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CRUSHER BELT TENSIONING APPARATUS

Abstract

A crusher belt tensioning apparatus is arranged for being mounting on a crusher having a driven crusher pulley to actuate a crusher, a drive pulley drivable by a power unit, a belt extending between the crusher pulley and the drive pulley to transfer drive from the power unit to the crusher, and a tension drum mounted on a tension arm for applying a tension force to the belt. The tension arm includes a first relatively short arm portion and a second relatively long arm portion connected to the first relatively short arm portion. The tension drum is movable by a hydraulic cylinder, attached to the relatively short arm portion, between a first belt tensioning operating position in which the tension drum applies tension to the belt and a second belt non-tensioning maintenance position in which the belt is removable from the tensioning apparatus.

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Background/Summary

RELATED APPLICATION DATA [0001] This application is a continuation of U.S. patent application Ser. No. 18/285,941 filed Oct. 6, 2023, which is a § 371 National Stage Application of PCT International Application No. PCT/EP2022/058515 filed Mar. 31, 2022, with priority to EP 21167644.0 filed Apr. 9, 2021.

TECHNICAL FIELD
[0002] The present disclosure relates to a crusher belt tensioning apparatus and to a crusher including the belt tensioning apparatus.
BACKGROUND
[0003] A variety of different crushers have evolved that are suitable for processing stone, minerals, and both domestic and industrial waste, including construction materials, to generate smaller particulate material and aggregate for subsequent processing or disposal. Conventional crushers include cone, impact, vibration and jaw crushers. Typically, the crusher is provided with a hopper for receiving the bulk material and a discharge conveyor to transfer the processed and crushed material to a discharge location.
[0004] Crushers can also be categorized into mobile crushers that are readily transportable from one site to another, and stationary crushers designed for large static installations that are assembled on site, e.g., at a quarry or mine environment where they remain until the source of raw material is exhausted.
[0005] Mobile crushers typically have endless tracks mounted at an undercarriage, which is in turn supported by a main chassis of the mobile crusher.
[0006] An on-board mounted power unit is configured to drive operation of the crusher via a belt drive assembly in which a belt is mounted about a pair of pulleys respectively connected to a crusher drive shaft and a powered drive shaft so as to transfer drive from a power unit to the crusher. Conventionally, the belt drive assembly is provided with a belt tensioning device which provides tension to the belt to both prevent belt slippage over the pulley wheels and to redress belt stretch following periods of use.
[0007] However, conventional belt tensioning devices suffer from a number of disadvantages. For example, known belt tensioning devices are manually operated requiring operatives to manually tension belts in close proximity to nip points and moving parts in the belt drive assembly which gives rise to a risk of injury to the operatives.
[0008] A typical example of a manually operated belt tensioning device is the turnbuckle tensioner as described EP 2777815 B1. In addition, known belt tensioning devices generally employ a tensioning drum to contact the drive belt where the tensioning drum is positioned within or internally of the path of the belt and the position of the tensioning drum in relation to the drive belt is adjusted manually. In these manually operated arrangements, the location of the tensioning drum within the path of the belt can reduce accessibility to the tensioning drum and increase the risk of injury to operatives. Furthermore, it is common for the belt to misalign at the drum and to impart

vibrations to the revolving belt resulting in high belt and bearing temperatures. Examples of such belt tensioning arrangements are also to be found in CN 211801545, US 2018/0209517, EP 2189222, WO 2008/140951 and US 2005/0187502.

[0009] Additionally, known tensioning devices utilise shock absorbers to absorb vibration and tension forces imparted to the belt particularly during crusher start-up and shut-down which would otherwise damage the crusher and power unit drive shaft. However, conventional spring type shock absorbers are susceptible to accumulation of dirt causing them to crack thus preventing shock absorbing compression as intended.

[0010] An object of the invention is to provide a belt tensioning apparatus for a crusher such as an impact, jaw or cone crusher that solves at least some of the problems of the prior art.

SUMMARY

[0011] According to the present disclosure there is provided a crusher belt tensioning apparatus for mounting on a crusher having a driven crusher pulley to actuate a crusher, a drive pulley drivable by a power unit, a belt extending between the crusher pulley and the drive pulley to transfer drive from the power unit to the crusher, and a tension drum mounted on a tension arm for applying a tension force to the belt, the tension arm including a first relatively short arm portion and a second relatively long arm portion connected to the first relatively short arm portion. The tension drum is movable by a hydraulic cylinder attached to the relatively short arm portion between a first belt tensioning operating position in which the tension drum applies tension to the belt and a second belt non-tensioning maintenance position in which the belt is removable from the tensioning apparatus. This geometry and conformation of the crusher belt tensioning apparatus and in particular the use of a tension arm having a first relatively short arm portion and a second relatively long arm portion connected to the first relatively short arm portion in which the hydraulic cylinder is connected to short arm portion ensures that the tension arm can be lowered down fully for maintenance and allows the creation of a clear path for safe and easy removal of the belt without any obstructions. This arc of movement subsequently reduces the overall belt length required, which in turn reduces the amount of tension that needs to be applied employing the crusher belt tensioning apparatus. The conformation and geometry of the apparatus also ensures that an optimum wrap angle range is always achieved on the drive pulley and crusher pulley during operation.

[0012] In an embodiment, the tension arm is a remotely operable tension arm. The remotely operable nature of the crusher belt tensioning apparatus, and in particular the remotely operable tension arm, ensures that any hazards such as being in close proximity to nip points and moving parts experienced with the manually operated prior art devices are eliminated.

[0013] The belt defines a belt circuit having an inner region enclosed by the belt. The tension drum is disposed outside the inner region so that the tension drum is in contact with an outer face of the belt. This arrangement facilitates easy access to the tension drum by an operative without any obstruction from the tension belt and also maximises contact between the tension belt and the pulleys.

[0014] Alternatively, the belt defines a belt circuit having an inner region enclosed by the belt and the tension drum is disposed inside the inner region so that the tension drum is in contact with an inner face of the belt. This arrangement provides an alternative configuration in which tension is applied using a downward movement of the tension drum.

[0015] In one embodiment, the tension arm is arcuately movable between the first belt tensioning operating position and the second belt non-tensioning maintenance position about a pivot point defined on the short arm portion of the tension arm. The pivot point on the short arm portion allows for optimal tensioning for minimal movement of the tension arm. The short-arm portion is mounted on a spigot pin mounting at the pivot point. The spigot pin mounting allows for ease of assembly of the apparatus of the invention and smooth and efficient arcuate movement of the tension arm.

[0016] Suitably, the apparatus further includes adjustable bearing housings between the pivot point

and the tension arm. The adjustable bearing housings ensure perfect belt alignment.
[0017] In an embodiment, the relatively short arm portion is disposed at an angle to the relatively long arm portion. As a result, maximum rotation for minimal movement of the tension arm is possible.
[0018] The apparatus further includes a lock to lock the apparatus in the first belt tensioning operating position. Accordingly, the apparatus is secured in place in use.
[0019] The apparatus includes a shock absorber to dampen shock on the apparatus. The shock absorber may have semi-bonded bushes. The semi-bonded bushes are resistant to damage in use to effectively dampen shock loads.
[0020] The tension drum includes remotely greasable internal bearings. The remotely greasable bearings increase the lifespan of the system and eliminate potential safety risks to operatives compared with manually greased bearings.
[0021] The present disclosure also extends to a crusher include a crusher belt tensioning apparatus as hereinbefore defined.
[0022] In an embodiment, the crusher belt tensioning apparatus of the crusher is operable independently of crushing operations. Accordingly, the crusher belt tensioning apparatus can be operated with the crusher power unit shut down so that belt tension can be measured and set safely. As a result, the belt tensioning apparatus of the crusher can be independently operated to allow the tension belt to bed in without requiring activation of the crusher power unit.
[0023] In an embodiment, the crusher is an impact, jaw or cone crusher.
[0024] The use of semi bonded bushes to dampen shock loads on the apparatus in use also optimises performance and reduces downtimes associated with conventional spring type shock absorbers in the apparatus of the prior art.
[0025] In addition, the adjustable bearing housings of the apparatus of the present disclosure facilitates multi directional belt alignment to ensure perfect belt alignment.
[0026] If desired, the apparatus can be operated electronically with the crusher central power unit shut down to enable belt tension to be measured and set safely. The apparatus can then be run to allow the belt to bed in without the need to start up the crusher central power unit.
[0027] The crusher belt tensioning apparatus of the present disclosure is suitable for use in a range of crushers such as impact, jaw, cone or other crusher types which can be mobile or stationary crushers.
[0028] The foregoing summary, as well as the following detailed description of the embodiments, will be better understood when read in conjunction with the appended drawings. It should be understood that the embodiments depicted are not limited to the precise arrangements and instrumentalities shown.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0029] The invention will now be described, by way of example only, with reference to the accompanying drawings in which:
[0030] FIG. **1** is a side view of a crusher belt tensioning apparatus of the prior art in which the tension pulley is manually adjusted with a turnbuckle with the tension pulley in the non-tensioning position.
[0031] FIG. **2** is a side view of the crusher belt tensioning apparatus of FIG. **1** with the tension pulley in the belt tensioning position.
[0032] FIG. **3** is a is a side view of an impact crusher fitted with a crusher belt tensioning apparatus of the present disclosure with the tension pulley of the crusher belt tensioning apparatus in the belt tensioning operating position.

[0033] FIG. **4** is an enlarged perspective view from above and one side of the crusher belt tensioning apparatus of FIG. **3**.
[0034] FIG. **5** is a side view of the crusher belt tensioning apparatus of FIG. **4** with the lock omitted.
[0035] FIG. **6** is an enlarged perspective view from above and one side of the crusher belt tensioning apparatus of FIG. **3** with the tension pulley in the non-tensioning maintenance position so that the belt is removable from the tensioning apparatus and with the lock omitted.
[0036] FIG. **7** is a side view of the crusher belt tensioning apparatus of FIG. **6** with the shock absorbing semi-bonded bushes omitted.
[0037] FIG. **8** is an enlarged rear perspective view from above and one side of the tension arm with the adjustable bearing housing positioned at the pivot point of the tension arm on the short arm portion of the tension arm.
[0038] FIG. **9** is a further enlarged rear perspective view from above and one side of the adjustable bearing housing of FIG. **8**.
[0039] FIG. **10** is an enlarged front perspective view from above and one side of the tension arm and spigot pin mounting.
[0040] FIG. **11** is a further enlarged front perspective view from above and one side of the spigot pin mounting of FIG. **10**.

DETAILED DESCRIPTION

[0041] FIGS. **1** and **2** show a manually operated crusher belt tensioning apparatus **1** of the prior art.
[0042] As shown in the drawings, the crusher belt tensioning apparatus **1** is generally made up of a driven crusher pulley **2**, a drive pulley **3** and an endless belt **4** extending between the crusher pulley **2** and the drive pulley **4**. A tension pulley **5** is positioned between the crusher pulley **2** and the drive pulley **3** in an inner region **6** defined and enclosed by the belt **4**. The tension pulley **5** is mounted on a pivotable tension/swing arm **7** so that the tension pulley **5** is in contact with an inner face **8** of the belt **4**. The tension pulley **5** is movable between a belt non-tensioning position shown in FIG. **1** and a belt tensioning position shown in FIG. **2** by pivoting the swing arm **7**. The swing arm **7** is pivoted by manually adjusting a turnbuckle **9** which extends between the swing arm **7** and a frame **10**.
[0043] In the belt non-tensioning position shown in FIG. **1**, the swing arm **7** is locked in position by a lock **11**. Conversely, in the belt tensioning position shown in FIG. **2**, the lock **11** is released and the tension pulley **5** is secured to the frame **10** via a shock absorber **12**.
[0044] As the turnbuckle **9** must be manually operated to move the tension pulley **5** between the bent non-tensioning and belt-tensioning positions, operatives can be exposed to safety hazards caused by nip points and moving parts on the crusher.
[0045] FIG. **3** shows a side view of a crusher of the present disclosure in the form of a mobile impact crusher **13** fitted with a crusher belt tensioning apparatus **14** of the present disclosure. Although the present disclosure is described in relation to the mobile impact crusher **13** of FIG. **3**, it will be appreciated by those skilled in the art that the crusher belt tensioning apparatus **14** of the present disclosure shown in FIGS. **4** to **11** is suitable for use in a range of crushers such as impact, jaw, cone or other crusher types in which tensioning is required. Accordingly, the crusher belt tensioning apparatus **14** of the present disclosure should not be construed as being limited to any particular crusher type.
[0046] The crusher **13** includes a main frame **15** providing a central support for the operative components of the crusher **13**. A chassis **16** is mounted to a lower region of frame **15** that in turns mounts two sets of wheels **17** around which extends a continuous belt track **18**. In particular, the crusher **13** includes a pair of endless tracks **21** (and associated drive components) positioned laterally at each side of the chassis **16** at the lower region of frame **15**. The wheels **17** are driven by a power unit **22** so as to drive each belt **21** to propel the crusher **13** over the ground.
[0047] The main frame **15** further supports a feed conveyor **23** having a discharge end **24** which fees material to be crushed to a crusher **25** mounted on the main frame **15**.

[0048] A discharge conveyor **26** projects forwardly of the main frame **15** and is arranged to receive material discharged from the crusher **25** and to discharge the crushed material from the crusher **25**.
[0049] As indicated above, in the present embodiment, the crusher **25** is an impact crusher in which material to be crushed is flung at speed against the walls of the crusher to break the material.
[0050] FIGS. **4** and **5** show enlarged views of the crusher belt tensioning apparatus **14** of FIG. **3** in the belt tensioning operating position. As shown in the drawings, the crusher belt tensioning apparatus **14** is made up of a driven crusher pulley **27**, a drive pulley **28** spaced apart from the crusher pulley **27** and an endless belt **29** extending between the crusher pulley **27** and the drive pulley **28** to transfer drive from the drive pulley **28** to the crusher pulley **27**. The crusher pulley **27** is mounted on a crusher pulley shaft **30** mounted on the main frame **15** and the drive pulley **28** is mounted on a drive shaft **31** also mounted on the main frame **15**. In one embodiment, the drive shaft **31** can be coupled to a crusher main shaft (not shown) which is in turn coupled to the power unit **22**. The power unit **22** can comprise a diesel engine in turn coupled to a clutch. Accordingly, the belt **29** transfers drive from the drive pulley **28** to the crusher pulley **27** to drive the crushing action of the crusher. However, in another embodiment, the crusher belt tensioning apparatus **14** can be operated electronically independently of the power unit **22** i.e. with the power unit **22** shut down to enable belt **29** tension to be measured and set safely independently of the power unit **22** and crushing operations. The crusher belt tensioning apparatus **14** can then be run to allow the belt **29** to bed in without the need to start up the power unit **22**.
[0051] The endless belt **29** of the crusher belt tensioning apparatus **14** defines a belt circuit having an inner region **32** within which the crusher pulley **27** and the drive pulley **28** are positioned and an exterior region indicated by the reference numeral **33**. Accordingly, the endless belt **29** has an inner face **34** disposed towards the inner region **32** and an outer face **35** disposed towards the exterior region **33**.
[0052] In the present embodiment, a tension drum **36** for applying a tension force to the belt **29** is mounted outside the inner region **32** at the exterior region **33** between the crusher pulley **27** and the drive pulley **28** on an elongate tension arm **37**. As described in more detail below in FIGS. **8** and **9**, the tension arm **37** is made up of a relatively short arm portion **38** and a relatively long arm portion **39** contiguous with the short arm portion **38** with the short arm portion **38** and the long arm portion **39** being disposed at an angle to each other (i.e. cranked) to define a substantially dog-leg shaped tension arm **37**. The tension arm **37** is mounted on a tension arm mounting bracket **40** attached to the crusher main frame **15** at a pivot point **41** about which the tension arm **37** can rotate. More particularly, a spigot pin mounting **42** is provided at the pivot point **41** to rotatably support the tension arm **37**.
[0053] The tension drum **36** can be provided with internal bearings (not shown) that are remotely greaseable to increase the lifespan of the crusher belt tensioning apparatus **14** and further eliminate any potential safety risks to operators.
[0054] The tension drum **36** is mounted towards a free end **43** of the long arm portion **39** of the tension arm **37** at a tension drum shaft **44** (see also FIG. **8**) while a remotely operable hydraulic cylinder **45** is connected at one end to the tension arm **37** towards a free end **19** of the short arm portion **38** of the tension arm **37** at a hydraulic cylinder mounting **46** to effect rotating movement of the tension arm **37** and hence the tension pulley **36** between a the belt tensioning operating position shown in FIGS. **4** and **5** and the belt non-tensioning maintenance position shown in FIGS. **6** and **7**. More particularly, the hydraulic cylinder **45** is made up of a hydraulic cylinder shell **47** attached to the crusher main frame **15** at hydraulic cylinder bracket **48** and a piston or ram **49** extending from the hydraulic cylinder shell **47** to the hydraulic cylinder mounting **46** on the short arm portion **38** of the tension arm **37**.
[0055] An adjustable bearing housing **50** is mounted between the tension arm **37**, and more particularly between the short arm portion **38** of the tension arm **37**, and the spigot pin mounting **42** to enable multi-directional belt **29** alignment as required.

[0056] As shown particularly in FIG. **4**, the tension drum **36** can be secured in the belt tensioning operating position with a removable mechanical lock **51**. In the present embodiment, the lock **51** is secured in place between semi-bonded bushes **52** provided on a semi-bonded bushes mounting **53** attached the crusher main frame **15** and a lock mounting **54** provided on the long arm portion **39** of the tension arm **36** (see also FIG. **8**). As with the hydraulic cylinder **45**, the lock **51** can also be remotely operated.

[0057] FIGS. **6** and **7** show the crusher belt tensioning apparatus **14** with the tension drum **36** in the non-tensioning maintenance position so that the belt **29** is removable from the tensioning apparatus **14**. Like numerals indicate like parts. As shown in the drawings, the tension drum **36** is fully lowered into the non-tensioning maintenance position in the exterior region **33** by the action of the hydraulic cylinder **45** on the short arm portion **38** of the tension arm **37** so that the tension arm **37** is rotated arcuately downwards at the spigot pin mounting **42** to remove tension from the belt **29**. Accordingly, in the present embodiment, by being located in the exterior region **33** in both the first belt tensioning operating position and the second belt non-tensioning maintenance position case of access to the apparatus of the invention for maintenance purposes is further enhanced.

[0058] FIGS. **8** and **9** show enlarged rear views of the tension arm **37** and adjustable bearing housing **50** of FIGS. **3** to **7**. As shown in the drawings, the tension arm **37** is plate-like in construction and is made up of the relatively short arm portion **38** and the relatively long arm portion **39**, which is contiguous with the short arm portion **38** to define a unitary tension arm **37** structure the short-arm portion **38** is not separable from or hingedly attached to the long-arm portion **39**—both the short-arm portion **38** and the long arm portion **39** are integral with each other to form the unitary tension arm **37**. As indicated above, the short arm portion **38** and the long arm portion **39** are disposed at an angle to each other (i.e. cranked) to define a substantially dog-leg shaped tension arm **37**. More particularly, an angled edge indicated by the reference numeral **59** is defined in an outer edge **60** of the tension arm **37** to demarcate the short arm portion **38** from the long arm portion **39**.

[0059] The short-arm portion **38** is provided with the hydraulic cylinder mounting **46** at its free end **19** which is made up of two spaced apart plates **55** defining a hydraulic piston receiving slot gap. Each plate **55** is further provided with opposing slots **57** for receiving the hydraulic piston **49**. The adjustable bearing housing **50** is mounted on the rear face **58** of the short-arm portion **38** substantially midway between the angled edge **59** and the hydraulic cylinder mounting **46** via adjustable bearing housing mountings **61**. The short-arm portion **38** is also provided with opposite laterally extending wings **62** at the adjustable bearing housing **50** to accommodate the adjustable bearing housing **50** on the short arm portion **38**. The adjustable bearing housing **50** allows for multi-directional and optimal alignment of the belt **29** via adjusters **67** provided on the adjustable bearing housing **50**.

[0060] The long arm portion **39** extends upwards from the short arm portion **38** from the angled edge **59** of the tension arm **37** and is in turn made up of a neck **63** which extends at an angle defined by the angled edge **59** from the short-arm portion **38** and a head **64** at its free end **43** on which the tension drum **36** is mounted at the tension drum shaft **44** on the front face **65** of the tension arm **36**. The head **64** is shaped to define a nose portion **66** for supporting the lock mounting **54**.

[0061] As shown in FIGS. **10** and **11**, the spigot pin mounting **42** is mounted on the front face **65** of the tension arm **36** in a position corresponding with the adjustable bearing housing **50**.

[0062] In use, the crusher belt tensioning apparatus **14** of a crusher **13** (which can be an impact, jaw, cone or other crusher and is exemplified as an impact crusher in FIG. **3**) remotely tensions the belt **29** as shown in FIGS. **4** and **5** by remotely operating the hydraulic cylinder **45** to urge the tension drum **36** upwards against the outer face **35** of the belt **29** (the first belt tensioning operating position). By being operable remotely, the hazards involved with prior art methods of manually tensioning the belts **29** in close proximity to nip points and moving parts are eliminated.

[0063] More particularly, the hydraulic cylinder **45** operates against the short arm portion **38** of the tension arm **37** so that the tension arm **37** is rotatable moved arcuately on the spigot pin mounting **42** upwards and the tension drum **36** on the long arm portion **39** tensions the belt **29**. By acting on the short arm portion **28**, the resulting arc of movement reduces the overall belt length required, which in turn reduces the amount of tension required to tension the belt **29**.
[0064] Once the belt **29** is tensioned, the crusher belt tensioning apparatus **14** can be mechanically locked in place via the lock **51**. Moreover, a shock absorber **52** at the lock **51** in the form of shock absorbing semi-bonded bushes **52** dampen any shock loads experienced by the crusher belt tensioning apparatus **14** during operation. As indicated above, the adjustable bearing housing **50** facilitates multi directional belt alignment and optimal belt **29** alignment.
[0065] As shown in FIGS. **6** and **7**, in order to remove tension from the belt **29** and move the tension drum **36** to the belt non-tensioning maintenance position so that the belt **29** is removable from the crusher belt tensioning apparatus **14**, the hydraulic cylinder **45** is once again remotely operated to operate on the short arm portion **38** of the tension arm **37** to urge the tension arm **37** and hence the tension drum **36** fully downwards thus releasing tension on the belt **29** and allowing for safe removal of the belt **29** without any obstructions—i.e. a clear path for removal of the belt **29** is created by remote operation of the hydraulic cylinder **45**.
[0066] Due to the geometry of the crusher belt tensioning apparatus **14** and in particular the geometry of the tension arm **37**, an optimal belt wrap angle range is always achieved on the crusher pulley **27** and the drive pulley **28** during operation. In addition, by connecting the hydraulic cylinder **45** to the short-arm portion **38** of the tension arm **37**, maximum rotation of the tension arm **37** for minimal movement is achieved.
[0067] If desired, the crusher belt tensioning apparatus **14** can be operated electronically with the power unit **22** shut down to enable belt tension to be measured and set safely. The crusher belt tensioning apparatus **14** can then be run to allow the belt **29** to bed in without the need to start up the power unit **22**.
[0068] Although the present embodiment(s) has been described in relation to particular aspects thereof, many other variations and modifications and other uses will become apparent to those skilled in the art. It is preferred therefore, that the present embodiment(s) be limited not by the specific disclosure herein, but only by the appended claims.

Claims

1. A crusher belt tensioning apparatus arranged for mounting on a crusher, the crusher belt tensioning apparatus comprising: a driven crusher pulley arranged to actuate a crusher; a drive pulley drivable by a power unit; a belt extending between the crusher pulley and the drive pulley to transfer drive from the power unit to the crusher; and a tension drum mounted on a tension arm for applying a tension force to the belt, the tension arm having a first short arm portion and a second long arm portion connected to the first short arm portion, wherein the tension drum is movable by a hydraulic cylinder attached to the short arm portion between a first belt tensioning operating position in which the tension drum applies tension to the belt and a second belt non-tensioning maintenance position in which the belt is removable from the tensioning apparatus, wherein the apparatus is configured to be operated independently of the power unit, such that the belt tensioning apparatus of the crusher can be independently operated to allow the tension belt to bed in without requiring activation of the crusher power unit.
2. The crusher belt tensioning apparatus as claimed in claim 1, wherein the belt defines a belt circuit having an inner region enclosed by the belt and the tension drum is disposed outside the inner region so that the tension drum is in contact with an outer face of the belt.
3. The crusher belt tensioning apparatus as claimed in claim 1, wherein the tension arm is a remotely operable tension arm.

4. The crusher belt tensioning apparatus as claimed in claim 1, wherein the tension arm is arcuately movable between the first belt tensioning operating position and the second belt non-tensioning maintenance position about a pivot point defined on the short arm portion of the tension arm.
5. The crusher belt tensioning apparatus as claimed in claim 4, wherein the tensioning arm is mounted on a tension arm mounting bracket of the crusher at the pivot point.
6. The crusher belt tensioning apparatus as claimed in claim 4, wherein the short arm portion is mounted on a spigot pin mounting at the pivot point.
7. The crusher belt tensioning apparatus as claimed in claim 4, further comprising an adjustable bearing housing located between the pivot point and the tension arm, wherein the adjustable bearing housing is arranged for adjusting an alignment of the belt via adjusters provided on the adjustable bearing housing.
8. The crusher belt tensioning apparatus as claimed in claim 1, wherein the short arm portion is disposed at an angle to the long arm portion.
9. The crusher belt tensioning apparatus as claimed in claim 1, further comprising a lock arranged to lock the apparatus in the first belt tensioning operating position.
10. The crusher belt tensioning apparatus as claimed in claim 1, further comprising a shock absorber arranged to dampen shock on the apparatus.
11. The crusher belt tensioning apparatus as claimed in claim 10, wherein the shock absorber includes semi-bonded bushes.
12. A crusher comprising a crusher belt tensioning apparatus as claimed in claim 1.
13. The crusher as claimed in claim 12, wherein the crusher is an impact, jaw or cone crusher.