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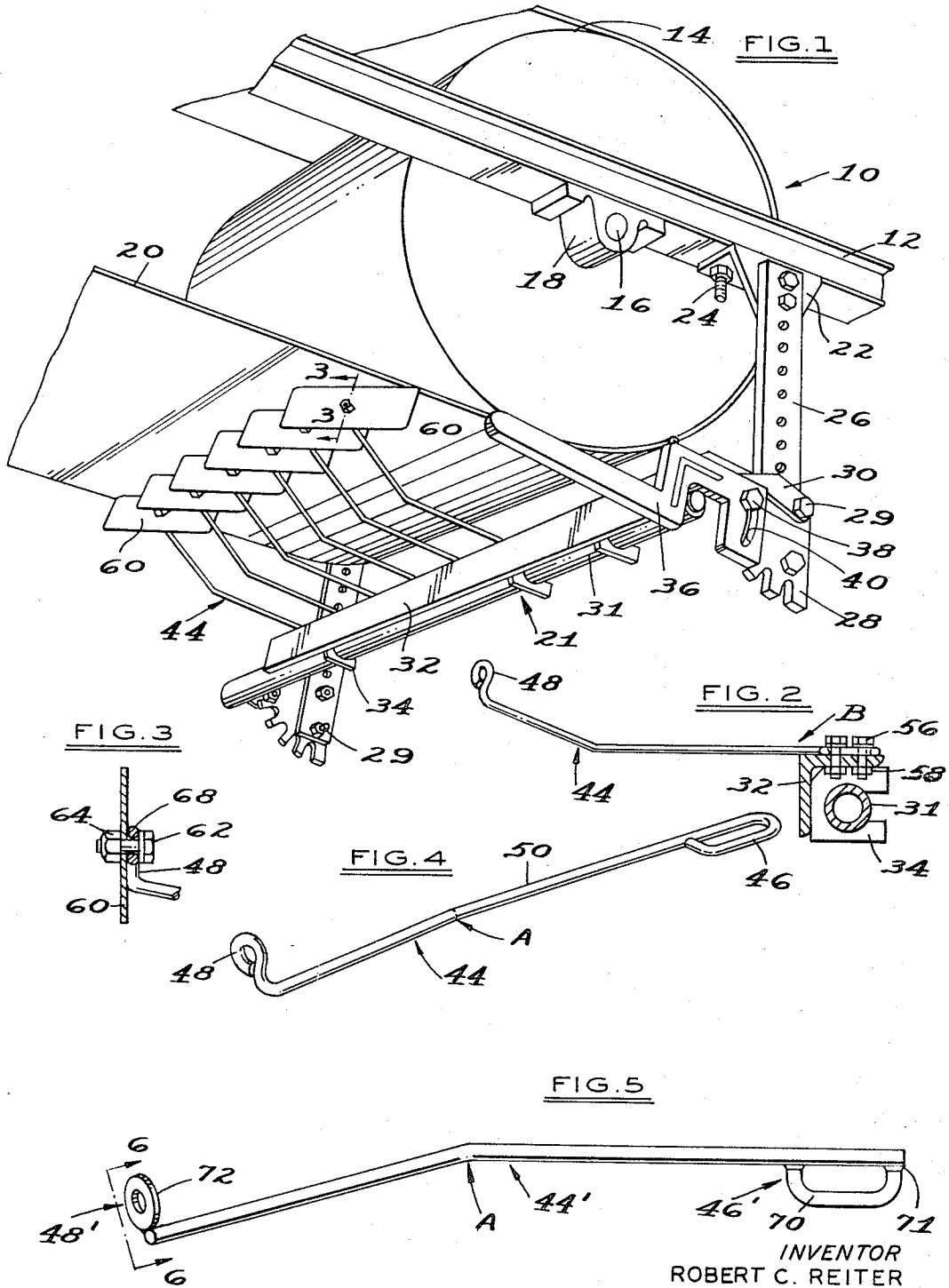
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CONVEYOR BELT CLEANER

Filed Feb. 10, 1966

2 Sheets-Sheet 1



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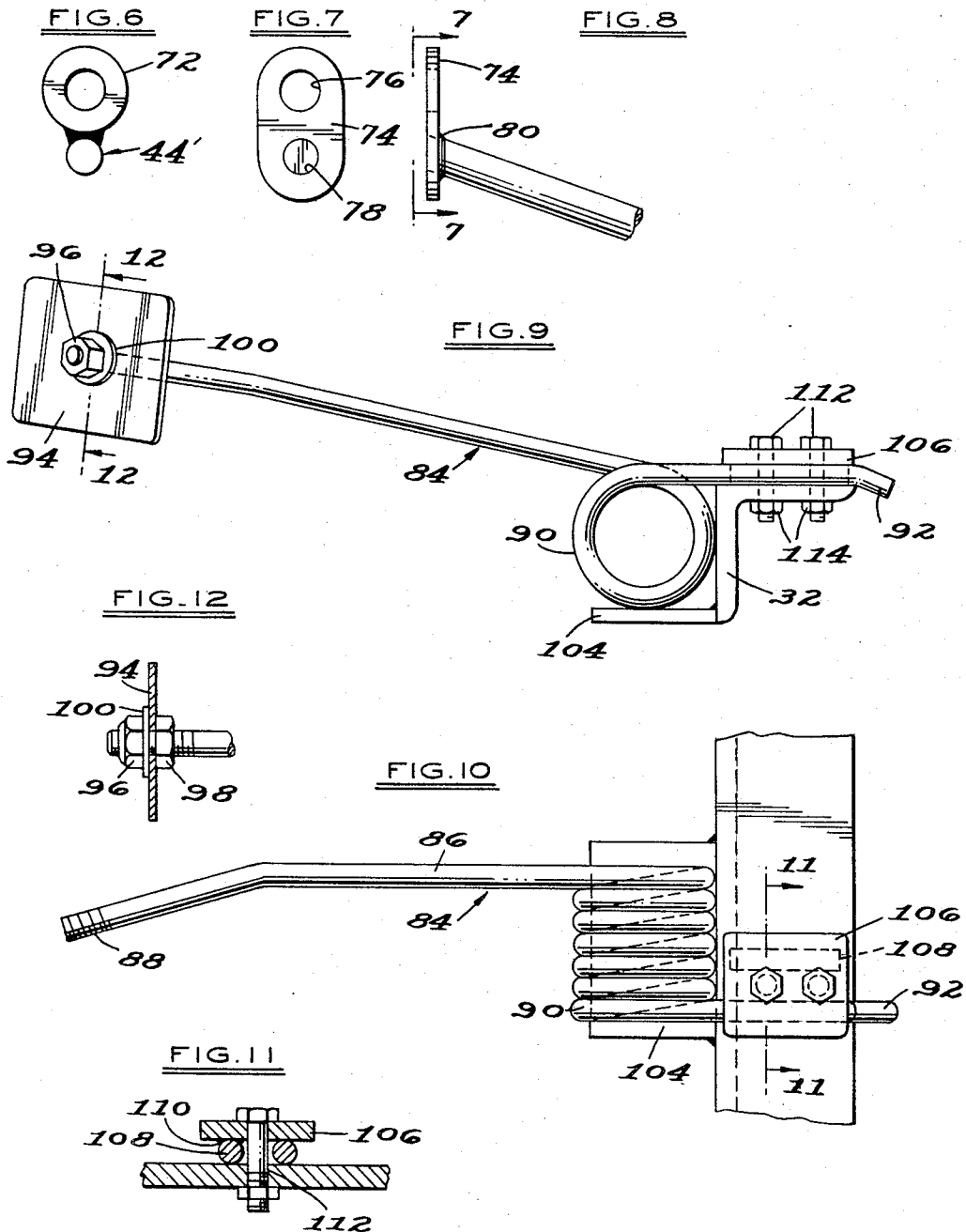
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CONVEYOR BELT CLEANER

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This invention relates to a mechanical cleaner for an endless conveyor belt and relates more particularly to a torsion spring conveyor belt cleaner which comprises a plurality of independently operable torsion spring-wiper blade assemblies for removing from the conveyor belt various types of abrasive types of abrasive and/or foreign materials.

The mechanical cleaner assembly is mounted underneath the return run or strand of the conveyor belt and is designed for quick and easy removal from the supporting structure. The cleaner assembly is subjected primarily to bending and torsional forces and includes a plurality of torsion spring or arms, each spring operating independently of the others. One end portion of each torsion spring or arm is fixedly connected to the supporting frame and the other end portion, which is free, is provided with a reversible wiper blade which is engageable with the conveyor belt to clean and wipe the abrasive material therefrom.

Each torsion arm or spring is in the form of an elongated relatively slender rod of circular cross-section which is subjected to torsional forces during the wiping operation. The torsion springs are made from specially processed spring steel. The requisite amount of cleaning action on the belt is assured by providing the correct amount of spring action in each torsion arm. The exclusive torsion flexing of the round torsion arm makes it self cleaning, since the abrasive material does not gather thereon, and causes the wiper blade to be automatically positioned for effective belt cleaning.

It is an object of the present invention to provide a mechanical cleaner for a conveyor belt in which the cleaner consists of a plurality of torsion spring-wiper blade assemblies which are subjected primarily to torsion and bending forces during the cleaning operation.

Another object of the present invention is to provide a cleaner for a conveyor belt adapted to engage the belt on the return run from below, including a support adapted to be mounted transversely of the belt to be cleaned and a plurality of torsion springs, each torsion spring having one end portion fixedly secured to the support and having on the other end portion a wiper blade which is engageable with the belt.

Still another object of the present invention is to provide a cleaner of the aforementioned type wherein each of the torsion springs is in the form of an elongated arm of generally circular cross section which prevents the abrasive material removed from the belt from collecting thereon. This imparts a universally flexible characteristic to the spring arm, including substantially equal flexure along the length of the arm in planes normal to and paralleling the direction of travel of the return run of the belt.

A further object of the present invention is to provide a cleaner of the aforementioned type wherein each of the torsion springs includes at opposite ends thereof mounting eyelets for respectively fixedly connecting one end portion to the support by one or more fastening elements and connecting the other end portion to the wiper blade by suitable fastening means.

A still further object of the present invention is to provide a cleaner of the aforementioned type wherein the mounting eyelets on each torsion spring are formed from the same stock as the main body of the torsion

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spring or formed from separate elements secured to the ends of the body by welding.

Another object of the present invention is to provide a cleaner of the aforementioned type wherein each of the torsion springs adjacent the fixed end portion thereof is provided with a plurality of coils which absorb the flexing of the torsion spring caused during the cleaning operation.

A further object of the present invention is to provide a cleaner of the aforementioned type wherein bracket means is connected to the support for supporting the coils of the torsion springs.

A still further object of the present invention is to provide a cleaner of the aforementioned type wherein each torsion arm includes a main body having one part fixed to the support extending generally horizontally and the other part which is unsupported extending generally upwardly therefrom and away from a vertical plane which is parallel to said one part of the arm.

It is thus another object of this invention to provide a simplified low cost structure of the aforementioned type having certain advantages contributing to efficiency, reliability, construction, operation, and long life as well as ease of maintenance.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the present invention is clearly shown.

FIGURE 1 is a fragmentary perspective view of the belt conveyor and mechanical cleaner therefor, with the cleaner mounted beneath the return strand of the conveyor belt and in an operative position.

FIGURE 2 is a side elevation of one of the torsion springs and the mounting therefor which is illustrated in section.

FIGURE 3 is a fragmentary sectional view taken on the line 3—3 of FIGURE 1 and illustrating the manner in which the wiper blade is adjustably attached to a torsion spring or arm.

FIGURE 4 is a perspective view of one form of torsion spring used with the cleaner of the present invention.

FIGURE 5 is a plan view of a modified torsion spring.

FIGURE 6 is an end view taken substantially from the line 6—6 of FIGURE 5.

FIGURE 7 is an end view of a mounting plate taken from the line 7—7 of FIGURE 8.

FIGURE 8 is a fragmentary elevational view of another modified torsion spring utilizing the mounting plate illustrated in FIGURE 7.

FIGURE 9 is an elevational view of still another modified torsion spring-wiper blade assembly and the supporting structure therefor.

FIGURE 10 is a plan view of the torsion spring and supporting structure therefor illustrated in FIGURE 9.

FIGURE 11 is a sectional view taken substantially on the line 11—11 of FIGURE 10.

FIGURE 12 is a sectional view taken substantially on the line 12—12 of FIGURE 9.

The conveyor illustrated in FIGURE 1 is designated by the numeral 10 and includes a frame 12 which supports a pair of pulleys or rollers, the head pulley or roller being designated by the numeral 14. The head pulley 14 is mounted on a shaft 16 which is supported by lugs or bearings 18 by the frame 12. Wrapped around the pulleys is an endless conveyor belt 20. The life of the belt 20 may be extended by removing therefrom abrasive or foreign materials whether wet, dry, or sticky. The belt 20 is cleaned by means of a mechanical belt cleaner designated by the numeral 21 in FIGURE 1.

The mechanical belt cleaner 21 includes a mounting assembly comprising a pair of angular mounting or

hanger clips 22 secured and fastened to the frame 12 by a plurality of fastening devices 24, an adjustable length hanger 26 for each mounting clip 22, an adjusting lock plate 28 secured to each hanger 26 by a plurality of fastening devices 29, and a tube support arm 30 secured to the outer surface of each lock plate 28 by means of the aforesaid fastening devices 29. The tube support arms 30 carry and support opposite ends of an elongated supporting pipe or tube 31 to form a generally U-shaped support spaced from the adjustable hangers 26.

The wiper assembly includes an elongated support member, holder or cross angle 32 of L-shaped cross section. The holder 32 is mounted to rotate and to slide on the supporting pipe or tube 31 by a plurality of C-clips 34 fixed to the holder 32. The wiper assembly further includes an adjusting lever or pressure handle 36 which is fixed on one end to the cross angle or holder 32, and fastening means including a stud 38 on one of the tube support arms 30 to fasten the wiper assembly in position. The stud 38 extends through an arcuate slot or opening 40 formed in the pressure handle 36.

The cross angle or holder 32 is provided with a plurality of spaced apart torsion springs or torsion spring arms 44 which are arranged in parallel. Each torsion spring 44, illustrated in FIGURE 4, is elongated, slender, and of circular cross-section and is provided with mounting eyelets at the opposite ends thereof. Each torsion spring 44 is made from a single piece of specially processed spring steel, with the trailing end thereof bent back upon itself in the form of a U to form the mounting eyelet 46 as best illustrated in FIGURE 4. The leading or free end of the torsion arm 44 is also bent and shaped to provide the mounting eyelet 48. The rear portion of the torsion spring 44 designated by the numeral 50 is relatively straight. The front portion of the spring 44 is bent upwardly at point A in FIGURE 4 and is also bent to one side of a vertical plane which extends parallel to the rear portion 50 of the torsion spring 44.

Each torsion spring 44 is mounted on the holder 32 as best illustrated in FIGURE 2. The mounting lug or eyelet 46 is supported on the top leg of the angle or holder 32 and is bolted thereto by a pair of fastening devices, each comprising a threaded bolt 56 and a nut 58. Thus the fastening devices 56 and 57 securely fasten the trailing end of each torsion spring 44 to the cross angle 32.

The leading end of each torsion spring 44 is provided with a reversible steel wiper blade 60 which is secured thereto by a bolt 62 cooperating with a nut 64 and a lock washer 68 as best illustrated in FIGURE 3.

As mentioned previously the torsion springs 44 are made from specially processed spring steel. Such torsion springs 44 are designed to withstand continual flexing and torsion forces created during the cleaning operation. During the cleaning operation each torsion arm 44 is subjected primarily to bending or torsional forces, with the fatigue point occurring at or near point B as illustrated in FIGURE 2. The fatigue point may be defined as the place on the torsion spring 44 where the breakage of the spring 44 is most likely to occur due to the continued flexing of the torsion arm during the cleaning operation.

Each torsion spring 44 is of circular cross section and thus is considered as self-cleaning. In other words, the abrasive and foreign material will not collect or build up on the torsion springs due to the particular configuration thereof. Each spring has substantial equality of flexure in horizontal, vertical and intermediate planes, enabling the blade 60, while being presented properly against the belt surface, to move considerably as an individual in assistance of the self-cleaning action. The torsion springs 44 adjust easily to meet various mounting conditions. The various fastening devices may be adjusted so as to provide precise positioning of the torsion spring-wiper blade assemblies and the correct cleaning pressure on the belt 20. It should be noted that the correctly pressured wiper blades 60 and torsion springs 44 working at

angles perpendicular to the belt 20 and diagonal to the line of travel of the belt 20 provides an effective cleaning unit for the conveyor belt 20. Thorough, yet gentle, cleaning action is assured by the correct amount of spring action in each arm 44. The exclusive torsion flexing of the round spring 44 makes it self-cleaning and causes each blade to be automatically positioned for most effective belt cleaning. The wiper blades 60 are reversible for double life and, because of their free-pivoting action on the ends of the arms 44, are completely self-aligning. The cleaner assembly 21 can be removed easily for servicing from the attaching assembly. The tube 31 and the spring arm holder 32 can be made in various lengths to fit almost any width of conveyor frame 12. The hangers 26 provide height adjustment for the entire cleaning assembly 21. Lock plates 28 can be rotated a full 360 degrees in order to secure the tube 31 in any desired position. The pressure handle 36 positions the wiper blade and spring arm assemblies for proper blade pressure and other vertical adjustments.

FIGURES 5 and 6 illustrate a modification of the torsion arm 44 and is designated by the numeral 44'. Due to the special dies and fixtures required to bend and form the spring arm 44 from a single piece of steel, it has been found that in certain applications it is more economically feasible to form the spring arm 44' from several pieces. In such a case, as an example, the main body of the torsion arm 44' is made from a single piece of spring steel. However, the supporting elements defining the mounting eyelets 46' and 48' are made from angular carbon steel. As an example, the U-shaped piece 70 illustrated in FIGURE 5 is secured to the trailing end of the body by a weld 71 to form the mounting eyelet 46'. The leading or free end of the spring 44' is provided with a heavy-duty washer 72 of generally flat stock which is secured thereto by welding to form the mounting eyelet 48'.

FIGURES 7 and 8 illustrate still another modification of the spring arm 44. Rather than utilizing a heavy-duty washer on the free end of the torsion arm 44', as illustrated in FIGURES 5 and 6, a relatively flat plate 74 is utilized. The plate 74 is provided with two openings 76 and 78. Opening 78 receives the free end of the main body of the torsion spring and thereafter, the plate 74 is secured to the free end of the torsion arm by a weld 80. Opening 76 receives the means for attaching the wiper blade to plate 74 similar to the mounting arrangement of FIGURE 3.

FIGURES 9-12 inclusive illustrate still another form of torsion spring. FIGURES 9 and 10 illustrate a torsion coil spring 84 of transverse circular cross section. The spring 84 is made from specially processed spring steel and comprises a main body portion 86 having on one end thereof an extension 88 which is threaded and on the other end thereof a plurality of coils 90. The trailing coil has an extension 92 which is fixed in place as will subsequently appear.

The reversible wiper blade 94 is secured to the threaded end of the extension 88 by means of lock nuts 96 and 98 and a lock washer 100 as best illustrated in FIGURE 12. The coils 90 of the torsion spring 84 rests against the front leg of the cross angle or holder 32, while the bottom surface of coils 90 rest upon a bracket or support 104 which is secured to the lower edge of the vertical leg of the holder 32. A locking plate 106 is provided for each torsion coil spring 84 and includes a pair of centrally located openings and on the underside thereof a spacer element 108 of circular cross-section which is secured thereto by a weld 110 as illustrated in FIGURE 11. The spacer 108 has the same diameter as the wire forming the extension 92 of the spring 84. A pair of bolts 112 extend through the openings in the locking plate 106 and through the openings in the horizontal leg of the holder 32. Nuts 114 are threaded to the bolts 112 and drawn firm to thereby hold one end of the torsion coil spring 84 in a fixed posi-

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tion. The spacer element 108 prevents the locking plate 106 from cocking since the bolts 112 are located at one side of the extension 92.

The coils 90 are located in the torsion spring 84 at the place where the flexing of the spring occurs. The fatigue occasioned by the flexing is absorbed by the coils 90. The torsion coil spring 84 has a longer life than torsion spring 44 or 44'. The coil type spring 84 has many of the advantages of torsion spring 44. The unit illustrated in FIGURES 9-12 inclusive may be mounted in the same manner as the unit of FIGURE 1.

The drawings and the foregoing specification constitute a description of the improved conveyor belt cleaner in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What is claimed as my invention is:

1. A cleaner for a conveyor belt adapted to engage the belt on the return run from below including a support adapted to be mounted transversely of the belt to be cleaned, and a plurality of torsion springs, each torsion spring having one end portion secured to said support and having on the other end portion a wiper blade which is engageable with the belt, each of said torsion springs being in the form of an elongated arm of generally circular cross-section substantially equal in flexibility, in the length thereof between said end portions, in planes normal to and paralleling the direction of travel of said belt return run.

2. The cleaner defined in claim 1 wherein each of said torsion springs includes at opposite ends thereof mounting eyelets for respectively connecting said one end portion to said support by one or more fastening elements and connecting said other end portion to the wiper blade by a fastening element.

3. The cleaner defined in claim 2 wherein the mounting eyelets on each torsion spring are formed from the same stock as the main body of the torsion spring.

4. The cleaner defined in claim 2 wherein the mounting eyelets on each torsion spring are formed from separate mounting elements secured to opposite ends of the torsion spring by welding.

5. The cleaner defined in claim 4 wherein the separate

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mounting element on said other end portion is in the form of a relatively flat washer.

6. The cleaner defined in claim 4 wherein the separate mounting element on said other end portion is in the form of a relatively flat plate having a pair of holes, with said one end portion of the torsion spring received in one of said holes and welded to said plate, and with the wiper blade having means securing the same in the other hole.

7. The cleaner defined in claim 1 wherein each of said torsion spring adjacent said one end portion is provided with a plurality of coils which absorb the flexing of the torsion spring.

8. The cleaner defined in claim 7 wherein bracket means is connected to said support for supporting the coils of each torsion spring.

9. The cleaner defined in claim 1 wherein each arm includes a main body having one part adjacent said support extending generally horizontally and the other part extending generally upwardly therefrom and away from a vertical plane which is parallel to said one part of the arm.

10. A cleaner for a conveyor belt adapted to engage the belt on the return run from below including a support adapted to be mounted transversely of the belt to be cleaned, and a plurality of torsion springs, each torsion spring having one end portion secured to said support and having on the other end portion a wiper blade which is engageable with the belt, each of said torsion springs being in the form of an elongated arm of generally circular cross-section, each torsion spring being provided adjacent one end portion thereof with a plurality of coils which absorb the flexing of the torsion spring.

11. The cleaner defined in claim 10 wherein bracket means is connected to said support for supporting the coils of each torsion spring.

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