means comprising a pair of permanent horseshoe magnets longitudinally arranged in the ends of each of said cars, transversely extending pole pieces provided on the ends of each of said permanent magnets, said pole pieces being arcuately curved in the horizontal plane of said cars so as to allow relative pivotal movements of the ends of said cars without causing separation of the pole pieces of the magnets of the abutting cars.

5. In combination with a pair of miniature cars, a coupling means between said cars, said

coupling means comprising a pair of permanent horseshoe magnets movably secured onto the ends of each of said cars, arcuate pole pieces secured onto the ends of each of said permanent magnets, said pole pieces being curved in the horizontal plane of said cars so as to allow relative pivotal movements by the ends of said cars without causing separation of the magnets, and means for uncoupling said cars including means for shifting one of said permanent magnets with respect to the other.

6. In combination, a pair of toy train cars, the end walls of said cars being convexly curved, a portion of one of said end walls being non-magnetic, a permanent magnet secured in one of said cars, the poles thereof arranged adjacent said non-magnetic end wall portion and adapted to magnetically attract a portion adjacent the end of the other car, and means in said one car for shifting said permanent magnet relative to said non-magnetic end wall portion.

7. In combination with a pair of relatively small vehicles, coupling means between said vehicles, said coupling means comprising a permanent magnet secured to one of said vehicles and a magnetic member secured to the other of said vehicles, means for mounting said magnet and said member to said vehicles whereby said magnet and said member may be moved relatively to each other and to said vehicles, said vehicles being held in abutment by magnetic attraction between said magnet and said member during a predetermined alignment of said magnet and said member and released upon the movement of said magnet and said member from said aligned relationship by said mounting means.

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