

Wind safety device for cranes

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Specification

G000002

- The invention concerns a wind safety device for at least two outdoor cranes, able to move by traveling gears on a jointly shared crane track, with holding
- 10 devices engaging at or in the region of the crane track to prevent the cranes from lifting up and being pulled away when certain wind speeds are exceeded. It should be possible to join together at least two neighboring cranes in the region of the traveling gears.
- 15 According to current rules and regulations (e.g., DIN 15 019, Part 1), cranes working outdoors must be taken out of operation after a certain wind speed and be secured against being lifted up and pulled away from the crane track by the wind. The wind speed for halting operation depends on the model of crane.
- Diverse holding devices for cranes are known; for the most part, use is made of
- 20 track pinch bars (for example, see DD 285 747). Drag shoes, mechanical locking systems, and track brakes are also used. When using track brakes, the braking capacity to be installed is determined according to the rolling resistance of the track traveling gear, the effective wind attack surface for the crane, its form factors, and the dynamic pressure. The form factors and dynamic pressure

are found by using a reference wind speed according to the location of the crane. The installed braking capacity can also be minimized by having an engine brake. Mathematical verification of crane tip-over safety is also done by using the above data and values.

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Moreover, a crane connection for at least two tall cranes in harbor facilities is already known from German patent application DE 199 13 980 A1. This crane connection comprises at least one coupling piece on each crane, by which the cranes can be joined together to achieve a high stability against tipping over
10 when the wind is blowing. This type of crane connection is supposed to have the advantage of saving on center ballast and bracing cables on the cranes. The cranes in this case are full gantry cranes, which can travel on rails by traveling gears. The coupling pieces are designed as bolt connections with corresponding shackles arranged on the cranes. Preferably, the coupling pieces
15 can be automatically joined to each other. The coupling pieces are to be installed at the bottom, in the region of the traveling gears on the gantry, and/or at the top of the crane.

The problem of the present invention is to improve a wind safety device for
20 cranes, especially full gantry cranes with tracks and brakes, so that a greater safety against being lifted up and pulled away by the wind is achieved for a crane that is taken out of operation on account of high wind speed.

The problem is solved by a wind safety device for at least two outdoor cranes which can travel on a jointly shared track by means of traveling gears, especially track-mounted full gantry cranes, with the features of claim 1.

Advantageous embodiments of the invention are indicated in the subsidiary
5 claims.

According to the invention, in a wind safety device for at least two outdoor cranes, able to move by traveling gears on a jointly shared crane track, especially track-mounted full gantry cranes, with holding devices engaging at or
10 in the region of the crane track to prevent the cranes from lifting up and being pulled away when certain wind speeds are exceeded, and it being possible to join together at least two neighboring cranes in the region of the traveling gears, an improved wind safety is achieved in that impact elements are arranged above the coupling on the at least two neighboring cranes, lying against each
15 other, when the at least two neighboring cranes are coupled together.

Thanks to the coupling of two neighboring cranes, the installed braking capacity of these two or possibly additional coupled cranes is available to protect against the crane being pulled away by the wind in the switched-off operating condition.
20 The same is true of the lifting up of the cranes by wind force, which is opposed by twice the weight of the cranes coupled together.

In addition to the mechanical coupling of the neighboring cranes in the region of the traveling gears, the invention provides that the cranes coupled together rest

against each other by impact elements above the coupling. Due to this combination of upper impact elements, which are provided solely to transmit pressure forces, and the lower mechanical coupling, one achieves an optimal protection of the cranes against wind, since the wind forces attacking the cranes are diverted by the impact elements into both cranes, especially into their gantries, and thus are absorbed and withstood by the traveling gears of both cranes. It is also important that the simultaneous mechanical locking in the region of the traveling gears prevents the cranes from being pushed apart in the region of the traveling gears. Furthermore, it is not necessary to provide for a locking and unlocking of the impact elements, which facilitates their handling.

Optimal wind protection, especially an optimal diverting of the wind forces into the traveling gears, is achieved in that the impact elements are arranged in the upper region of each crane, or in the case of full gantry cranes preferably in the region of the upper bridge trusses.

It is especially advantageous in terms of design to have the impact elements in the form of bumpers with end faces that rest against each other to absorb and divert the pressure forces when the at least two neighboring cranes are coupled together.

Especially favorable conditions result, according to one feature of the invention, when the crane directly exposed to the wind in the secured parking position at least partly covers the one or more cranes coupled to it. Thus, when the

arrangement of the cranes relative to each other in the parked position on the common crane track is chosen such that at least one crane or large regions of one or more other cranes are in the lee of the crane first exposed to the wind, this reduces the effective wind attack surface, which is part of the calculation of the braking capacity to be installed, so that the actual performance of the track brakes of the respective cranes is improved.

According to the invention, track brakes or another familiar accessory such as drag shoes, mechanical locking systems, track pinch bars or the like are used as holding devices, as have been used heretofore for securing of individual cranes on the crane track or on the rails.

According to another feature of the invention, it is proposed that a coupling link be provided for the coupling of the at least two cranes driven directly next to each other, and preferably impinging on each other, with which the neighboring cranes can be interlocked. In event of an impending storm or wind speeds preventing the crane from operating, at least two of the neighboring cranes traveling on the common crane track are driven so close to each other or impinging on each other that both cranes can be interlocked with a coupling link. Once the storm danger is past, this coupling link can be easily removed again, but it joins together the two cranes or possibly several neighboring cranes with additional coupling links as a wind safety device. The cranes will then also make contact in the region of the impact elements.

In one favorable embodiment of the invention, each coupling link joins together two coupling pieces, which are fastened to each crane in the region of the traveling gear in order to absorb tensile and compressive forces acting between the neighboring cranes. The coupling by tensile and compressive connection is
5 thus favorably provided near the ground, where an especially effective coupling of the cranes is achieved in the region of the traveling gear. Furthermore, the coupling pieces are identical in configuration, so that fabrication is simplified and the coupling of the cranes is facilitated, as the coupling pieces always fit together.

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Preferably, each coupling piece is fastened to the traveling gear of each crane basically sticking out horizontally and parallel to the crane track, so that the opposite free ends of the two coupling pieces can be interlocked in removable
manner.

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These coupling pieces can even form the outer ends of the cranes, which makes sense when, according to another feature of the invention, the coupling link embraces appropriately configured bearing surfaces fashioned on the coupling pieces and thereby locks the coupling pieces butting against each
20 other.

In a very simple embodiment, the coupling link has a double T-shape, while the web can be inserted in recesses in the opposite end faces of the coupling pieces so that the inner sides of the flanges of the coupling link engage with

corresponding bearing surfaces on the wall-shaped coupling pieces. Coupling links of such configuration can be very easily manipulated, they are easy to install and just as easy to remove once again.

- 5 A sample embodiment of the invention is depicted in the drawing and shall be described hereafter. It shows:

Fig. 1, a perspective view of two full gantry cranes coupled together according to the invention,

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Fig. 2, a magnified detail view of Fig. 1, from the region of the coupled traveling gears of the gantry cranes, and

Fig. 3, a magnified detail view of Fig. 1 from the region of the abutting gantry
15 stanchions of the cranes.

Figure 1 shows a perspective view of two cranes 2a and 2b, configured as full gantry cranes and coupled together in a parked position for wind safety, being able to run on a commonly shared crane track 1. Each of the two cranes 2a, 2b
20 is built conventionally and consists essentially of the four vertical gantry stanchions 3a, 3b, whose top ends are joined by bridge trusses 9a, 9b running transversely to the direction of travel F of the cranes 2a, 2b to form the gantry. On each of the bridge trusses 9a, 9b, a trolley 12a, 12b with the hoisting mechanisms arranged on it can travel along the bridge trusses 9a, 9b. The

lower ends of the gantry stanchions 3a, 3b thrust against a traveling gear 6, which runs on rails 1a, 1b of a crane track 1. The rails 1a, 1b run parallel to and at a distance from each other.

5 Furthermore, the traveling gears 6 each have several wheels 13 which can run on the rails 1a, 1b, being arranged in succession in the direction of travel F for each traveling gear 6. The lower end of the respective vertical gantry stanchions 3a, 3b thrusts against the traveling gear 6 roughly in the middle, so that the traveling gear 6 looking in the direction of travel F projects in front of or behind
10 the gantry stanchions 3a, 3b and thus they form a front end 14v and a rear end 14h in relation to the particular crane 2a, 2b.

Figure 1 also shows the parked position of the two cranes 2a, 2b, having taken up this position when the operation of the cranes 2a, 2b had to be halted for
15 safety reasons, due to high wind speeds. In the parked position, the cranes 2a and 2b have come up so close to each other, looking in the direction of travel F, that the two cranes 2a and 2b lie against each other in the region of their traveling gears 6 by their respective front and rear ends 14v, 14h. The traveling gears 6 and thus the cranes 2a, 2b butting against each other on each rail 1a,
20 1b are additionally joined together mechanically in the region of their front and rear ends 14v, 14h by means of a coupling link 4, which shall be described more closely hereafter in connection with Figure 2.

In addition, the opposite gantry stanchions 3a, 3b lie against each other in the parked position in the region of their top ends adjacent to the bridge trusses 9a, 9b. Since, as described above, the traveling gears 6 project to the front and rear relative to the gantry stanchions 3a, 3b, looking in the direction of travel F, when
 5 the front and rear ends 14v, 14h are formed, bumper-like impact elements 10a, 10b are provided on the gantry stanchions 3a, 3b. In the parked position, the free ends of the respective impact elements 10a, 10b touch, but they are not interlocked. The impact elements 10a, 10b are simply configured as pipe segments, extending sideways, horizontally and in the direction of travel F from
 10 the gantry stanchions 3a, 3b, and their free end is closed off to form an end face 11 (see Fig. 3).

Besides the mechanical connection of the traveling gears 6 by the coupling link 4 in the parked position, the holding mechanisms of the two cranes are brought
 15 into play at the same time, say, by activating the track brakes (not shown) of each crane 2a, 2b.

Figure 2 shows an enlarged detail view of feature X of Fig. 1, showing the region of the coupled together traveling gears 6 of the cranes 2a, 2b in their
 20 parked position. For this, a coupling piece 5a or a coupling piece 5b is firmly arranged on each traveling gear 6, forming either the front or the rear end 14v, 14h of the respective crane 2a, 2b. The coupling pieces 5a, 5b are each configured as U-shaped steel sections, which project in parallel to the crane track 1 in the direction of the neighboring crane 2a or 2b above the wheels 13 of

the traveling gear 6. To form a bearing surface, the facing ends 14v, 14h of the U-shaped coupling pieces 5a, 5b are each closed off with an end wall 7a, 7b. In the parked position of the cranes 2a, 2b, as depicted, the projecting ends 14v, 14h of the coupling pieces 5a, 5b essentially lie against each other with their
5 end walls 7a, 7b, so that compressive forces acting between the cranes 2a and 2b can be transmitted across the coupling pieces 5a, 5b between the cranes 2a and 2b.

In order to be able to transmit tensile forces as well between the cranes 2a and
10 2b at the same time, besides the coupling pieces 5a and 5b lying against each other there is also provided a coupling link 4, which clamps together the coupling pieces 5a and 5b and holds them against each other. The coupling link 4 – as can be recognized from Fig. 2 – is formed as a double T from a steel plate and is inserted by its web 4a into a corresponding recess in the two
15 coupling pieces 5a and 5b. This upward open recess is provided in an end wall 7a, 7b closing off the particular coupling piece 5a, 5b, forming at the same time a bearing surface 8a, 8b at the side away from the bearing surface for the inner sides of the flanges of the double T-shaped coupling link 4 when these flanges engage with the end walls 7a and 7b of the coupling pieces 4. In this way, the
20 two cranes 2a and 2b are interlocked with each other and thereby provide a definitely greater safety against wind and storm than conventional devices for individually secured cranes.

Especially favorable conditions occur when the second crane 2b stands essentially in the lee of the first crane 2a, which is the case when the wind is blowing from a direction W parallel to the direction of travel F. Lower wind forces then act on the second crane 2b, so that this can take over a portion of the braking performance required for the directly exposed crane 2a, thanks to
5 the coupling with the first crane 2a.

Figure 3 shows an enlarged detail view of feature Y of Fig. 1, concerning the region of the impact elements 10a, 10b of the cranes 2a, 2b, lying against each other in the parked position. These are provided to protect the cranes 2a, 2b
10 from tipping over under high wind speeds. The free ends of the impact elements 10a, 10b lie against each other with their facing end walls 11 as soon as the coupling pieces 5a and 5b of the traveling gears 6 also abut with their end faces. In this way, the cranes 2a, 2b also thrust against each other in the top
15 region and thereby substantially increase the restoring moment of the cranes 2a, 2b under wind and storm. The free ends of the impact elements 10a, 10b are not interlocked with each other.

List of reference numbers

	1	Crane track
	1a	Rail
5	1b	Rail
	2a	First crane
	2b	Second crane
	3a	Gantry stanchion
	3b	Gantry stanchion
10	4	Coupling link
	4a	Web
	5a	Coupling piece
	5b	Coupling piece
	6	Traveling gear
15	7a	End wall
	7b	End wall
	8a	Bearing surface
	8b	Bearing surface
	9a	Bridge truss
20	9b	Bridge truss
	10a	Impact element
	10b	Impact element
	11	End face
	12a	Trolley

- 12b Trolley
- 13 Wheels
- 14v Front end
- 14h Rear end

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- F Direction of travel
- W Wind direction
- X Enlarged cutout
- Y Enlarged cutout

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Claims

1. Wind safety device for at least two outdoor cranes (2a, 2b), able to move by traveling gears (6) on a jointly shared crane track (1), especially track-mounted full gantry cranes, with holding devices engaging at or in the region of the crane track (1) to prevent the cranes (2a, 2b) from lifting up and being pulled away when certain wind speeds are exceeded, and it being possible to join together at least two neighboring cranes (2a, 2b) in the region of the traveling gears (6), characterized in that impact elements (10a, 10b) are arranged above the coupling on the at least two neighboring cranes (2a, 2b), lying against each other when the at least two neighboring cranes (2a, 2b) are coupled together.
2. Wind safety device per claim 1, characterized in that the impact elements (10a, 10b) are arranged in the upper region of each crane (2a, 2b), or in the case of full gantry cranes preferably in the region of the upper bridge trusses (9a, 9b).
3. Wind safety device per claim 1 or 2, characterized in that the impact elements (10a, 10b) are in the form of bumpers with end faces that rest against each other to absorb the pressure forces when the at least two neighboring cranes (2a, 2b) are coupled together.

4. Wind safety device per one of claims 1 to 3, characterized in that the crane (2a) directly exposed to the wind in the parking position at least partly covers the one or more cranes (2b) coupled to it.
- 5 5. Wind safety device per one of claims 1 to 4, characterized in that track brakes or other accessories such as drag shoes, mechanical locking systems, track pinch bars are used as the holding devices.
6. Wind safety device per one of claims 1 to 5, characterized in that a coupling
10 link (4) is provided for the coupling of the at least two cranes (2a, 2b) driven directly next to each other, and preferably impinging on each other, with which the neighboring cranes (2a, 2b) can be interlocked.
7. Wind safety device per claim 6, characterized in that each coupling link (4)
15 joins together two coupling pieces (5a, 5b), which are fastened to each crane (2a, 2b) in the region of the traveling gear (6) in order to absorb tensile and compressive forces acting between the neighboring cranes (2a, 2b).
8. Wind safety device per claim 7, characterized in that each coupling piece (5a,
20 5b) is fastened to the traveling gear (6) of each crane (2a and 2b) basically sticking out horizontally and parallel to the crane track (1) and the opposite free ends of the two coupling pieces (5a, 5b) can be interlocked in removable manner by the coupling link (4).

9. Wind safety device per one of claims 6 to 8, characterized in that the coupling link (4) embraces appropriately configured bearing surfaces (8a, 8b) fashioned on the coupling pieces (5a, 5b) and thereby locks the coupling pieces (5a, 5b) butting against each other.

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10. Wind safety device per claim 9, characterized in that the coupling link (4) has a double T-shape, while the web (4a) can be inserted in recesses in the opposite end walls (7a, 7b) of the coupling pieces (5a, 5b) so that the inner sides of the flanges of the coupling link (4) engage with bearing surfaces (8a, 8b) on the coupling pieces (5a, 5b).

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