RAILWAY CAR COUPLER

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ABSTRACT

An interlocking type F railway car coupler recognized by the Association of American Railroads (A.A.R.) as alternate standard equipment and which is provided with a hood. The hood has a roof which overlies the knuckle-receiving recess of the F type coupler to afford vertical interlock between two opposed coupled car couplers when the F coupler is intercoupled with an automatic knuckle-type of car coupler known as an A.A.R. Standard E coupler.

3 Claims, 12 Drawing Figures
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1 RAILWAY CAR COUPLER

BACKGROUND OF THE INVENTION

It is well known in the railway art that when a freight car equipped with an A.A.R. Standard E-type railway car coupler is coupled into an interchange service, to an adjacent tank car equipped with an A.A.R. Interlocking type F car coupler, accidental separation of the couplers could occur during a train wreck. That is, during train derailment the intercoupled type E and F car couplers could become vertically misaligned to the extent permitting the knuckle of the E coupler to vertically slip out of the F coupler knuckle-receiving recess to cause accidental disengagement of the couplers. As a result, the hazard of fire, explosion and/or the escape of poisonous gas is substantially increased since the opposed car couplers of the adjacent separated and derailed cars could overlap each other sufficiently to permit the E coupler on the freight car to puncture or rupture the shell structure of the tank car.

It is the primary object of this invention to minimize the possibility of train separation and to decrease the hazards associated with train derailment by providing a railway car coupler of the type designated as an A.A.R. Alternate Standard type F car coupler with an interlock hood that will prevent accidental disengagement of A.A.R. Standard E-type car coupler intercoupled with the type F car coupler.

Another object is to provide an interlock hood on an A.A.R. type F car coupler that overcomes the knuckle-receiving recess of the coupler which will prevent a worn knuckle of an A.A.R. Standard E car coupler from slipping out of the knuckle-receiving recess of the F coupler.

A further object of the invention is to provide an interlock hood on an A.A.R. type F car coupler with a roof that may deform under a fully loaded condition resulting from vertical displacement, coupler twist and vertical angular movements between intercoupled type E and F car couplers during railway car train derailments and yet prevent vertical disengagement of the couplers.

A corollary object to the preceding object is to provide the roof of the interlock hood with a safety ledge which provides further interference between a worn knuckle of an E coupler and the roof of the interlocking hood on the F coupler during a railway car train derailment.

DESCRIPTION OF THE DRAWINGS

In the drawings, with respect to which the invention is described below:

FIG. 1 is a front elevational view of an A.A.R. Alternate Standard type F railway car coupler illustrating an interlock hood integrally connected to the upper side of the coupler head;

FIG. 2 is a fragmentary side elevational view taken along line 2—2 in FIG. 1 showing the hood from the guard arm side of the coupler head;

FIG. 3 is a top plan view of the F coupler shown in FIG. 1 intercoupled with an A.A.R. Standard E railway car coupler, with the coupler heads being illustrated under a buff condition;

FIG. 4 is a side elevational view of the couplers shown in FIG. 3 taken along the guard arm side of the F car coupler, except illustrating the maximum condition of misalignment according to A.A.R. specifications between the Standard E type car coupler and the Alternate Standard F type car coupler under a pull condition and illustrating the position of the knuckle of the E coupler as it just contacts the hood of the F coupler;

FIG. 5 is an enlarged fragmentary side elevational view, in cross section, of the E knuckle contacting the hood of the F coupler shown in FIG. 4;

FIG. 6 is a top plan view similar to FIG. 3 showing a worn F coupler intercoupled with a worn E-type car coupler and with the coupler heads being illustrated under a pull condition;

FIG. 7 is a top plan view of the intercoupled couplers shown in FIG. 6, with the E coupler being illustrated in a vertical misalignment and coupler twist condition during initial railway car train derailment and illustrating the interlock hood with a safety ledge;

FIG. 8 is an enlarged fragmentary top plan view of the interlocking hood with the safety ledge shown in FIG. 7;

FIG. 9 is a fragmentary side elevational view of the hood shown in FIG. 8 taken along line 9—9;

FIG. 10 is a sectional view taken along line 10—10 in FIG. 7 showing the various contact points between the E and F couplers during an initial railway car train derailment;

FIG. 11 is a sectional view similar to FIG. 10 showing the roof in a distorted condition, with the E knuckle engaging the safety ledge to prevent coupler separation; and

FIG. 12 is a modification of the invention shown in side elevation.

DESCRIPTION OF THE INVENTION

Referring to FIGS. 1, 2 and 3 of the drawings, there is shown a railway car coupler which is of the interlocking type known as the A.A.R. Alternate Standard type F car coupler. The type F car coupler comprises a head 15 having a shank 16 integrally united therewith and is shown in FIG. 3 in mating engagement, under a buff condition, with a mating locking type of coupler known as the A.A.R. Standard E car coupler. A longitudinal central axis L—L is indicated as extending through both the E and F car couplers. In regions horizontally offset from the central axis, head 15 has a guard arm 17 on one side and, on the other side, a pair of vertically spaced bearing lugs 18, 18. A knuckle 20 having a buffing face 21 and a pulling face 23 is journaled to the bearing lugs by a pivot pin 25 for rotation about the pin in the usual manner. A buffing section 30 connects the rearward ends of the bearing lugs and guard arm to form with knuckle 20 a vertical knuckle-receiving recess 31 having a forwardly facing buffing surface 32 between the guard arm and bearing lugs.

Coupler head 15 further comprises a forwardly projecting nose 33 which extends longitudinally outwardly from the forward end of guard arm 17 as defined by top and bottom vertical coplanar surfaces 34 and 35. On the knuckle side of the F coupler, head 15 has a pair of vertically spaced aligning wings 36 and 37 disposed laterally outwardly of the bearing lugs 18, 18. Wings 36 and 37 are adapted to cooperate with nose 33 of another type F railway car coupler to afford vertical interlock between two opposed type F couplers when the two couplers are brought together during a coupling operation.

The A.A.R. Standard E coupler head shown intercoupled to the F coupler in FIG. 3 comprises a head 39 provided with an integral guard arm 40 and pivot knuckle 41 having a buffing face 42, pulling face 43, head 44 and a nose 45. Knuckle 41 is secured to the head by a vertically disposed pin 46 which is connected to a pair of vertically spaced pivot lugs 47, 47. The guard arm and pivot lugs are disposed on opposite sides of the longitudinal central axis L—L of the coupler to define therebetween an opening similar to recess 31 of the F coupler for receiving therein knuckle 20 of the mating F coupler.

The E and F car couplers each have a coupling plane C—C and C—'C—' respectively. Each coupling plane is normal to the central axis of the coupler and subdivides the axis forwardly of the knuckle pivot pin axis to define, when two opposed new couplers are in mating buff engagement, the amount of longitudinal slack between the couplers. Expressed differently, the distance between two coupling planes of two new mated couplers in buff condition corresponds to the amount of longitudinal slack between the opposed knuckle pulling faces of the coupled couplers. When two new E and F-coupled couplers are in a draft or pull condition, the opposing pulling faces 23 and 43 of the knuckles are in engagement and the coupling planes of both couplers merge into a single plane.

FIG. 3 clearly shows the amount of longitudinal slack available between the knuckles of the opposed new coupled couplers and any clearance between knuckle 41 of the E coupler and the contour of the F coupler.
Coupler head 15 is further provided with a generally horizontal transversely extending shelf 50. Shelf 50 is disposed directly under vertical recess 31 of the head and has a forward edge 51 on the knuckle side of the longitudinal axis. Edge 51 is positioned rearward of the coupling plane and in close spaced parallel relationship therewith. Shelf 50 terminates on the guard arm side of the longitudinal axis with a concave contour edge 52 rearward of forward edge 51. The function of the shelf is for supporting knuckle 41 of an opposed mated E coupler when the shank of the E coupler fails during service thereby maintaining a coupled relationship between the couplers and thus preventing the E coupler from falling onto the railway track bed.

In accordance with the invention, coupler head 15 is provided on its upper side with a hood 55 having a roof 56 that overlies the vertical recess 31 of the head. Roof 56 is connected on both sides and rear to an upstanding web 57. Web 57 extends from the upper bearing lug 18, following the contour of vertical recess 31, to the guard arm 17 and terminates near vertical surface 34. The vertical inner surface of web 57 is offset a small amount away from buffing surface 32, as seen in FIG. 5. The web is reinforced by ribs 58 and 59 which extend from the top of the hood downwardly and rearwardly to the top of coupling head 15. The forward portion of roof 56 terminates with a concave contour edge 60 on the guard arm side of the longitudinal axis L—L and is shaped as shown in FIG. 3. Edge 60 joins forward edge 61 of the roof on the guard arm side of the longitudinal axis near the central portion of knuckle-receiving recess 31. Edge 61 lies in a vertical plane parallel to coupling plane C—C and is spaced approximately one inch rearwardly therefrom. Edge 61 is also rearward of an intermediate vertical parallel plane that contains the axis of the knuckle pivot pin 25.

Referring to FIG. 4 there is illustrated the maximum vertical and angular misalignment, under a full condition, between the new E and F car couplers shown in FIG. 3. Under this condition the shank of the E coupler remains in contact with the bottom portion of the supporting striker casting 65 since a type E car coupler, according to A.A.R. specifications, is not considered to angle vertically relative to the car. The forward portion of the F coupler shank is, under normal conditions, supported by a spring supported coupler carrier 66 which is carried in the lower portion of striker housing 67. In the position shown, shank 16 is angled upwardly to the limit of its vertical swing about is pivotal connection within the center sill structure (not shown) of the railway car and is in contact with upper portion 68 of the striker housing.

FIG. 5 shows the position of knuckle 41 within the knuckle-receiving recess 31 of the F coupler under the maximum condition of misalignment of the mated couplers illustrated in FIG. 4. In this position, bottom forward edge 70 of buffing face 42 of knuckle 41 engages the buffing surface 32 of the F coupler, while top forward edge 71 on knuckle 41 engages undersurface 72 of hood 55. FIGS. 4 and 5 clearly illustrate the maximum allowable vertical displacement between the two mated couplers at the coupling plane. This displacement, as indicated as in FIG. 4, corresponds to the maximum allowable vertical coupler centerline offset of 7/8 inches between two noninterlocking type car couplers as presently specified by A.A.R. specifications. Adherence to A.A.R. specifications in the design of freight cars is mandatory if all cars intended for interchange service. At the upper limit of the allowable knuckle vertical offset at the coupling plane the knuckle of the E coupler just contacts undersurface 72 of hood 55 on the F coupler; thus roof 56 of hood 55 does not restrict normal movements of the E knuckle within the F coupler shank contour.

Advancing to FIG. 6 there is illustrated an F coupler intercoupled with an E-type car coupler, with the F coupler worn almost to condemning limits under A.A.R. standards and the E coupler guard arm and knuckle approaching the condemning limits under A.A.R. standards due to guard arm wear, knuckle wear and knuckle stretch, and with the coupler heads being shown under a pull condition. As shown, the two coupling planes of the E and F couplers are not in a condition of coincidence, thus the amount that roof 56 of hood 55 overreaches knuckle 41 of the E coupler is substantially reduced when compared to the amount of overlap indicated in FIG. 3. Under a condition of vertical misalignment and coupler twist during a railway car train derailment, amount of overlap between knuckle 41 and the hood on the F coupler, as shown in FIG. 7, is further reduced.

To prevent the worn knuckle 41 shown in FIG. 6 from slipping out of the vertical knuckle-receiving recess 31 of the worn F coupler during a train wreck, a safety ledge 74 is integrally formed onto the forward portion of roof 56 as shown in FIGS. 7, 8 and 9. Safety ledge 74 extends forward of roof 56 above the level of undersurface 72 in spaced parallel relationship therewith, to define a recess 75 along the forward edge 61 and concave contour edge 60 of the roof. The safety ledge terminates on the knuckle side of the longitudinal center axis with a forward edge 76 in coplanar relation with edge 51 on shelf 50. On the guard arm side of the longitudinal axis, the safety ledge terminates with a concave contour edge 77 rearward of edge 76 and in coplanar relation with edge 52 on shelf 50. Edge 77 is of the same contour as bearing lug 47 on the E coupler to provide for the reception thereof in the event that the E coupler is vertically offset an exceptional amount when the opposed couplers are moved towards a coupling position. As indicated in FIGS. 7 and 10, hecl 44 of worn knuckle 41 engages web 57, as nose 45 engages roof 56 at the intersection of forward edge 61 and undersurface 72, and as designated as point 80. Point 80 is spaced further from the knuckle side of web 57 than the point at which a new knuckle for an E coupler would engage the roof under similar conditions, and for this reason it is the critical loading point for the roof. With a maximum vertical load applied at point 80, during train derailment, the roof of the F coupler is designed to deform before the F coupler shank 16 fails in the area where the shank engages upper portion 68 of striker 67, as shown in FIG. 4. Additional design requirements which control the location of point 80 are: the thickness of the roof (which is preferably 1 inch); the minimum distance between undersurface 72 of the roof and the longitudinal central axis of the F coupler (which is preferably 10 inches); and the length of the moment arms from the loading point 80 to the web of the hood and to the striker face, coupled with the section modulus of both the roof and the coupler shank at its point of engagement with the striker face.

As knuckle 41 moves upwardly relative to the longitudinal axis of the F coupler during train derailment to deform roof 56, hecl 44 of knuckle 41 moves longitudinally outwardly of recess 31; thus shifting the location of load point 80. Continual deformation of the roof changes the form of load application upon the roof to one of a uniform load distribution over the area of knuckle engagement. As the roof deforms, nose 45 of knuckle 41 engages safety ledge 74, where it functions as a stop means to prevent coupler separation by precluding knuckle 41 from moving further outwardly, in the upward direction, of vertical recess 31 of the F coupler.

Referring to FIG. 12, there is illustrated a modified safety ledge 74a. Briefly, the only distinguishable structural feature of ledge 74a over ledge 74 is its downwardly facing surface 79 which extends forward of roof 56 and its direction away from the forward extremity of undersurface 72. Surface 79 terminates forward of roof 56 at its juncture with edges 76a and 77a, which edges correspond in peripheral outline to forward edge 76 and concave contour edge 77, respectively, of safety ledge 74.

What is claimed is:

1. An interlocking knuckle-type car coupler comprising:
   A. a head facing in the forward direction for coupling with a noninterlocking knuckle-type car coupler and having a longitudinal central axis and a transverse coupling plane normal to said longitudinal central axis, said head having
vertically spaced forwardly extending convexly curved upper and lower bearing lugs, a knuckle pivotably mounted to said lugs, a guard arm and a buff section having a flat vertical forwardly facing surface in spaced parallel relation to said coupling plane, said buff section connecting the rearward ends of said lugs and the guard arm and forming with said knuckle a vertical knuckle-receiving recess adapted to receive the knuckle of a mating noninterlocking-type car coupler; and

B. a deformable hood on the upper side of said head extending above the level of said upper lug and guard arm, said hood having a roof of predetermined thickness projecting forwardly of the buff section, said roof extending between said upper lug and said guard arm, the forward face of said roof comprising a flat portion adjacent said upper lug and a vertical concavely curved portion adjacent said guard arm, said flat portion being disposed in a transverse vertical plane disposed parallel to and slightly rearward of said coupling plane, said curved portion being disposed rearwardly of said flat portion and having a curvature generally complementary to that of said upper lug to receive the upper lug of a mating coupler under conditions of substantial relative vertical displacement between the couplers as they approach for coupling, said roof having an undersurface in predetermined spaced relation to said longitudinal central axis to define the upper limit of the allowable knuckle vertical offset at the coupling plane between the opposed interlocking and noninterlocking mated car couplers when said coupled couplers are subjected to pulling forces under conditions of maximum relative vertical displacement and twist about their longitudinal axes, and said roof preventing coupler separation by engagement with the knuckle of the noninterlocking coupler to prevent the knuckle from slipping out of the vertical recess of the interlocking coupler upon deformation of the roof resulting from operating conditions producing relative knuckle vertical offset exceeding the allowable knuckle vertical offset at the coupling plane.

2. The car coupler of claim 1 wherein: said hood comprises a continuous vertical web joining said roof to said head, said web commencing at one end in line with said flat portion of the roof and extending to said guard arm at the lateral extremity of said curved portion of the roof, said web conforming substantially to the contour of said knuckle-receiving recess and having its inner side offset slightly in a direction away from said contour.

3. The car coupler of claim 1 wherein: the forward portion of said roof forms a safety ledge, said ledge having its undersurface offset upwardly relative to the undersurface of the rearwardly adjacent section of the roof so as to be of lesser thickness than said adjacent section, said offset undersurface of said ledge assuring that only said adjacent section of the roof will engage with the knuckle of a noninterlocking mated coupler to limit relative vertical movement between the couplers, said ledge being engageable with the knuckle of the noninterlocking mated coupler under the aforesaid conditions of maximum relative vertical displacement and twist of the couplers sufficient to cause deformation of said adjacent section.