

April 15, 1969

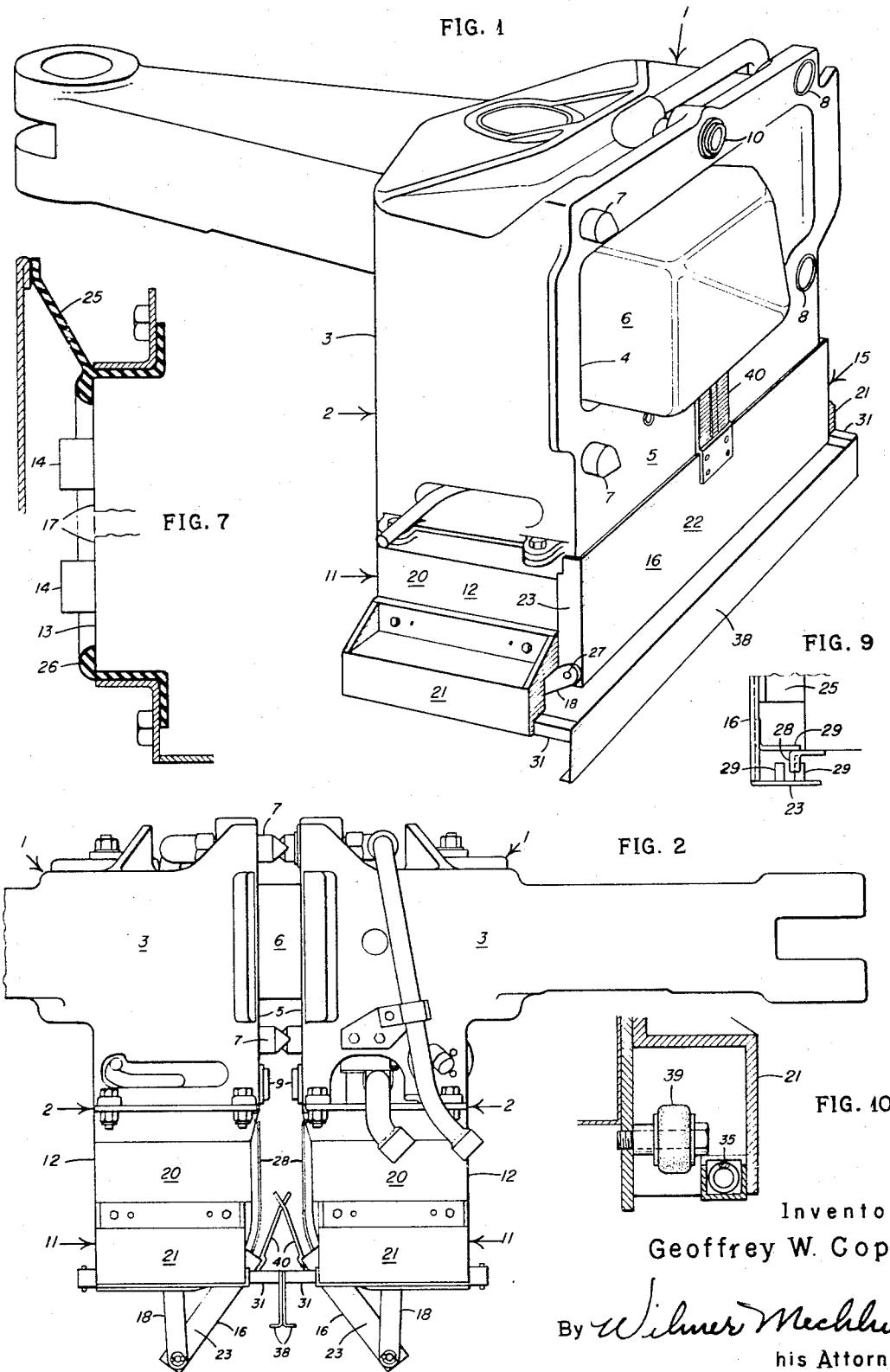
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3,438,511

ELECTRIC COUPLER COVER ASSEMBLY

Filed Sept. 6, 1967

Sheet 1 of 3



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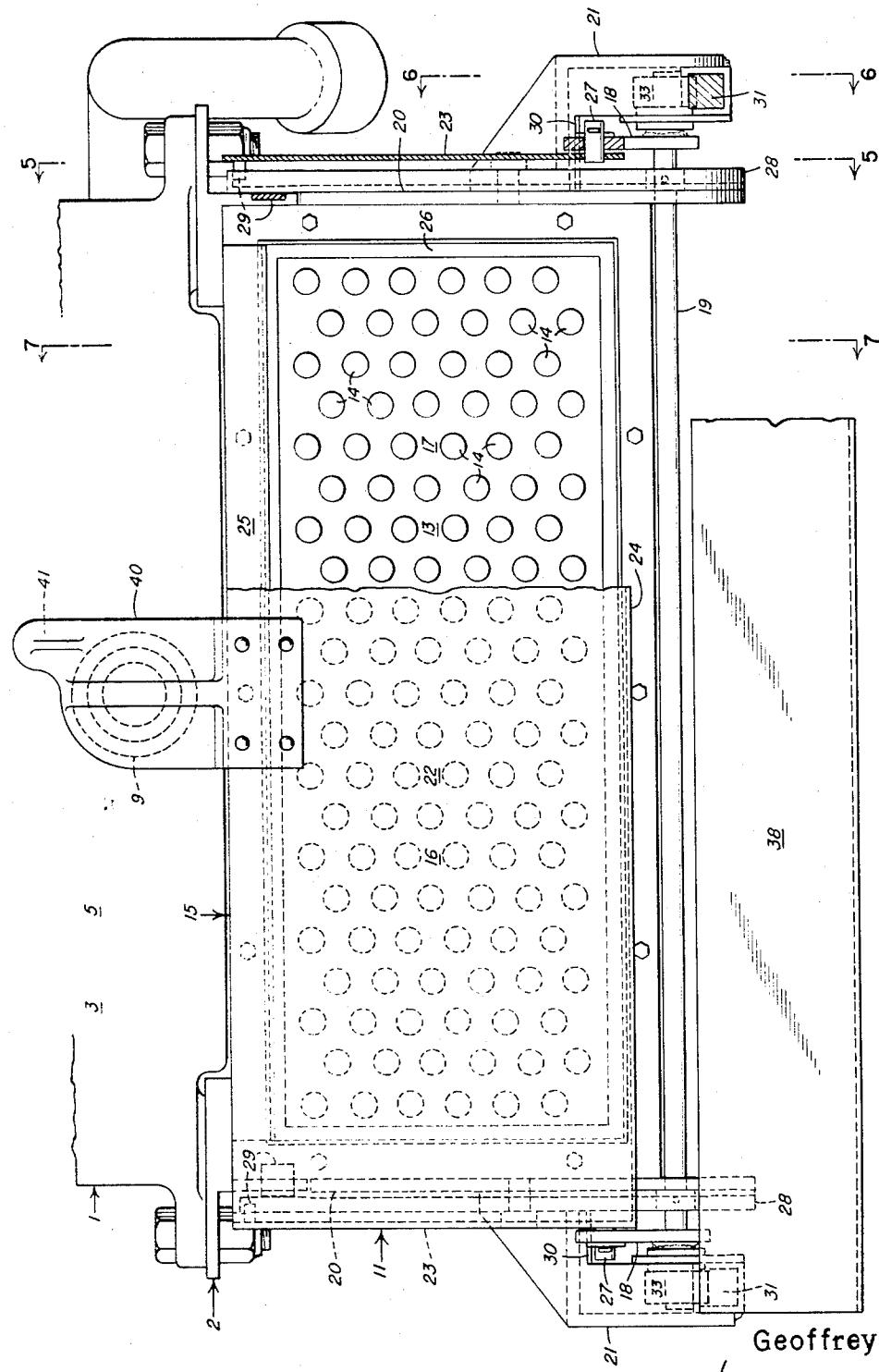


FIG. 3

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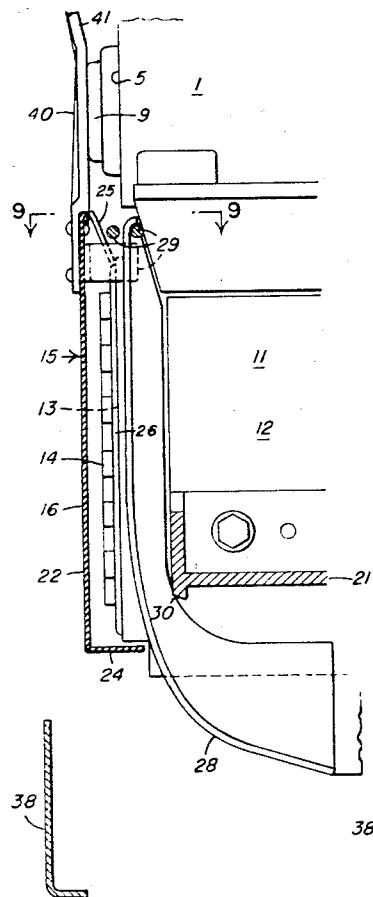


FIG. 5

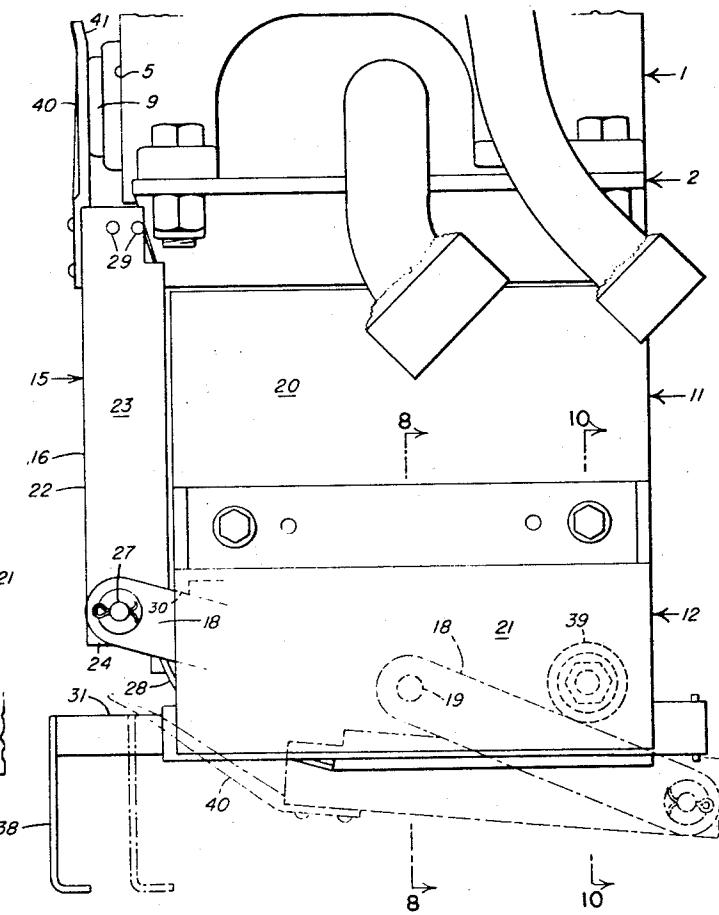


FIG. 4

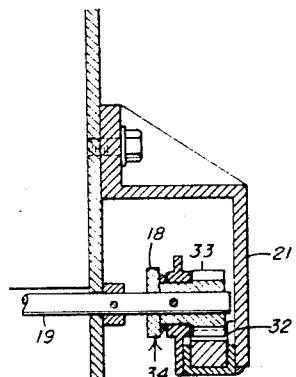


FIG. 8

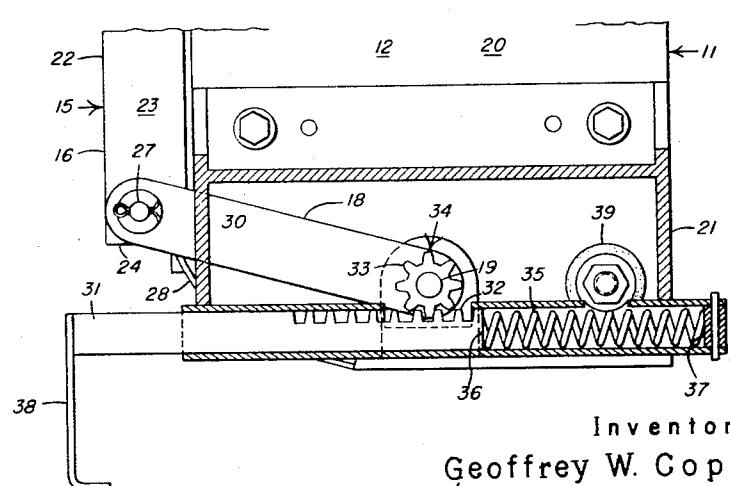


FIG. 6

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14 Claims

ABSTRACT OF THE DISCLOSURE

An automatic hook type mechanical coupler mounting on its head air and electric couplers, the electric coupler in a housing on the bottom of the head, and a cover mounted on the housing and normally covering the contacts of the electric coupler and an adjoining air coupler. The cover is supported at the bottom on lever arms by which it is swung between open and closed positions and guided at the top during swinging by tracks on the sides of the housing. Pushers acting against return springs and on the lever arms through rack-and-pinion drives, engage pushers of a mating coupler at the start of a coupling operation for swinging the cover out of the way to open position.

Background of the invention

In subway couplers it is common practice to mount one or more electric couplers on a mechanical coupler, each in a housing, and provide each housing with a cover normally spring-held in closed position covering the coupler's contacts. Such a cover is pivotally mounted on the housing and swung automatically to open position in a coupling operation to expose the electric contacts, one type by specially contouring its front face to produce a lateral force on striking a corresponding face of the cover of the mating coupler and another type by a lever arrangement actuated by depression of an associated plunger on striking a confronting surface of the mating coupler. It is with improving covers of the second type that the present invention is particularly concerned.

Summary of the invention

The primary object of the present invention is to provide an improved electric coupler cover assembly which not only is automatic in opening and closing its cover but ensures opening of the cover to expose the electric contacts regardless of the conditions under which a coupling operation is performed. The cover of the assembly is swung between open and closed positions by levers pivotally connected to its sides adjacent its bottom and in swinging is guided at the bottom by the levers and at the top by guide lugs engaging guide tracks on the sides of the housing.

The levers are plunger-actuated through gears for opening and closing the cover, the preferred assembly having a pair of plungers projecting forwardly from opposite sides of the housing and carrying a striker extending substantially the full width of the housing, which, with a corresponding striker on the mating coupler, assures against failure of either cover to open in time due to non-contact or passing of the plungers, even when the associated mechanical couplers have extended gathering ranges and are very substantially misaligned laterally or vertically at the start of the coupling operation. Also, in the preferred assembly, each plunger is drivably connected by its own gear train to a cross-shaft to which the levers are fixed to assure positive opening of the cover in a coupling operation in which there is an angled approach and the first contact is made by one or the other end of the striker plate. While the plungers are connected by the striker, as

well as through the cross-shaft, each has its own return spring, either of which will provide the force necessary for closing the cover in an uncoupling operation.

In addition to the contacts of the electric coupler, the cover of the preferred assembly is adapted to cover an adjoining air coupler, without extending the range of movement of the plungers, by mounting a flexible flap which projects beyond its end adjoining the air coupler.

The foregoing and other objects and advantages of the invention will appear hereinafter in the detailed description, be particularly pointed out in the appended claims and be illustrated in the accompanying drawings, in which:

Figure description

15 FIGURE 1 is a perspective view of a combined mechanical, air and electric coupler, the electric coupler of which incorporates a preferred embodiment of the cover assembly of the present invention;

20 FIGURE 2 is a fragmentary side elevational view of a pair of the combined couplers of FIGURE 1 at an intermediate stage in a coupling operation;

25 FIGURE 3 is a fragmentary front elevational view on an enlarged scale of the combined coupler of FIGURE 1, mainly showing the electric coupler and with portions broken away and shown in section to more clearly illustrate certain of the details of construction;

FIGURE 4 is a side elevational view of the structure of FIGURE 3;

30 FIGURE 5 is a fragmentary vertical sectional view taken along the lines 5—5 of FIGURE 3;

FIGURE 6 is a fragmentary vertical sectional view taken along lines 6—6 of FIGURE 3;

35 FIGURE 7 is a fragmentary vertical sectional view taken along line 7—7 of FIGURE 3;

FIGURE 8 is a fragmentary vertical sectional view taken along lines 8—8 of FIGURE 4;

40 FIGURE 9 is a fragmentary horizontal sectional view taken along lines 9—9 of FIGURE 5; and

FIGURE 10 is a fragmentary vertical sectional view taken along lines 10—10 of FIGURE 4.

Detailed description

Referring now in detail to the drawings in which like reference characters designate like parts, the improved electric coupler cover assembly of the present invention is particularly designed for application to an electric coupler which is adapted for mounting on or in a mechanical railway coupler for automatically coupling electric train lines incident to the mechanical coupling of two railway vehicles. For such coupling, the mechanical couplers should be of a type capable of coupling or locking against substantial relative movement to a mating coupler and, ordinarily, the mechanical coupler will also mount air couplers to form a combined mechanical, air and electric coupler for enabling both air and electric train lines to be coupled automatically as the vehicles are mechanically coupled. Such combined couplers are widely used on subway cars and usually have as their mechanical coupler an automatic hook type coupler. It thus is to a combined coupler having a mechanical coupler of that type that the improved assembly has been applied as exemplary of the invention.

As usual in automatic hook type couplers, the mechanical coupler 1 of the illustrated combined coupler 2 has a generally box-shaped head 3, through a central aperture 4 in a flat front face 5 of which projects a mechanical coupling member in the form of a laterally swingable hook 6 for engagement with a hook of a mating coupler. When coupled, the mechanical coupler 1 is held against substantial transverse movement relative to the mated coupler by the interfit of the aligning pins 7

on and sockets 8 in its front face 5 beyond the aperture 4 with mating elements on the other coupler. If, as illustrated, the combined coupler 2 includes air couplers, there usually will be two such couplers, one, 9 for the air brake line and the other, 10 for a line carrying air for other air-operated devices. The illustrated air couplers project forwardly from the face 5 of the mechanical coupler 1 and conveniently are centered laterally on that face with the brake line coupler 9 below and the other coupler 10 above the aperture 4.

The combined coupler 2 may have one or more electric couplers 11 for coupling the electric lines of the particular train consist and any such coupler may be mounted in or on a side or bottom of the head 3. Following not unusual practice, the combined coupler 2 has a single electric coupler 11 mounted in an open-fronted box or housing 12 which is bolted to and suspended from the bottom of the head 3. Conventionally, the electric coupler 11 has housed in and projecting forwardly from its box 12 an insulator block 13 mounting in laterally spaced relation a multiplicity of contact pins or other suitable electric contacts 14, each connected or connectable to an electric line (not shown) and contactable in a coupling operation with a corresponding or mating contact of the mating electric coupler. If, as illustrated, the electric contacts 14 are all contact pins, the contacts ordinarily will be spring-urged and longitudinally projectable forwardly somewhat beyond the front face 5 of the mechanical coupler 1 to ensure satisfactory electrical contact on coupling of the electric coupler with a mating coupler. Exposed when the coupler 11 is coupled, the electric contacts 14 otherwise should be covered to protect them from the elements and, if any are energized when uncoupled, also to protect a workman from injury by contact with them. The improved cover assembly 15 of the present invention automatically provides such exposure and coverage at the required times.

The cover assembly 15 is comprised of a cover 16 conveniently stampable from sheet stock and of a size to cover the otherwise open or exposed insulator block 13 and contacts 14 at the front end 17 of the electric coupler 11. The cover 16 is designed to be swung between open and closed positions and in opening to swing away from the front end 17 of the coupler 11 in the direction in which it will not be impeded by the front face 5 of the mechanical coupler 1. The improved cover assembly 15 can be applied to a side-mounted box and horizontally or vertically swingable covers of a pair of such boxes at opposite sides of the mechanical coupler can even have a common actuator. However, the assembly will usually be most advantageous when applied to an electric coupler mounted on the bottom or in the bottom portion of the head 3 of the mechanical coupler 1 and for that reason has been applied as the exemplary of the invention to the illustrated bottom-mounted box 12 for which the cover 16 swings vertically between open and closed positions and downwardly in opening.

Wherever the electric coupler 11 is mounted relative to the head 3 of the mechanical coupler 1, the cover 16 preferably will be mounted between or bracketed and supported and swung by a pair of parallel, laterally aligned and spaced lever or crank arms 18 mounted for swinging about the same fixed axis, conveniently on an operating shaft 19 to which both are fixed. In the illustrated embodiment the operating shaft 19 is a cross-shaft extending horizontally across the bottom of the box 12 and projecting or extending at each end beyond an adjoining side 20 of the box and into a housing or gear box 21 bolted or otherwise releasably attached to that side. According to preference, the shaft 19 may be suitably journaled either in the side housings 21 or, as illustrated, inwardly thereof in downward extensions of the box's sides 20.

The cover 16 has a front wall or body 22 of a size or area and shape to cover the otherwise open or exposed front end 17 of the coupler 11 and preferably is of a

length to overlap or extend beyond the box's opposite sides 20. With its front wall 22 generally rectangular, the illustrated cover 16 has at each end of that wall a side flange 23 instanding or inturned therefrom substantially parallel to the adjoining side 20 of the box. The illustrated cover is also flanged at the bottom by an inturned or instanding bottom flange 24 extending between and connecting the side flanges 23 and the side and bottom flanges longitudinally overlap the insulator block 13. While the cover may be flanged at top, as well, such flanging may be dispensed with, if, as illustrated, shielding in that direction is provided by engagement of the cover's front wall 22 with an outwardly and upwardly sloping top flange or flap 25 of a rubber or like gasket 26 mounted in the coupler's front end 17 and surround or encircling the insulator block 13. Outset from the insulator block and overlapped at sides and bottom by the cover's side and bottom flanges 23 and 24, the gasket 26 with those flanges protects the contacts 14 from direct exposure to the weather, while ensuring that any moisture reaching the inside of the cover will drain out at the bottom between the bottom flange and the insulator block.

The side flanges 23 on the cover 16 also serve as convenient mountings for pivotally connecting the lever arms 18 to the cover, suitably through pivot pins 27 fixed to and outstanding from the side flanges substantially normal thereto. Embraced or straddled by the lever arms or levers 18 and pivotally connected thereto at opposite sides adjacent its bottom, the cover 16 is adapted to be both swung and guided at the bottom in its swing by those arms. Guidance of the cover at the top during swinging is provided by guides or guide tracks 28 fixed to and outstanding laterally from the sides 20 of the box and engaged, preferably at both front and back and also inboard or inwardly, by guide means on the top portion of the cover, which for each track conveniently may be guides 29 spaced laterally of the cover and laterally straddling or bracketing the track, with the inboard and outboard guides respectively a guide lug instanding from the front wall 22 and a pair of guide pins fixed to instanding from the adjoining side flange 23 and spaced from each other and straddling or interfitting with the track in a direction normal to the front wall. Guiding the cover in its swing, the lever arms 18 and the guide tracks 28 and cooperating guides 29 also hold the cover in its closed position. For fixing that position, it is preferred to provide a positive limit or stop against over-swinging of the cover in an upward or closing direction, the stop in the illustrated cover assembly 15 taking the form of integral downstanding abutments or shoulders 30 on the side housings 21 forwardly of the cross-shaft 19 and overlying and engaged by the lever arms 18 in the latter's closed position.

For driving or swinging the lever arms 18 and therethrough swinging the cover 16 between open and closed positions, the cover assembly 15 includes a pair of plungers, pushers or push rods 31 at opposite sides of the box 12 and projecting or extending horizontally and longitudinally of the box, forwardly of or beyond the coupler's front end 17. Each plunger 31 is slidably mounted for relative longitudinal movement, reciprocation, telescoping or projection and retracting and against relative rotation in one of the side housings 21, preferably below the end portion of the operating shaft 19 therein. Carried by and forming part of each plunger and extending longitudinally thereof is rack 32 meshing with a pinion 33 fixed either directly to the adjoining lever arm 18 or, as illustrated, to the adjoining end portion of the operating shaft 19 mounting and preferably fixed to both lever arms. Each rack 32 with the associated pinion 33 forms a rack-and-pinion drive or driving connection 34 between the plunger and the shaft and, through the latter, the adjoining of the or both lever arms 18. A return spring 35 for each plunger is mounted in the related side housing

21 rearwardly of the related rack 32 and pinion 33 and acts between a rearwardly facing abutment or shoulder 37 in the rear of the housing, to provide a spring or yieldable force for swinging the cover 16 to closed position, once it is free to return thereto, and also normally to hold the cover in that position.

To produce a force opposing that of the return springs 35 for opening the cover 16 in a coupling operation, the plungers 31 carry on and have fixed to their front ends a striker, actuator or striking, push or contact plate or member 38 which is positioned below and extends laterally and preferably substantially the full width of the box 12 parallel to the coupler's front end 17, and is adapted in a coupling operation to strike, contact or engage and be pushed back or retracted by a like member or part of a mating coupler. Disposed forwardly of the cover 16 and in the main vertically, the striker 38 is of a width or depth and length or lateral extent to accommodate any vertical or lateral misalignment of its own and a mating mechanical coupler 1 within the coupler's gathering ranges at the outset of a coupling operation. The gear driving connection 34 between each plunger 31 and the common operating shaft 19, by applying any buffing or coupling force to both ends of the shaft, ensures that the driving mechanism of the cover assembly will not be jammed by an angled approach in a coupling operation in which one or the other end of the striker first strikes or contacts the striker of the mating coupler.

While the swing of the cover 16 to close position under the force of the return springs 35 ordinarily will require no cushioning, the usually greater opening force applied through the striker 38 makes it desirable to cushion the swing to open position. This is readily accomplishable by bolting or otherwise mounting in each side housing 21, rearwardly of the cross-shaft 19 and in position to be engaged by the adjoining lever arm 18 at substantially the limit of the arm's opening swing, a shock absorbing stop or bumper 39, suitably in the form of a block of low resilience elastomeric material, such as butyl rubber.

It remains only to ensure that the cover will be opened and out of the way in the brief interval between the first contact of the strikers 38 of mating couplers and the surface contact of the front faces 5 of the mechanical couplers signaling the completion of the mechanical coupling. Guided by the lever arms 18 and interfit of the guide lugs and pins 28 with the tracks 29 and swinging inside the striker 38 and between the plungers 31, the cover 16 is permitted only slight forward and even less lateral movement relative to the box 12 in its guided swing and the extent of longitudinal movement of plungers 31 for swinging the cover between open and closed positions is fixed or predetermined by the gear ratio of the drives 34. Thus, full opening of the covers of a pair of mating couplers in a coupling operating, without interference between them is, merely a matter of fixing the initial or normal projection or spacing of each striker 38 beyond the front end of its box, a projection permitting as little as 1½ inches of rearward movement of the plungers in a coupling operating usually being quite adequate.

For automatically opening in a coupling operation and closing in an uncoupling operation, the air couplers 9 and 10 must be fitted with suitable automatic valving (not shown). However, since the proper action of the air brakes is absolutely vital to the operation of the train and forcing matter entering the brake line coupler 9 during a period in which it is uncoupled could clog its valving against automatic operation, it is desirable to shield that coupler against such entry. The desired shielding, the cover assembly 15 provides by having mounted on the top portion of the cover 16 in position to cover the brake line coupler 9 when the coupler is closed, a cover flap 40. Upstanding from the cover, the flap 40, if rigid, would require a corresponding increase in the forward projection of the striker 38, but the need for this

is eliminated by making the flap of an elastomeric material, such as neoprene, that will be flexible or resilient and low-setting over the range of temperatures to which it will be subjected in service, so as both to hold the flap tight against the air coupler in closed position and enable it to bend, flex or yield to the required extent when contacted by the flap of the mating coupler. An upstanding and outsloping or beveled guide finger 41 on the upper end and offset to one side of the main part of the flap enables the flap, in the cover's open position, to be supported at the front on the upper edge of the striker 38 without interfering with like support of the flap on the cover of the mated coupler. The outslope of the finger 41 also enables it to guide the flap in closing over any then projecting contacts 14 of the electric coupler 11.

Constructed in the above manner, the improved cover assembly 15 not only has a cover that opens and closes automatically, respectively on coupling and uncoupling, but absolutely assures against failure of the cover to open in a coupling operation due to by-passing of actuators or jamming of drive mechanism, regardless of the conditions under which a coupling operation is conducted. It should be understood that the described and disclosed embodiment is merely exemplary of the invention and that all modifications are intended to be that do not depart from the spirit of the invention.

Having now described my invention, I claim:

1. A cover assembly for an electric coupler mounted in a housing on a mechanical railway coupler, comprising a cover normally closing a front end of the electric coupler, lever means pivotally connected to the housing and said cover for swinging said cover between open and closed positions, plunger means projectable and retractable relative to said front end and normally projected forwardly thereof for engagement with and retraction by means on a mating electric coupler in a coupling operation, and gear means drivably connecting said plunger and lever means for swinging said cover to open and closed positions respectively on retraction and projection of said plunger means.

2. A cover assembly according to claim 1, including guide means on said cover and spaced in the direction of swinging thereof from the pivotal connection thereto of the lever means, and guide means on said housing and engaged by said cover guide means, said cover and housing guide means cooperating with the lever means for guiding the cover relative to the housing on swinging thereof between open and closed positions and normally holding the cover in closed position under a projecting force applied to the plunger means.

3. A cover assembly according to claim 2, wherein the plunger means are a pair of horizontally spaced plungers at least one of which is drivably connected by the gear means to the lever means, and including a striker extending horizontally between and fixed to front ends of said plungers and presenting a vertically disposed front face for engagement in a coupling operation with a striker of a mating coupler.

4. A cover assembly according to claim 2, wherein the housing is mounted below a mechanical coupling element of the mechanical coupler, the lever means are a pair of levers pivotally connected to the bottom portion of the cover at opposite sides thereof, and the plunger means are a pair of plungers mounted on opposite sides of the housing, and including a striker carried by and extending horizontally between the plungers and presenting a substantially vertical front face for engagement by a striker of the mating electric coupler.

5. A cover assembly according to claim 4, including a cross-shaft rotatably mounted on the housing, and wherein the lever means are fixed to said cross-shaft, and the gear means are a pair of gear trains each drivably connecting one of the plungers to an adjoining end portion of the cross-shaft.

6. A cover assembly according to claim 5, wherein each plunger is retractable against and normally projected by a return spring.

7. A cover assembly according to claim 6, wherein each gear train includes a rack on one of the plungers, and a pinion fixed to an adjoining end portion of the cross-shaft.

8. A cover assembly according to claim 7, wherein the housing is a box removably mounted on a bottom of a head of the mechanical coupler.

9. A cover assembly according to claim 8, wherein a front face of the mechanical coupler below the mechanical coupling element thereof and above the front end of the box is interrupted by a brake line air coupler, and the assembly includes a flap fixed to and projecting above the cover and covering said air coupler in the cover's closed position.

10. A cover assembly according to claim 9, wherein the flap is resilient for yielding in a coupling operation on contact with a flap of a mating coupler.

11. A cover assembly according to claim 8, wherein the housing guide means are guide tracks fixed to opposite sides of the housing, and the cover guide means are for each track guides fixed to the cover and straddling said track both laterally of and normal to the cover.

12. A cover assembly according to claim 8, including stop means mounted on the housing and engageable by the levers for fixing the closed position of the cover.

13. A cover assembly according to claim 12, including shock absorbing stop mounted on the housing and engageable by the levers at substantially the limit of the swing thereof to open position for cushioning opening of said cover.

14. A cover assembly according to claim 3, wherein the cover in swinging between open and closed positions swings inside the striker and between the plungers.

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DRAYTON E. HOFFMAN, Primary Examiner.

U.S. Cl. X.R.

213—76