TIGHT-LOCK CAR COUPLER

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A common type of coupler for connecting together railway cars is that in which two rigid heads interlock with each other and are secured in such interlocked relation by means of movable locking dogs. To obtain rigidity in the connection, there should be no looseness in the locking means but, on the other hand, there must be provision for constantly exerting a holding force on the locking dogs. Furthermore, as wear occurs during use, the tightness of the connection must be automatically maintained. In order to effect an uncoupling, it is necessary first to relieve the pressure between the locking dogs and the parts of the opposing couplers which they engage. One of the difficulties heretofore encountered has been to obtain a considerable range of automatic adjustment in the locking blocks to compensate for wear. In some of the well known forms of tight-lock coupler, any automatic adjustment to compensate for wear is accomplished at the expense of effectiveness in the holding capacity of the locking dogs, due to the fact that with the adjustment of the dogs their normal locking position is lost, while the couplers are new, conditions are brought about that have a greater and greater tendency to cause the locking dogs to release in service.

The object of the present invention is to provide a simple and novel locking means for a tight-lock coupler which shall be efficient and effective in operation, be easily unlocked when unlocking is desired and be prevented from accidentally unlocking not only when the couplers are new but after they have become worn, and which shall satisfactorily compensate for a much greater amount of wear than is possible in former types of locking means.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a side view of a coupler head embodying the present invention; Fig. 2 is a side view showing a fragment of the opposite side of the coupler from that appearing in Fig. 1; Fig. 3 is a horizontal section through a complete coupler head and a fragment of a companion head, coupled together; Fig. 4 is a view similar to Fig. 3, showing the two coupler heads still interlocked, but the single locking dog shown in this figure being in its release position, so that

the coupler heads may pull apart; Fig. 5 is a view similar to Figs. 3 and 4, showing a single coupler head in its normal, uncoupled condition, ready for automatic coupling with a companion coupler; Fig. 6 is a view on a somewhat larger scale than Fig. 5, showing in section, on a different plane from that of Fig. 5, the locking dog and the immediate operating means therefor, the section being on line 6—6 of Fig. 7; Fig. 7 is a section on line 7—7 of Fig. 6; Fig. 8 is a section on a larger scale, on line 8—8 of Fig. 5, only a fragment of the coupler being shown; Fig. 9 is a section on line 9—9 of Fig. 8, showing a still smaller fragment; Fig. 10 is a rear elevation of the locking dog; and Figs. 11 and 12 are diagrammatic views showing, respectively, the locking position in the case of a new coupler and the locking position after a coupler has become greatly worn.

In the drawings 1 represents a hollow cast steel coupler head of standard contours to permit rigid interlocking of two heads. The head is provided at the front end, and on one side of the longitudinal center, with a hook-like nose 2 having a flat laterally inclined front face 3 adapted to engage with a corresponding inclined reentrant face 4 in a companion coupler; thus, when two couplers come together, permitting the nose of each to enter the front end of the other head and slide diagonally toward the longitudinal center along the inclined face 4 of that head until the two noses are interlocked with each other, as indicated in Figs. 3 and 4. Within the coupler head, directly behind the face 4 and in registration with a suitable opening or window 5 in that face, is a locking dog 6 in the form of a solid sturdy steel block. It will be seen that the face 3 of the nose of the coupler contains a window 7 so disposed that it provides the tip portion of the nose with a back side or vertical face 8 that is parallel with the longitudinal axis of the coupler. As will hereinafter be explained, the locking dog of one coupler is adapted to swing out through the window 5 in that coupler and wedge itself against the face 8 on the nose of a companion coupler, as shown in Fig. 3.

The locking dog is mounted at one end upon a vertical hinge pin 9 which in turn extends through and is journaled in two eccentric bearing blocks 10 and 11 rotatably supported in the top and bottom walls of the coupler head. As is best seen in Fig. 7, the locking dog lies between and engages with both of the eccentrics.

Each eccentric has radially projecting arms on the ends thereof next to the locking dog, as indi-
cated at 13 and 14. These arms are of sufficient thickness to engage with each other so that when a vertical pin 15 is inserted through the same, the two eccentrics are not only connected together but joined into a comparatively rigid unit.

Each of the arms 13 and 14 has its outer end slotted so that the companion arm projecting from the two eccentrics contains an upper slot 6 and a lower slot 7. These slots provide room for the reception of members surrounding the pin 15 and serving to oscillate the eccentrics. What may be termed the vertical web of the companion arm, including two vertical barlike elements, is in each instance at least 15 wider than the web-like portion, forming an inwardly and rearwardly projecting flange 20 on the hinge end of the locking dog. This arrangement permits a limited relative oscillatory movement between the locking dog and the eccentrics. As in some of my prior patents, this lock has been made to release the pressure on the locking dog in uncoupling and to maintain a constant tightening pressure on the locking dog while a coupled condition exists.

Associated with the locking dog is a strong spring which ends at each end. This spring is outwardly into and past its locking position. This spring, indicated at 22, surrounds a long tubular stem 23 extending diagonally across the interior of the coupler behind a wall 26 arranged diagonally in the coupler head behind the locking dog. The front end of the spring bears against the wall 24 while the rear end is engaged with an annular flange 25 on the member 23. The forward end of the stem 23 passes through an opening in the wall 24 and is connected by a hinge pin 28 to a link 21 which extends through the window 16 in the companion arm for the eccentrics and is journalled on the pin 15, as best shown in Figs. 6 and 7. A second link 20 extends at one end into the window 17 where it is journalled on the pin 15. The link 28 contains a long slot 29 extending inwardly from a point near the outer end. The outer end of the link 28 extends through a bifurcated portion of a lever 30 and is connected thereto by a pin 31 and extending through the slot 29. The forward end of the lever is hinged to a part of the coupler head by a vertical pin 33. Surrounding the pin 33 and cooperating with the lever and a stationary part of the coupler head is a lock 34 that tends constantly to hold the lever close to the side of the coupler head; the slot 28 permitting this, regardless of the position of the locking dog.

The inner or rear end of the tubular stem 23 is guided by a post 35 detachably secured at one end to a side wall of the coupler and long enough to insure that its forward end will not become disengaged from the stem when the latter has been moved forward as far as it will go, namely into the position illustrated in Fig. 4.

When the coupler is applied to a car having power control equipped to provide power means for unlocking the coupler as, for example, a pneumatic control system, the coupler head may be provided with a suitable power driven actuator for moving the locking dog into its release position. In the arrangement illustrated, there is a power actuator in the form of an air cylinder 30 containing a piston provided with a plunger 37 projecting out through the front end of the cylinder. The cylinder is fastened to the side of the coupler with its axis horizontal and arranged at an acute angle to the longitudinal axis of the coupler, the forward end being farther away from such axis than is the rear end. The arrangement is further such that the plunger 31 lies above the lever 30 so as to interfere with the latter. On the upper member 13 of the composite arm radiating from the eccentrics is a lateral extension 38 having at its free outer end a depending flange 39 lying directly in front of the plunger or piston rod 37.

It will thus be seen that the eccentrics may be turned in the clockwise direction, as viewed in Figs. 3, 4, 5 and 6, either by means of the lever 30 or by means of the power actuator. Upon release of the lever or the shutting off of pressure to the cylinder 30, the eccentric 38 swings the eccentrics in the counter-clockwise direction as far as conditions permit, the extent of such movement depending upon whether or not the coupler is engaged with a companion coupler.

As heretofore explained, the eccentrics may turn through a small angle relatively to the locking dog by reason of the fact that the notch 19 in the part 20 on the rear side of the dog is wider than the bar 18 on the companion arm of the eccentrics. Normally, the bar 18 engages with that portion of the member 20 that lies on the side of the coupler opposite the center of the coupler; this being the case when the coupler is free from any other coupler, as illustrated in Figs. 5 and 6, and when the coupler is fully coupled to a companion coupler, as illustrated in Fig. 3. It will be seen that at these times the thicker parts of the eccentrics lie in front of the hinge pin 9 for the locking dog. Therefore, when the eccentrics are turned, either by the hand lever or by the power actuator, resulting in the swinging of the bar 18 to the opposite side of the notch 19, an increasingly thicker portion of the eccentrics appears on the side of the pin 9 facing the longitudinal axis of the coupler, and this pin is therefore moved bodily away from this axis, carrying the locking dog with it. In other words, the first movement of the eccentrics in the clockwise direction as viewed in Figs. 3 to 6 of the drawings is sufficient to release the pressure on the locking dog, in the direction of its length, tending to pull it bodily away from the longitudinal axis of the coupler, thereby releasing the pressure between the dog and the nose of the opposing coupler, when this movement of the eccentrics occurs while type 60 coupled relation to each other; thereby leaving the dog free to turn in unison with the eccentrics into its release or unlocking position, during the further turning of the eccentrics in the clockwise direction. After a coupling has been made, bringing the parts in the position shown in Fig. 3, the spring 27 is exerting a turning effort, in the counterclockwise direction, on the eccentric 38 on the locking dog. This insures that the locking dog is pressed lengthwise into close contact with the face 8 on the nose of the opposing coupler and that this condition will be maintained even after wear takes place. Further explanation of the manner in which the locking dog performs its holding functions and automatically compensates for wear will hereafter be made.

In uncoupling, it is necessary that the locking dog be not only swung into release position, but that it be held there without requiring further attention on the part of the trainman until the cars have pulled part. Also, upon the pulling apart of cars, the locking dog must be made ready to provide for subsequent automatic coupling upon bringing two cars together. The
mechanism for making these operations possible will now be described.

It will be seen that on the rear side of the locking dog, toward its free end, is a rearwardly projecting lug 40. This lug is adapted to be extended with sufficient lever or force by a spring, vertically within the interior of the coupler head behind the locking dog and extending from the locking dog to the opposite side of the head. The pawl is mounted on a vertical pin 43 which, as best shown in Fig. 8, is in the form of a bolt extending from the front face of the coupler head, and is seated in a hole in the bottom wall of the coupler head. Surrounding the pin 43 and cooperating therewith and with adjacent portions of the body of the coupler head is a torsion spring 44 that tends constantly to force the nose end of the pawl forward. The parts are so proportioned that when the locking dog is swung back into its release or unlocking position and the pawl is free, the nose of the pawl drops behind the lug 40, as shown in Fig. 4.

It must not be possible, however, to secure the locking dog in its release position while the coupler remains disengaged from other couplers; because, in that case, automatic coupling could not be effected. I have therefore provided means for holding the pawl 42 in an idle or inoperative position except at times when the coupler is engaged with a similar coupler. It will be seen that the tail end of the pawl has a long wide opening or window 45 through the same. Mounted in front of the tail end of the pawl is a vertical pin 46 on which is a rocker device comprising a rearwardly extending curved arm 47 that extends through the window 45, and a forward extending arm 48. The arm 47 projects at an angle from a slot in a head 41 on the inner end of a pin 50 that extends through and is soldered in a portion 52 of the front wall of the coupler that extends outwardly from and at right angles to the face 4 of the coupler. Projecting rearwardly from the head 49, in axial alignment with the pin 50, is a stem 53 surrounded by a compression spring 54. One end of the spring 54 bears against the head 49 and the other end is seated in a socket 55 formed on the inner side of a bar-like casting 56 arranged on the outside of the coupler head and fastened thereto by suitable bolts 57, as best shown in Fig. 3; the wall of the coupler to which the member 56 is secured has a large opening 58, which is spanned by the member 56 and permits the withdrawal of the pin 50 with its head and stem, after the member 56 is removed.

The spring 54 tends constantly to hold the head 49 against the wall 52, as shown in Fig. 5. The rocker device, comprising the arms 47 and 48 is, of course, compelled to oscillate as its actuator, comprising the pin 50 with its head and stem reciprocates. The parts are so proportioned that when the pin 50 is pushed back by the nose of a companion coupler, as in Figs. 3 and 4, the rocker arm 47 is swung about to a point where it does not interfere with the movement of the pawl 42 into its latching position, which is illustrated in Figs. 5 and 4. It will be seen, as above described, that the locking dog must be swung back farther than the nose of the companion coupler will push it, in order to permit the pawl to engage with the lug 40; the front face of the locking dog lying approximately parallel with the face 4 of the coupler and at a substantial distance inwardly from the latter; whereas the face 3 on the nose of the companion coupler is in sliding contact with the face 4 and no part of the nose of the companion coupler can, therefore, extend rearwardly beyond the face 4. Therefore, although the coming together of two couplers frees their paws so that they may assume their latching positions, the two locking dogs will not be pushed far enough to permit the paws to drop into latching engagement with the lugs 40. Therefore, each main spring 22 will throw its locking dog forward just as soon as the noses of the couplers have moved laterally far enough to bring their lock-engaging faces 5 to the ends of the cooperating locking dogs. In other words, each locking dog is pressed by its spring 22 against the face 3 of the opposing coupler and, when the face 3 abruptly terminates at its juncture with the face 8, the dog snaps into engagement with the face 8, as shown in Fig. 3.

When it is desired to uncouple, the locking dog may be swung back far enough, as shown in Fig. 4, to permit the pawl to move into latching engagement with the lug 40. This condition will be maintained until the companion coupler withdraws its nose, the pin 50 following the retracting nose and, through the rocker device acting on the pawl, to withdraw it from engagement with the lug on the dog after the nose has been shifted laterally far enough to cause the dog to be stopped by the face 3 of the retreating coupler, so that it can swing automatically into its idle position of Fig. 5 upon the complete withdrawal of the companion coupler.

It will thus be seen that automatic coupling may be effected without danger of having a locking dog locked in its release position at the time of making the coupling; this being so because the locking dog cannot be left in its release position except while a companion coupler is in interlocked relation with the coupler to which the said dog is mounted. On the other hand, the locking dog may be swung into its release position and be positively latched in that position while a coupling relation exists, and the dog will be automatically released during the separation of the couplers.

One of the difficulties experienced with tight-lock couplers having swinging locking dogs of the general type illustrated, is to prevent accidental unlocking due to the existence of the component of the thrust of the nose of a companion coupler against the dog that holds it in place, which component acts in a direction to swing the dog back out of its locking position. This undesirable component of the force acting on the locking dog results from the need of a cam face on the locking dog to produce a constant pressure on the nose of the companion coupler; the cam face being the result of forming the ends of the locking dogs as fragments of surfaces of cylinders having their axes displaced laterally from the pivotal axes of the dogs. When a sufficient cam effect is created to provide not only for a tight lock when the couplers are new, but also to compensate for wear, the distance between the two axes, just mentioned, is considerable and results in frequent accidental unlocking of couplers.

In accordance with one feature of my invention, I provide an adequate cam effect at all times, not only when the couplers are new, but after they have become greatly worn, without at any time permitting the creation of forces of a kind that can cause the locking dogs to be driven into unlocking positions while one coupler is exerting a pull upon another coupler with which it is interlocked. The manner in which I accomplish...
this is best illustrated in Figs. 11 and 12. In these figures, the line A represents a vertical
plane at right angles to the longitudinal axis of the
coupler and containing the common axis of the two eccentrics indicated at X. The line B
indicates a vertical plane at right angles to the plane A and intersecting the latter at the axis
of the eccentrics. The axis of the pin 8, indicated at Y, is in a vertical plane, represented by the
line C that also contains the axis X and lies at a
right angle to the plane B, whereby the center of the
pin 9, with the locking dog in the position shown in Fig. 11, while the parts are new, lies farther away from the longitudinal axis of the
coupler than does the axis of the eccentric.

The working face 12 of the locking dog is a part of
the surface of the cylinder whose axis Z lies in the plane C in such a position that the axis
Y is located about half way between the axes X
and Z.

When the parts are new, the locking dog engages the face 8 of an opposing coupler at the end of a radius D extending from the axis Z at a
right angle to the plane of the dog 10, as shown in said bearing members with its axis vertical.

The area between the lines E and F near the outer
der end of the locking dog represents the amount of radial shifting of the dog that can be
produced by the turning of the eccentrics, whereas the area between the line F and the end face
12 of the dog indicates the amount of take up
due to the displacement of the axis Z from the axis
Y of the pin. As wear takes place, the eccentrics turn through a progressively larger angle
to force the locking dog against the nose of the
opposing coupler. At the same time, the point of
contact between the dog and the nose of the
coupler follows the progressively higher points on the cam face of the dog. Fig. 12 illustrates the
condition which exists after extreme wear has occurred. In other words, the dog has swung so
far to the left that the face 8 will still make contact with the cam face 12 at the end of the radius
D which is at right angles to the face 8, provided that the face 8 has receded a distance substan-
tially equal to the greatest width between the
lines E and F in Fig. 11. All three axes, X, Y and Z, are now in the plane represented by the
line B, namely a plane parallel with the longitudinal axis of the coupler. But, because the
axis of the hinge pin lies between the other two
axes, there is no substantial variation in the
direction of the pressure on the locking pin and,
consequently, there is no danger that the pressure
on the locking dog will force it into a release po-
sition even after there has occurred such wear as
it will take a score of years to produce.

While I have illustrated and described with particularity only a single preferred form of my
invention, I do not desire to be limited to the ex-
act structural details thus illustrated and de-
scribed; but intend to cover all forms and ar-
rangements which come within the definitions of
my invention constituting the appended claims.

I claim:

1. In combination, the head of a car coupler
of the tight-lock type, bearing members mounted
in one side of the head for rotation about a ver-
tical axis, a locking dog, and a vertical hinge
dog in said bearing members with its axis eccentric to the aforesaid axis,
the end face of the locking dog at the free end
of the dog being in the form of a section of a
cylinder whose axis is vertical and is eccentric to both of the aforesaid axes.

2. In combination, the head of a car coupler
of the tight-lock type, bearing members mounted in one side of the head for rotation about a ver-
tical axis, a locking dog, a hinge pin for the dog
journalled in said bearing members with its axis vertical, and the end face of the dog at the free
end of the latter being in the form of a section of a cylinder whose axis is vertical, the said axes
being spaced apart from each other.

3. In combination, the head of a car coupler
of the tight-lock type, bearing members mounted in one side of the head for rotation about a ver-
tical axis, a locking dog, a hinge pin for the dog
journalled in said bearing members with its axis vertical, and the end face of the dog at the free
end of the latter being in the form of a section of a cylinder whose axis is vertical, the axis of
the hinge pin being positioned between and spaced apart from the other two axes.

4. In combination, a car coupler of the tight-lock type, bearing members mounted in one side of the head for rotation about a ver-
tical axis, a locking dog, a hinge pin for the dog
journalled in said bearing members with its axis vertical, and the end face of the dog at the free
end of the latter being in the form of a section of a cylinder whose axis is vertical, the axis of
the hinge pin lying rearwardly from the axis of the bearing members and the axis of said cylin-
drical surface lying rearwardly from the axis of the hinge pin.

5. In combination, the head of a car coupler
of the tight-lock type, bearing members mounted
in one side of the head for rotation about a ver-
tical axis, a locking dog, a hinge pin for the dog
journalled in said bearing members with its axis vertical, and the end face of the dog at the free
end of the latter being in the form of a section of a cylinder whose axis is vertical, the axis of
the hinge pin lying nearer the longitudinal axis of the coupler than the axis of said end face
of the dog and closer to said axis of the bearing member when the dog in an unworn coupler is in
locking position, and the axis of the hinge pin
being in rear of the axis of the bearing members
and in front of the other axis.

7. In combination, a hollow coupler head, a
locking dog mounted in the head for movements
between a locking position and a release pos-
tion, means tending constantly to hold the dog
in its locking position, a pawl for latching the
dog in its release position, and means to render
the pawl inoperative except when the coupler is
in coupled relation to a companion coupler.

8. In combination, a hollow car coupler head, a
horizontally-swinging locking dog mounted in
the front end and at one side of the head for
movements between a locking position and a re-
lease position, a spring tending to hold the
dog in its locking position, a pawl to hold the
dog in its release position, and means adapted to
be controlled by a cooperating coupler to render the pawl inoperative except while the coupler is in coupled relation to another coupler.

9. In combination, a hollow coupler head, a locking dog mounted in the head for movements between a locking position and a release position, means tending constantly to hold said dog in its locking position, a spring-pressed pawl tending constantly to move into position to latch the dog in its release position, a device to hold said pawl in an inoperative position; and means adapted to be engaged by a companion coupler to move said device into a position that leaves the pawl free while a coupled relation is maintained between two couplers.

10. In combination, a hollow coupler head, a locking dog mounted in the head for movements between a locking position and a release position, means tending constantly to hold said dog in its locking position, a spring-pressed pawl tending constantly to move into position to latch the dog in its release position, a device to hold said pawl in an inoperative position, and an element on said device projecting into the path of an oncoming coupler in the act of coupling to cause said device to be shifted by the oncoming coupler into a position to leave the pawl free.

11. In combination, a hollow coupler head, a locking dog mounted in the head for movements between a locking position and a release position, means tending constantly to hold said dog in its locking position, a spring-pressed pawl tending constantly to move into position to latch the dog in its release position, a movable member adapted to engage said pawl, a spring strong enough to overcome the spring for the pawl acting on and tending constantly to move said movable member in a direction to shift the pawl into its inoperative position, and means on said movable member adapted to be engaged by a companion coupler to move said movable member into a position that leaves the pawl free while a coupled relation is maintained between two couplers.

12. In combination, the head of a car coupler of the tight-lock type, bearing members mounted in one side of the head for rotation about a vertical axis, a locking dog, a vertical hinge pin for the dog journaled in said bearing members with its axis eccentric to the aforesaid axis, said locking dog having a wide notch in the side, an arm fixed to said bearing members and narrower than said notch extending into the latter, a spring connected to said arm to turn said bearing members and said dog in one direction, and an actuator connected to said arm to turn the bearing members and the dog in the opposite direction.

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