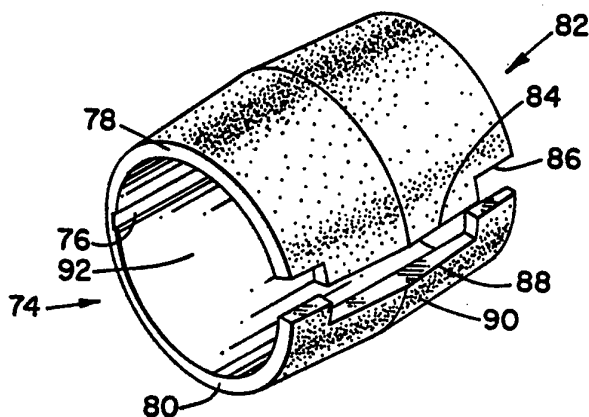




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(54) Title: BELT GUIDE PULLEY



(57) Abstract

A clam shell shaped belt guide pulley (74) having first and second curved halves (78, 80) which are hinged together. Each pulley half has curved inner and outer surfaces. The pulley (74) is adapted to be placed on a large diameter shaft (50) without the need to remove the shaft (50) from the remainder of a machine. There is no supporting structure between the inner surfaces of the pulley halves (78, 80) and the shaft (50). Each half (78, 80) has a free end (86, 90). An apparatus (82) is provided to removably connect the free ends (86, 90) together to secure the pulley (74) on the shaft.

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Belt Guide Pulley

at.

DescriptionTechnical Field

This invention relates to belt guide pulleys. More particularly it relates to belt guide pulleys which may be used with large diameter shafts having a low moment of inertia and a high bending modulus.

Background Art

Conveyor machines for moving textile articles such as towels and the like often include a plurality of parallel endless belts which operate between spaced apart shafts. Each shaft normally includes a plurality of pulleys which are attached to the respective shafts. The belts ride on the pulleys which maintain the belts in proper alignment. Normally the shafts are made of one inch (2.54 cm) diameter steel. Because a force of between 50 and 60 pounds (between 22.7 and 27.2 kg) or more is applied by each belt to the shaft, there are limitations to the length of the shaft and thus the width of the conveyor.

A typical prior art small diameter shaft and pulley system is shown in Figure 1. Pulley 10 is attached to one inch (2.54 cm) diameter shaft 12. Pulley 10 includes support web 14 having keyed hole 16 for receiving the shaft. Shaft 12 also includes key 18 which is received in slot 20 of web 14. The key 18 must be machined when the shaft is manufactured thereby increasing the cost. Pulley 10 includes outside surface 22 for making contact with a conveyor belt. Surface 22 may be crowned to keep the conveyor belt in proper alignment.

Typical pulleys having support webs on the inside thereof are shown in U.S. Patent Nos. 605,104 issued to Knoblock and 1,959,972 issued to Wanamaker. U.S. Patent Nos. 4,439,173 issued to Fokos, 3,010,332 issued to Skates, and 4,718,544 issued to Herren show pulleys having an

internal web structure as set forth above, and also having an additional outer covering for the outside surface of the pulley which, in the case of the Fokos and Skates patents, are initially in two halves.

5 For wider conveyors larger diameter shafts are used. In some cases the pulleys are machined onto the shaft during the construction of the shaft. In other cases, because of the machining expense, pulleys are omitted and guides adjacent to the shaft are used to keep the belts
10 aligned. These guides cause excessive wear on the belts.

Disclosure of Invention

In accordance with one form of this invention, there is provided a belt guide pulley for attachment to a shaft. The pulley is in the form of a clam shell shaped member
15 which includes first and second curved halves. Each half of the clam shell shaped member has an inner curved surface and an outer curved surface. A weakened section or hinge, which is preferably integral with the two halves, connects the first half to the second half. Each half has a free
20 end. The hinge enables the free ends to be moved relative to one another so that the pulley may be readily placed on the shaft.

A connection apparatus is provided for connecting the free ends together. It is preferred that the connection
25 apparatus be in the form of a male member extending from one free end for receipt in a receptacle formed in the other free end, thereby enabling a specific pulley to be used on shafts having various diameters, i.e., to accommodate shaft tolerances. Preferably an adhesive, in
30 the form of double sided tape covered by release paper, is applied to the inner surface of each half for securing the pulley to the shaft. Additionally the outside surfaces of the pulley preferably are crown shaped to hold the belts on the pulley thereby maintaining proper alignment of the
35 belts. It is also preferred that the outside surface of the pulley be roughened to reduce slipping of the belt.

In accordance with another form of this invention, there is provided a conveyor system with at least one shaft having a diameter of at least two inches (5 cm). At least one belt guide pulley is removably attached to the shaft.

5 The pulley is clam shell shaped having first and second curved halves, each having a free end, and a hinge rotatably connecting the first half to the second half. The ratio of the largest outer diameter of the pulley to the outer diameter of the shaft is no more than 1.2 to 1.

10 A connection apparatus is provided for connecting the free ends together.

In accordance with yet another form of this invention, there is provided a method of applying a clam shell shaped belt guide pulley having two halves each with a hinged end

15 and a free end to a conveyor machine shaft without removing any portion of the shaft from the conveyor machine. A male member extends from one free end and a receptacle is formed in the other free end. The pulley is opened by moving the free end of each half away from each other. The pulley is

20 placed on the shaft so that the inside surface of the pulley contacts the outside surface of the shaft. The male member is inserted into the receptacle for securing the pulley on the shaft.

In yet another form of this invention there is

25 provided a belt guide pulley adapted to be attached to a shaft. The pulley is in the form of a unitary curved sleeve having first and second free ends juxtaposed from one another. A connection apparatus is provided for connecting the first free end to the second free end. The

30 connection apparatus includes a male portion extending from the first free end and a receptacle formed in the second free end. The male portion is removably received in said receptacle.

It is preferred that the inside surface of the pulley

35 be adhered to the outside surface of the shaft.

It is also preferred that the pulley be void of any supporting structure between the inner curves surfaces of each half and the shaft.

Thus the invention provides a belt guide pulley which
5 may be utilized with large diameter shafts, having various diameters. The invention provides a belt guide pulley which may readily be attached to and removed from a conveyor shaft and, more particularly, which may be attached and secured to a shaft without the need to remove
10 the shaft. The invention also provides a conveyor system which utilizes large diameter shafts having pulleys which may be easily attached thereto and, more particularly, provides a conveyor system which utilizes inexpensive and easy-to-use belt guide pulleys which may be placed on the
15 shafts without the need to remove the shafts from the conveyor system. The invention provides a conveyor system which utilizes shafts with low moments of inertia and high bending moduli. The invention further provides a conveyor system which utilizes a shaft which does not require
20 special tooling.

Brief Description of Drawings

The subject matter which is regarded as the invention is set forth in the appended claims. The invention itself, however, together with further objects and advantages
25 thereof, may be better understood with reference to the following description taken in conjunction with the accompanying drawings in which:

Figure 1 is a partial pictorial view showing a prior art belt guide pulley attached to a prior art keyed small
30 diameter shaft;

Figure 2 is a pictorial view showing one form of an easily-attached belt guide pulley;

Figure 3 is a sectional view of Figure 2 taken through section lines 3-3;

35 Figure 4 is a sectional view of an alternative pulley to that shown in Figures 2 and 3;

Figure 5 is a sectional view of another alternative pulley to that shown in Figures 2, 3 and 4;

Figure 6 is a top plan view showing a portion of a conveyor system utilizing the pulleys of Figure 2 connected to a large diameter shaft;

Figure 7 is a pictorial view showing the pulley of Figure 2 receiving a conveyor belt, which pulley is connected to a large shaft and showing the pulley of Figure 4 connected to a drive belt, which pulley is also connected to the large diameter shaft;

Figure 8 is a partial pictorial view showing the pulley of Figure 2 being connected between two other like pulleys on a large diameter shaft;

Figure 9 is a more detailed partial pictorial view of a portion of the pulley and shaft shown in Figure 8 with parts of the shaft being in phantom for clarity;

Figure 10 shows the pulley of Figure 2 but with a roughened outer surface and with an adhesive system on the inner surface;

Figure 11 is a sectional view of Figure 10 taken through section lines 11-11;

Figure 12 is a partial pictorial view showing the pair of pulleys of Figure 2 connected to a large diameter shaft and a pair of transfer fingers;

Figure 13 is a side elevational view of the apparatus shown in Figure 12;

Figure 14 is a pictorial view of another form of an easily-attached belt guide pulley;

Figure 15 is a partial plan view of the connection apparatus portion of the embodiment shown in Figure 14;

Figure 16 is a partial plan view showing another form of the connection apparatus shown in Figure 15;

Figure 17 is a partial plan view showing yet another embodiment of the connection apparatus shown in Figure 15; and

Figure 18 is a partial pictorial view showing the connection apparatus portion of the embodiment of Figure 14 in more detail.

Best Mode for Carrying out the Invention

5 Referring now more particularly to Figures 2 through 13, there is provided belt guide pulley 24. Pulley 24 is clam shell shaped and includes curved halves 26 and 28. The two halves 26 and 28 are rotatably attached to one another by hinge 30. The halves 26 and 28 and hinge 30 are
10 all integral with one another with the hinge 30 being formed by a weakening or slit in the material which forms the pulley. Half 26 includes free end 32 and half 28 includes free end 34. Preferably the pulley is made of plastic or rubber. Suitable materials are neoprene and
15 nylon.

It is also preferred that the curved outer surfaces of the halves 26 and 28 be roughened as generally indicated by 36 in Figure 10. The roughened surface will aid in preventing the belts from slipping. In the preferred
20 embodiment the pulley is crown shaped as best seen in Figure 3 and is generally indicated by 38. This crown shape causes the belt to stay on the pulley and thus stay in alignment with adjacent belts as shown in Figure 6. The pulley may be formed in other shapes such as that shown in
25 Figure 4, which has an elongated U slot 40 which in the embodiment shown in Figure 7 is used to receive drive belt 42. In addition, the top surface of the pulley could include shoulders 44 and 46 as shown in Figure 5 which serve to guide the belt.

30 Pulley 24 is normally used in a multi-belt conveyor system. As can be seen from Figure 6, a multi-belt conveyor generally indicated at 48 includes a large diameter shaft 50 which is at least two inches (5 cm) in diameter and is preferably three inches (7.6 cm) in
35 diameter. The ends of the shaft 50 are attached to portions of the conveyor machine generally indicated as 52

and 54 so that access to the shaft is restricted. A plurality of pulleys 24 are attached to shaft 50. A plurality of belts 56 are received over pulleys 24.

In order to place a pulley 24 onto shaft 50, it is merely necessary to move free ends 32 and 34 away from one another, thereby opening the clam shell so that the distance between the free ends is at least the diameter of shaft 50. This attachment procedure is best illustrated in Figures 8 and 9.

Once the clam shell pulley is received over the shaft 50, the inside surface 58 of each half contacts the outside surface 60 of the shaft. Although it is possible that the tension of the belts 56 will hold the pulley in place, it is preferred that the inside surface 58 be adhered to the outside surface 60 of the shaft. This is best accomplished by the use of a suitable adhesive such as contact cement or two sided adhesive tape and release paper as illustrated in Figures 10 and 11. Double sided adhesive tape as generally indicated as 60 is placed on the inside surface 58 of each half. The tape includes backing 62. Adhesive layer 64 makes direct contact with the inside surface 58 each clam shell half and adhesive layer 66. Release paper 68 is received over adhesive layer 66. Release paper 68 is removed from each half at the time that the pulley is to be placed onto shaft 50. In addition, it is preferred that free ends 32 and 34 be glued together once the pulley is fully installed on shaft 50.

The preferred maximum thickness of the crown pulley shown in Figure 3 is 0.25 inch (6.35 mm) as indicated by measured from the top of the crown to the inside surface 58. Thus the resulting diameter at its maximum of the combination of the three-inch (7.6 cm) shaft 50 and crown pulley is approximately 3.5 inches (8.9 cm). The ratio of the pulley outer diameter to the shaft outer diameter is 1.2 to 1 or less, again measured from the top of the crown. The construction results in a low moment of inertia for the shaft, which is preferably less than 100 inch pounds (115

centimeter kilograms). In addition, because of the use of the large three-inch (7.6 cm) diameter shaft, as compared to the prior art one-inch (2.54 cm) diameter shaft as shown in Figure 1, the shaft has a much higher bend modulus and can withstand much higher forces than a standard one-inch (2.54 cm) shaft. In addition a longer shaft and thus a wider conveyor may be used. The pulleys described above may be readily replaced when they are worn out without the need to remove the shaft from the machine thereby eliminating a costly procedure which stops production for an extended period of time and is labor intensive. While the pulleys represent only a 0.25 inch (6.35 mm) buildup from the outside surface 61 of the shaft, there is sufficient room to provide transfer fingers 70 between adjacent pulleys 24 as shown in Figure 12. Transfer fingers 70 are supported by bar 72 which is positioned adjacent to shaft 50. These transfer fingers 70 enable a smooth transition of the material being conveyed to an adjacent conveyor section.

Referring now to Figures 14-18, there is provided a belt guide pulley 74 which is preferably crown shaped. Pulley 74 is in the form of a unitary clam shell shaped structure having a weakened portion 76 in the form of groove 76. Groove 76 forms a weakened section or hinge and divides first curved half 78 from second curved half 80. The description of the clam shell shaped structure of Figure 2 is applicable to Figure 14 except that the structure of Figure 14 includes connection apparatus 82 in the form of a rectangular shaped male member or land 84 extending from free end 86 of half 78, and rectangular shaped receptacle or groove 88 formed in free end 90 of the other half 80 of the pulley. The connection apparatus 82 enables one to readily secure the pulley to shaft 50, although it is preferable that adhesive also be applied to the inside surfaces 92 of each half. However, with the use of the connection apparatus 82, there is no need to apply adhesive to the free ends 86 and 90 to secure the pulley to

the shaft. The male member or land 84 includes side walls 94 and 96. The receptacle or groove 88 includes side walls 98 and 100. Land 84 is received in groove 88. Side wall 94 makes contact with side wall 98, and side wall 96 makes
5 contact with side wall 100, thus providing an interference fit between the side walls of land 84 and the side walls of groove 88. The free ends of 86 and 90 of the two halves of the clam shell are thus tightly secured together yet may be readily slid apart and the land 84 may be completely
10 removed from the groove 88 so that the pulley may be easily installed on and removed from shaft 50.

Furthermore, because of this interference fit, the pulley may be used for various diameters of shafts. This is important because of the manufacturing tolerances of the
15 shafts. This connection avoids the need for one to keep a large number of slightly different sized pulleys in inventory in order to accommodate the tolerances, i.e., varying diameters, of the shafts. When using a shaft having a slightly larger outside diameter than the inside
20 diameter of the pulley, gaps 102(a), 102(b) and 102(c) are formed between the respective facing walls 104 and 106, 108 and 110, 112 and 114 of connection apparatus 82. However, because of the tight fit between the side walls, the pulley will still be operable even with the aforementioned gaps.

25 Figure 16 shows an alternative embodiment to the connection apparatus 82 wherein land 116 and groove 118 are trapezoidal in shape so that the groove will guide the land into position. The connection apparatus shown in Figure 16 will not result in as tight of connection as the embodiment
30 of Figure 15.

Figure 17 shows another alternative embodiment to the connection apparatus 82 whereby land 120 and groove 122 are dovetailed shaped resulting in an even tighter connection between the two halves. However, it is more difficult for
35 one to make the connection in the embodiment shown in Figure 17.

Thus there is provided a clam shell shaped pulley particularly useful with a large diameter shaft thereby enabling one to use high tension multiple belts without the fear that the shaft will bend excessively. The pulley may
5 be easily placed on the shaft without the need to remove the shaft from the conveyor. The pulleys are inexpensive to manufacture and easy to use without substantial training time and do not require a specially machined shaft. The pulley is held together on the shaft by a unique connection
10 apparatus.

From the foregoing description of the preferred embodiments of the invention, it will be apparent that many modifications may be made therein without departing from the true spirit and scope of the invention.

15 Industrial Applicability

The invention is applicable to machines employing belt guide pulleys in general, and to conveyor systems in particular.

Claims

1. A belt guide pulley adapted to be attached to a shaft comprising:
 - a unitary clam shell shaped member, said member including first and second curved halves, each half having an inner curved surface and an outer curved surface, each half having a free end;
 - a weakened section on said member and located between said free ends, said weakened section connecting said first curved half to said second curved half, said weakened section enabling said free ends to be moved relative to one another whereby said member may be readily placed on the shaft; and
 - connection apparatus for connecting said first free end to said second free end.
2. A pulley as set forth in Claim 1 wherein said connection apparatus includes a male portion extending from said free end of said first half and a receptacle formed in said free end of said second half, said male portion removably received in said receptacle.
3. A pulley as set forth in Claim 2 wherein said male portion is in the form of a land and said receptacle is in the form of a groove.
4. A pulley as set forth in Claim 3 wherein said land and said groove are each rectangular in shape.
5. A pulley as set forth in Claim 3 wherein said land and said groove are each trapezoidal in shape.
6. A pulley as set forth in Claim 3 wherein said land and said groove are each shaped in the form of a dovetail.
7. A pulley as set forth in Claim 2 whereby there is an interference fit between said male portion and said receptacle.
8. A pulley as set forth in Claim 2 wherein said male portion has at least one side wall and said receptacle has at least one side wall, said male portion slidably

contacting said side wall of said receptacle when said member is placed on the shaft.

9. A pulley as set forth in Claim 8 wherein said male portion includes a facing wall and said receptacle includes a facing wall, said facing wall of said male portion and said facing wall of said receptacle being juxtaposed to one another; a gap being formed between said facing wall of said male portion and said facing wall of said receptacle when the inside diameter of said clam shell shaped member is smaller than the outside diameter of the shaft; and said side walls remaining in contact with one another whereby said pulley may be used with shafts having various diameters.

10. A pulley as set forth in Claim 1 wherein said outer curved surface of each half is crown shaped.

11. A pulley as set forth in Claim 1 wherein said member is substantially void of any supporting structure between said inner curved surfaces of each half.

12. A pulley as set forth in Claim 1 further including an adhesive applied to said inner surface of each half whereby said member may be adhered to said shaft.

13. A pulley as set forth in Claim 12 further including release paper attached to said adhesive.

14. A conveyer system comprising:
at least one shaft, said shaft having a diameter of at least two inches (2.54 cm);
at least one unitary belt guide pulley removably attached to said shaft, said pulley being clam shell shaped and having first and second curved halves and a weakened section connecting said first and second halves together enabling said halves to be rotated, the ratio of the largest outer diameter of said pulley to the outer diameter of said shaft being no more than 1.2 to 1, said first half having a free end and said second half having a free end;
and
a connection apparatus for connecting said first free end to said second free end.

15. A conveyor system as set forth in Claim 14 wherein said connection apparatus includes a male member extending from the free end of said first half and a receptacle formed in said second half, said male member
5 removably received in said receptacle.

16. A conveyor system as set forth in Claim 15 wherein the moment of inertia of said shaft/pulley is less than 100 inch pounds (115 centimeter kilograms).

17. A method of applying a unitary clam shell shaped
10 belt guide pulley having (a) two halves each with inside and outside curved surfaces, and (b) a weakened section connecting said halves together, each half having a free end with a male member extending from the free end of said first one half and a receptacle formed in the other half,
15 to a conveyor machine shaft having an outside curved surface without having to remove any portion of the shaft from the conveyor machine, said method comprising the steps of:

opening the pulley by moving the free ends of
20 each half away from each other;

placing the pulley on the shaft so that the inside surface of each pulley half contacts the outside surface of said shaft; and

inserting said male member into said receptacle.

25 18. A method as set forth in Claim 17 further including the step of adhering said inside surface of each pulley half to the outside surface of the shaft.

19. A belt guide pulley adapted to be attached to a shaft comprising:

30 a unitary curved sleeve, said sleeve having first and second free ends juxtaposed from one another; and

a connection apparatus for connecting said first free end to said second free end, said connection apparatus including a male portion extending from said first free end
35 and a receptacle formed in said second free end, said male portion removably received in said receptacle.

20. A pulley as set forth in Claim 19 wherein said male portion is in the form of a land and said receptacle is in the form of a groove.

21. A pulley as set forth in Claim 20 wherein said
5 land and said groove are each rectangular in shape.

22. A pulley as set forth in Claim 19 wherein there is an interference fit between said male portion and said receptacle.

23. A pulley as set forth in Claim 19 wherein said
10 male portion has at least on side wall and said receptacle has at least one side wall, said side wall of said male portion slidably contacting said side wall of said receptacle when said pulley is placed on the shaft.

24. A pulley as set forth in Claim 23 wherein said
15 male portion includes a facing wall and said receptacle includes a facing wall, said facing wall of said male portion and said facing wall of said receptacle being juxtaposed to one another; a gap being formed between said facing wall of said male portion and said facing wall of
20 said receptacle when the inside diameter of said sleeve is smaller than the outside diameter of the shaft; and said side walls remaining in contact with one another whereby said pulley may be used with shafts having various diameters.

[received by the International Bureau on 17 January 1994 (17.01.94); original claims 11,14-16,18,22 cancelled; original claims 1,5-7 amended; claims 12,13,17,19,20,21,23 and 24 amended and renumbered as claims 11,12,13,14,15,16, 17 and 18; other claims unchanged (5 pages)]

1. A belt guide pulley adapted to be attached to a shaft comprising:

a unitary clam shell shaped member, said member including first and second curved halves, each half having an inner curved surface and an outer curved surface, each half having a free end;

a weakened section on said member and located between said free ends, said weakened section connecting said first curved half to said second curved half, said weakened section enabling said free ends to be moved relative to one another whereby said member may be readily placed on the shaft;

connection apparatus for connecting said first free end to said second free end; and

said member being substantially void of any supporting structure between said inner curved surfaces of said halves.

2. A pulley as set forth in Claim 1 wherein said connection apparatus includes a male portion extending from said free end of said first half and a receptacle formed in said free end of said second half, said male portion removably received in said receptacle.

3. A pulley as set forth in Claim 2 wherein said male portion is in the form of a land and said receptacle is in the form of a groove.

4. A pulley as set forth in Claim 3 wherein said land and said groove are each rectangular in shape.

5. A belt guide pulley adapted to be attached to a shaft comprising:

a unitary clam shell shaped member, said member including first and second curved halves, each half having an inner curved surface and an outer curved surface, each half having a free end;

a weakened section on said member and located between said free ends, said weakened section connecting said first curved half to said second curved half, said

weakened section enabling said free ends to be moved relative to one another whereby said member may be readily placed on the shaft; and

connection apparatus for connecting said first
5 free end to said second free end, said connection apparatus including a male portion in the form of a land extending from said free end of said first half and a receptacle in the form of a groove formed in said free end of said second half, said male portion removably received in said
10 receptacle, and said land and said groove each being trapezoidal in shape.

6. A belt guide pulley adapted to be attached to a shaft comprising:

a unitary clam shell shaped member, said member
15 including first and second curved halves, each half having an inner curved surface and an outer curved surface, each half having a free end;

a weakened section on said member and located between said free ends, said weakened section connecting
20 said first curved half to said second curved half, said weakened section enabling said free ends to be moved relative to one another whereby said member may be readily placed on the shaft; and

connection apparatus for connecting said first
25 free end to said second free end, said connection apparatus including a male portion in the form of a land extending from said free end of said first half and a receptacle in the form of a groove formed in said free end of said second half, said male portion removably received in said
30 receptacle, and said land and said groove each being shaped in the form of a dovetail.

7. A belt guide pulley adapted to be attached to a shaft comprising:

a unitary clam shell shaped member, said member
35 including first and second curved halves, each half having an inner curved surface and an outer curved surface, each half having a free end;

a weakened section on said member and located between said free ends, said weakened section connecting said first curved half to said second curved half, said weakened section enabling said free ends to be moved
5 relative to one another whereby said member may be readily placed on the shaft; and

connection apparatus for connecting said first free end to said second free end, said connection apparatus including a male portion extending from said free end of
10 said first half and a receptacle formed in said free end of said second half, said male portion removably received in said receptacle, and there being an interference fit between said male portion and said receptacle.

8. A pulley as set forth in Claim 2 wherein said
15 male portion has at least one side wall and said receptacle has at least one side wall, said male portion slidably contacting said side wall of said receptacle when said member is placed on the shaft.

9. A pulley as set forth in Claim 8 wherein said
20 male portion includes a facing wall and said receptacle includes a facing wall, said facing wall of said male portion and said facing wall of said receptacle being juxtaposed to one another; a gap being formed between said facing wall of said male portion and said facing wall of
25 said receptacle when the inside diameter of said clam shell shaped member is smaller than the outside diameter of the shaft; and said side walls remaining in contact with one another whereby said pulley may be used with shafts having various diameters.

30 10. A pulley as set forth in Claim 1 wherein said outer curved surface of each half is crown shaped.

11. A belt guide pulley adapted to be attached to a shaft comprising:

a unitary clam shell shaped member, said member
35 including first and second curved halves, each half having an inner curved surface and an outer curved surface, each half having a free end;

a weakened section on said member and located between said free ends, said weakened section connecting said first curved half to said second curved half, said weakened section enabling said free ends to be moved
5 relative to one another whereby said member may be readily placed on the shaft;

connection apparatus for connecting said first free end to said second free end, and including an adhesive applied to said inner surface of each half whereby said
10 member may be adhered to said shaft.

12. A pulley as set forth in Claim 11 further including release paper attached to said adhesive.

13. A method of applying a unitary clam shell shaped belt guide pulley having (a) two halves each with inside
15 and outside curved surfaces, and (b) a weakened section connecting said halves together, each half having a free end with a male member extending from the free end of said first one half and a receptacle formed in the other half, to a conveyor machine shaft having an outside curved
20 surface without having to remove any portion of the shaft from the conveyor machine, said method comprising the steps of:

opening the pulley by moving the free ends of each half away from each other;

25 placing the pulley on the shaft so that the inside surface of each pulley half contacts the outside surface of said shaft;

inserting said male member into said receptacle;
and

30 adhering said inside surface of each pulley half to the outside surface of the shaft.

14. A belt guide pulley adapted to be attached to a shaft comprising:

a unitary curved sleeve, said sleeve having first
35 and second free ends juxtaposed from one another; and

a connection apparatus for connecting said first free end to said second free end, said connection apparatus

including a male portion extending from said first free end and a receptacle formed in said second free end, said male portion removably received in said receptacle, and there being an interference fit between said male portion and
5 said receptacle.

15. A pulley as set forth in Claim 14 wherein said male portion is in the form of a land and said receptacle is in the form of a groove.

16. A pulley as set forth in Claim 15 wherein said
10 land and said groove are each rectangular in shape.

17. A pulley as set forth in Claim 14 wherein said male portion has at least one side wall and said receptacle has at least one side wall, said side wall of said male portion slidably contacting said side wall of said
15 receptacle when said pulley is placed on the shaft.

18. A pulley as set forth in Claim 17 wherein said male portion includes a first facing wall and said receptacle includes a second facing wall, said first facing wall of said male portion and said second facing wall of
20 said receptacle being juxtaposed to one another; a gap being formed between said first facing wall of said male portion and said second facing wall of said receptacle when the inside diameter of said sleeve is smaller than the outside diameter of the shaft; and said side walls
25 remaining in contact with one another whereby said pulley may be used with shafts having various diameters.

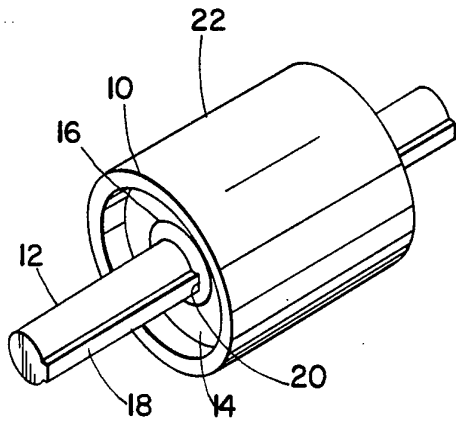


Fig. 1
(PRIOR ART)

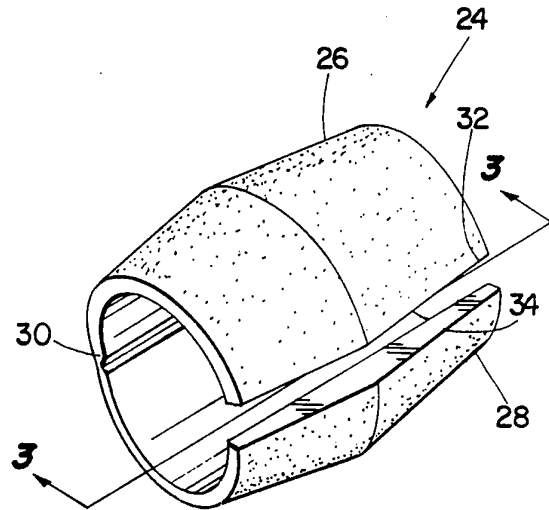


Fig. 2

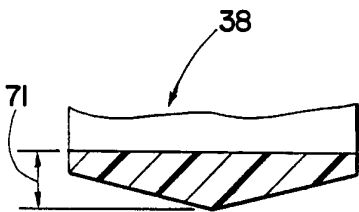


Fig. 3

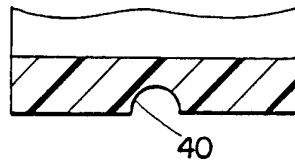


Fig. 4

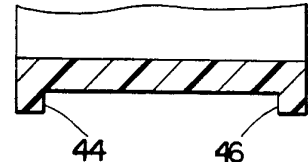


Fig. 5

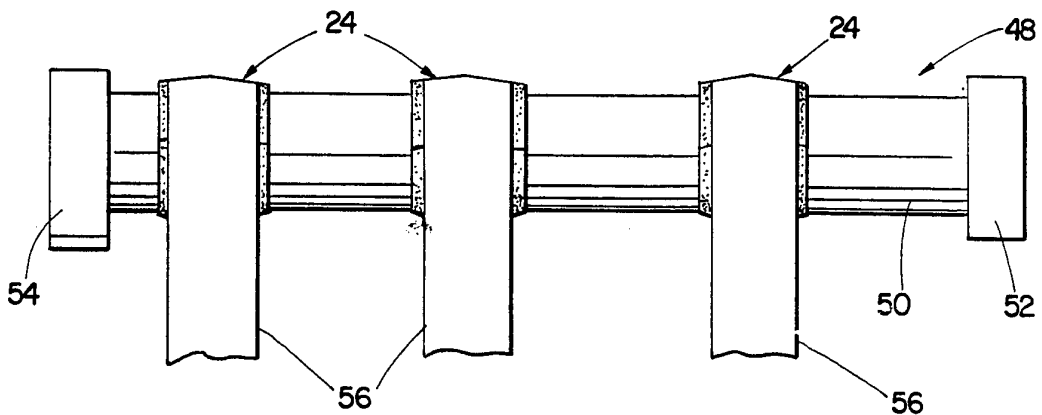
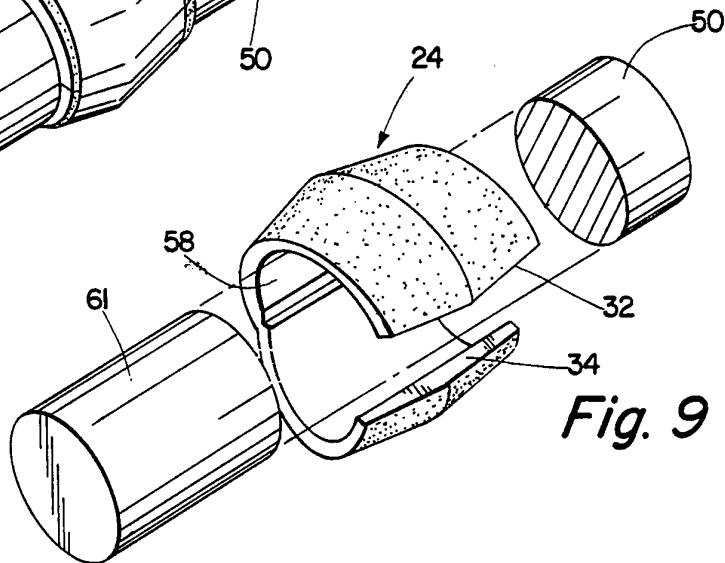
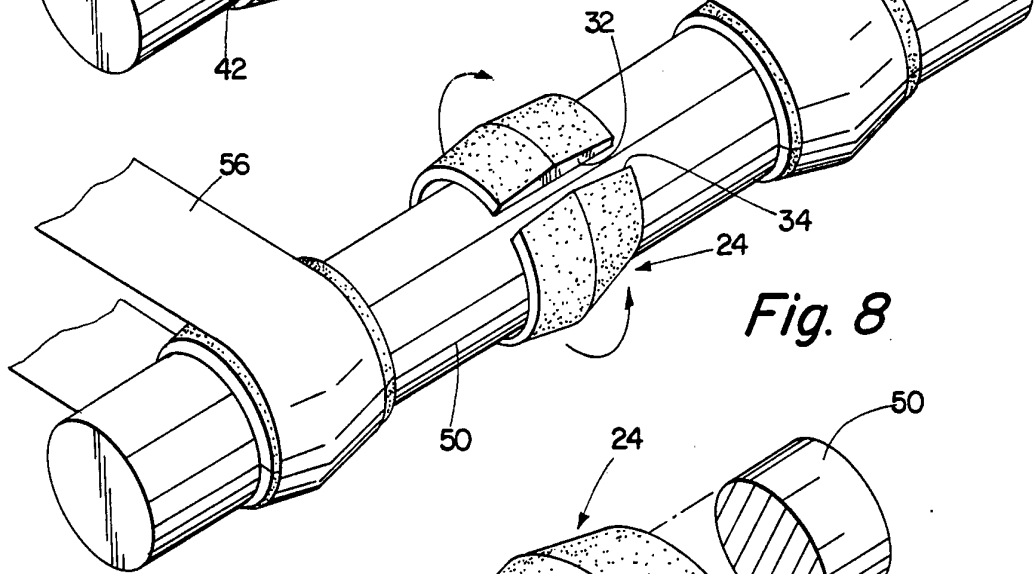
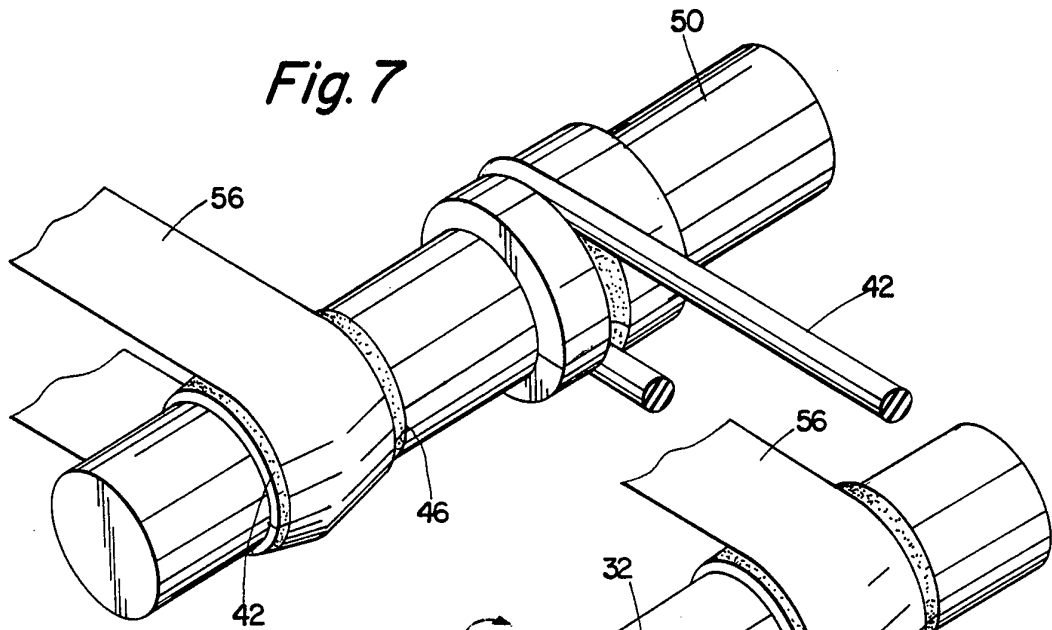


Fig. 6



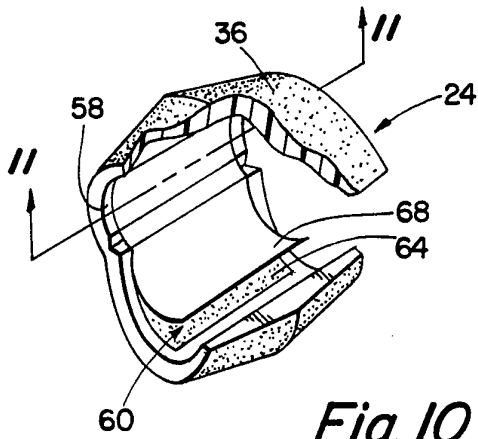


Fig. 10

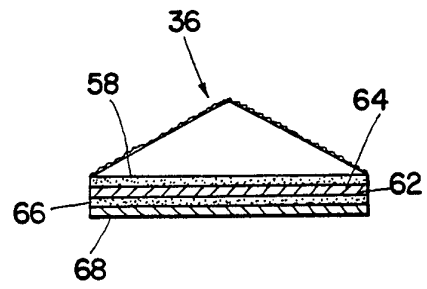


Fig. 11

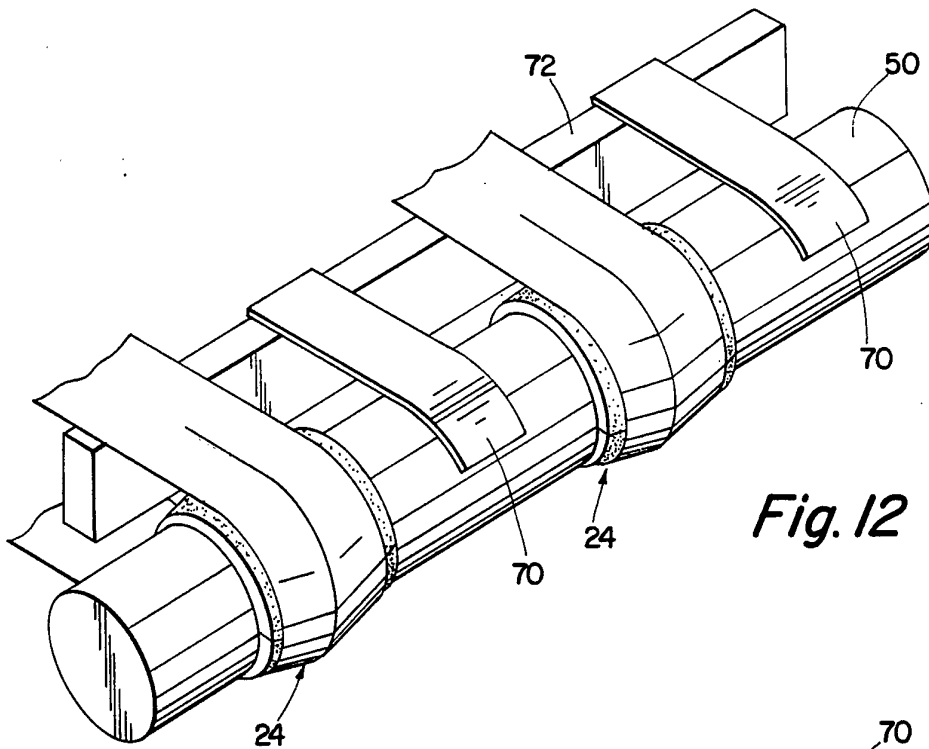


Fig. 12

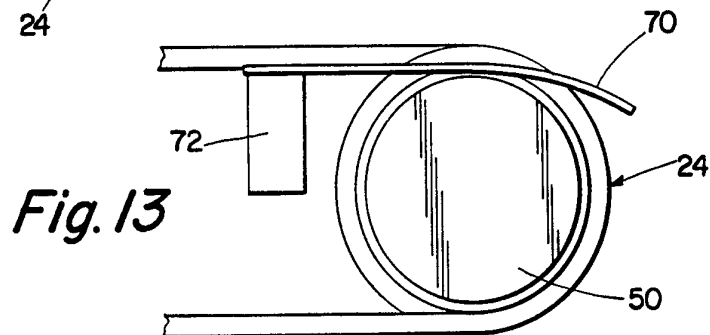


Fig. 13

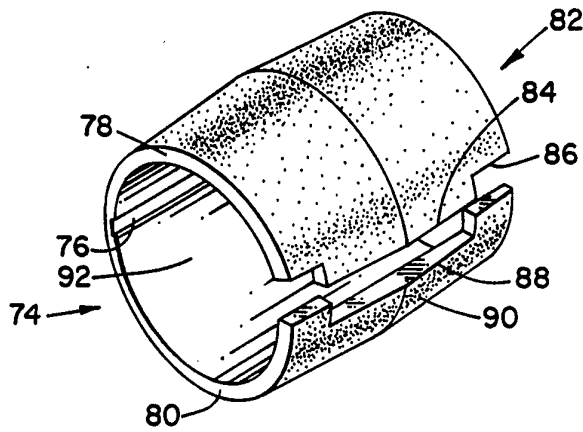


Fig. 14

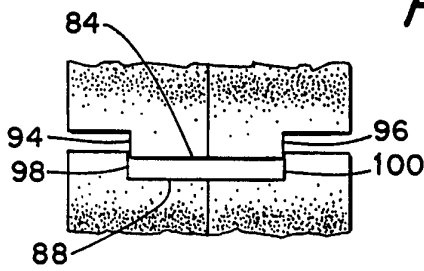


Fig. 15

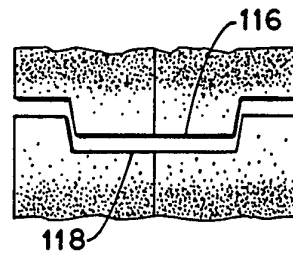


Fig. 16

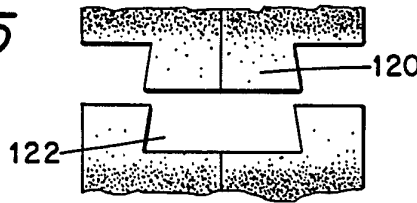


Fig. 17

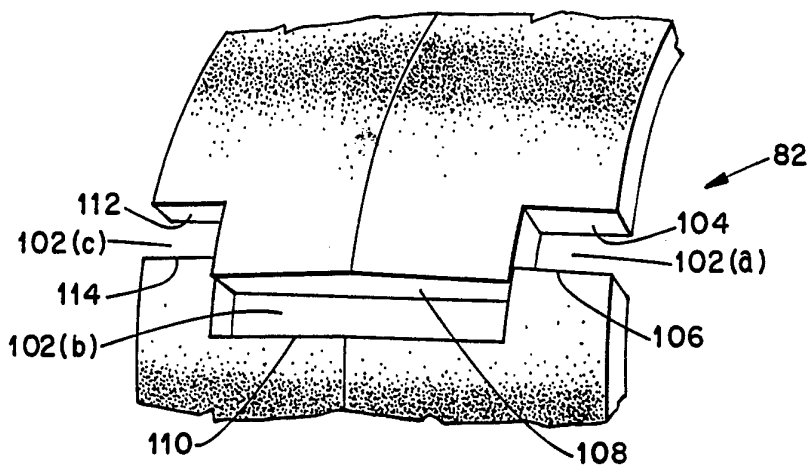


Fig. 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/07712

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :F16H 55/12
US CL :475/95, 184, 190; 198/803.01, 836.4, 843

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 474/96, 97, 148, 150, 187, 189, 273, 902, 903; 198/789, 790, 803.02, 836.1, 836.2, 837, 841, 842.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US, A 3,789,682 (Holz) 05 February 1974, (see entire reference)	1, 10 ----- 2-4, 8, 9, 14-17, 19-21, 23, 24
Y	US, A 769,414 (Simmons) 06 September 1904, (see entire reference)	2-4, 8, 9, 14-17, 19-21, 23, 24
Y	US, A, 2,269,821 (Kempfert et al) 13 January 1942, (see entire reference)	19-21, 23, 24
A	US, A, 5,117,970 (Gibbs) 02 June 1992 (see entire reference)	1-24

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be part of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z*	document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means		
P document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

28 OCTOBER 1993

Date of mailing of the international search report

NOV 16 1993

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