March 3, 1953 G. B. HALL 2,629,909

PINTLE OR THE LIKE STRUCTURAL ELEMENT FOR HINGED SEAMS

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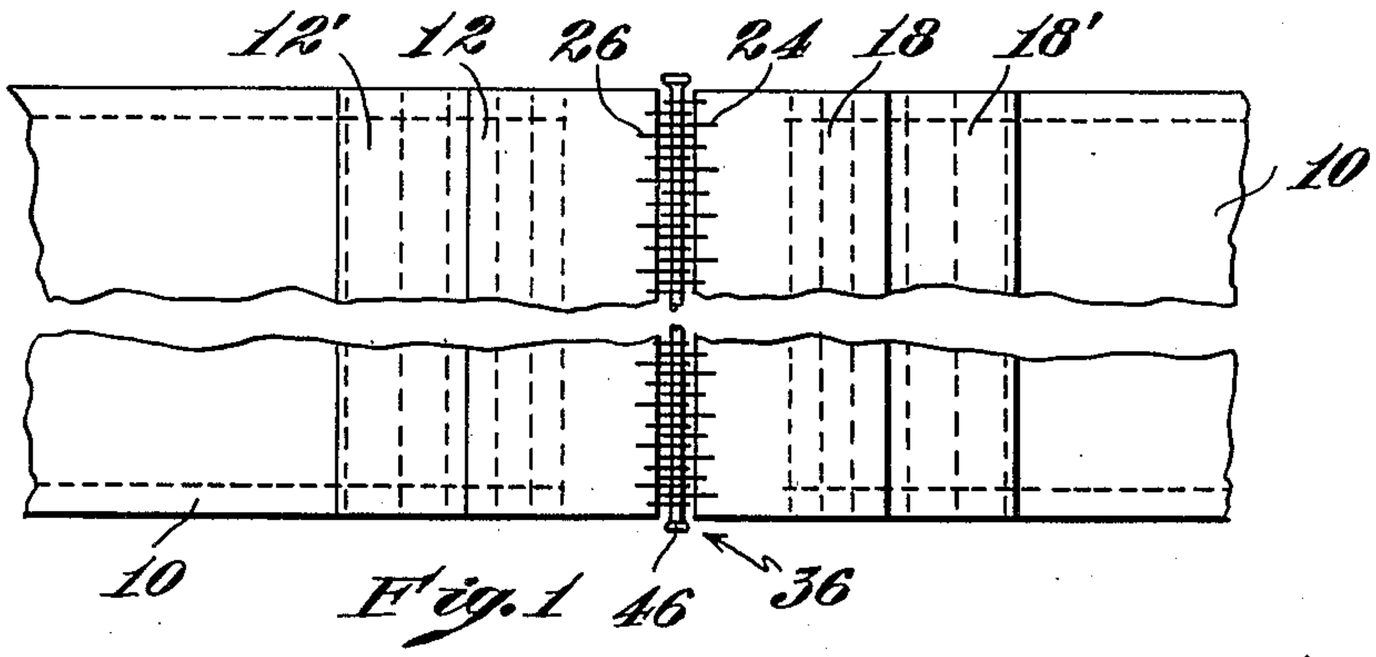

Fig. 1

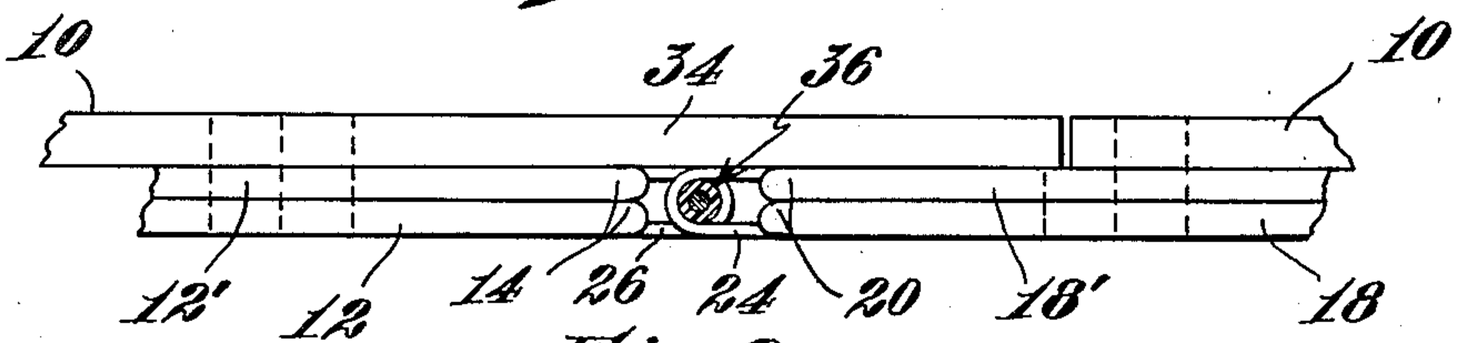

Fig. 2

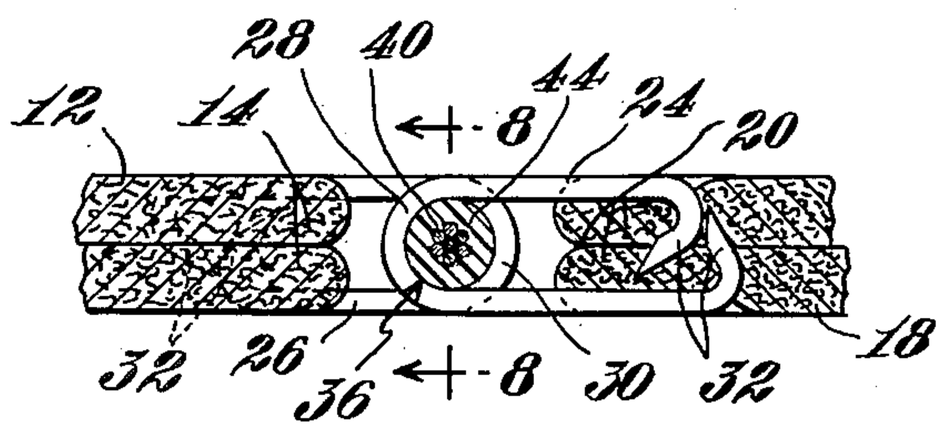

Fig. 3

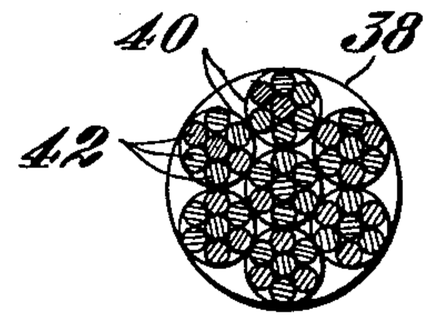

Fig. 4

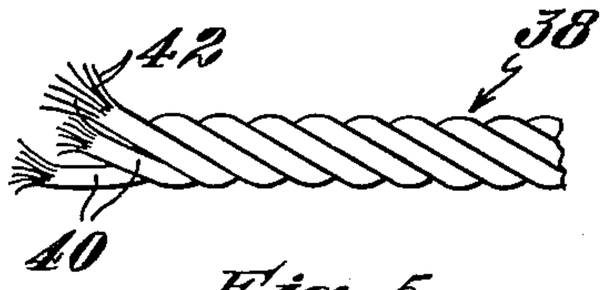

Fig. 5

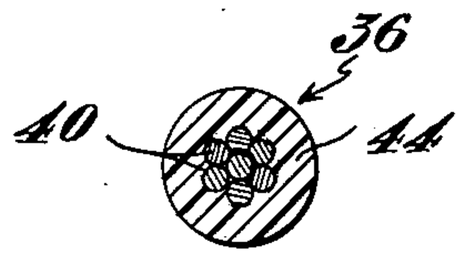

Fig. 6

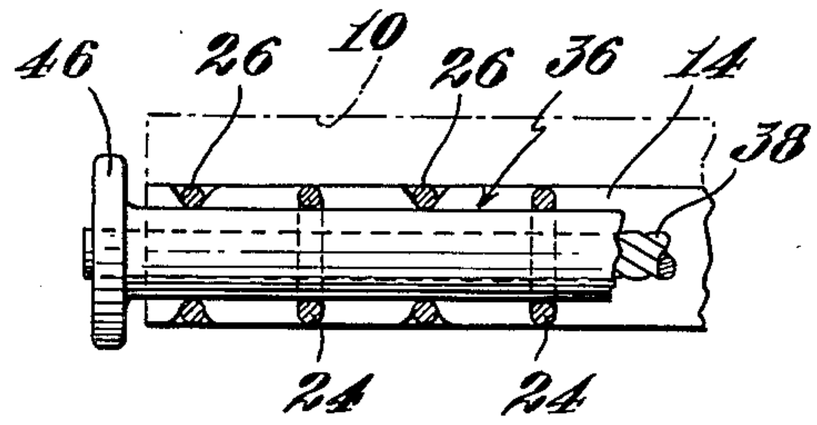

Fig. 8

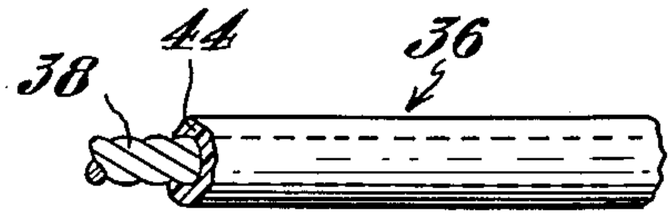

Fig. 7

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PINTLE OR THE LIKE STRUCTURAL ELEMENT FOR HINGED SEAMS

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6 Claims. (Cl. 24—33)

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This invention relates to hinge seams for paper-drying felts and more especially to a novel structural element from which pintles may be made and a method of assembling the hinge seam parts and pintle, it being understood however that the novel pintle and method of use are broadly applicable to other uses where multi-knuckle or clip-type hinges are employed.

It is customary to join the ends of flexible belts, webbing and felts such as are used, for example, in paper-drying by applying to the opposite ends of the belt a plurality of regularly spaced clips, enmeshing the clips at the ends to provide a substantially continuous transverse passage, and then introducing a flexible pintle member therethrough. Heretofore the pintle member has been a bundle of bronze strands twisted to form a composite cable. Because of the softness of the bronze wire even when several strands are twisted together, it does not have sufficient stiffness so that an end can be placed in the aforesaid passage at one end of the seam and pushed through to the opposite end of the seam. It has been necessary to weld, braze or otherwise secure the end of the bronze cable to one end of a pilot in the form of a long stiff needle, long enough to extend clear through the seam and to push the needle through the hinge until its end can be grasped at the opposite side and then to draw the cable into the seam. This is inconvenient since each time that a seam is made a needle must be found of sufficient length, it must then be welded to the strand, drawn through the hinge and then cut off after the cable is in place.

The principal objects of this invention are to produce an improved pintle material from which pintles may be made which may be engaged with the hinge seam members without the need of a piloting device, which will be of as good flexibility as the prior pintle materials but of vastly greater stiffness and strength, which will have good bearing qualities such as smoothness and wear-resistance, which will be resistant to such chemical solutions as are normally encountered in the paper-making art, and which will be capable of withstanding the drying heat of the paper-making machinery. Still other objects are to provide a novel method of making seams with the foregoing pintle material.

As herein illustrated the pintle material from which pintles of suitable length for the required width of drying felt may be cut has a stiff flexible core preferably of twisted strands of steel wire laid up cable-fashion and embedded in a

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homogeneous coating of nylon or the like material of such thickness that the outer surface of the nylon cover is smooth, cylindrical and of uniformly greater diameter than the steel cable.

In accordance with the method of making a seam with the foregoing pintle material, the ends of the belt are brought together to enmesh the seam members and hence to produce a clear passage from side to side thereof, a length of the pintle material is pushed through the passage, being stiff enough so that it can be thrust through from one side to the other and the material is then cut off so that short portions project from each side. Thereupon the nylon cover is softened by heating such as with an open match flame and is then pushed along the core to raise a flat, disk-like collar of larger diameter than the body of the pintle close to the edges of the belt which is allowed to set and hence to form a permanent keeper or cap at each end of the pintle to hold the pintle in place. Finally the exposed ends of the core may be cut off flush with the keepers or caps.

The invention will now be described in greater detail with reference to the accompanying drawings wherein:

Fig. 1 is a plan view of a paper-drying felt with a clip-type hinge seam joining its ends and showing the novel pintle element engaged with the clips;

Fig. 2 is an edge view longitudinally of the felt to somewhat larger scale showing the novel pintle in section;

Fig. 3 is a vertical section longitudinally of the felt to larger scale through the parts in which the clips are anchored, omitting the felt;

Fig. 4 is a transverse section through the core material;

Fig. 5 is a plan view of the core material;

Fig. 6 is a cross section of the core embedded within the nylon cover;

Fig. 7 is a plan view of the core embedded within the nylon cover; and

Fig. 8 is a view taken on the line 8—8 of Fig. 3 near one edge of the felt showing the fasteners in section and the pintle in elevation.

In the art of paper making following collection of the paper fibers in a coherent sheet form, for example in a Fourdrinier, the wet fragile sheet is delivered onto paper-making felts and from there to drying felts for movement over steam heated drums which consolidate and dry the sheet. These drying felts are of great length and width and are extremely costly, hence it is desirable to make the hinge seam at their ends

as secure as possible and at the same time flexible so that breakdown and hence damage to the felt is minimized, and also to provide a seam which may be made and/or repaired quickly.

As illustrated in Figs. 1 and 2 the ends of a felt 10 of flexible webbing are brought together and secured by a flexible hinge seam. In order that the upper surface of the felt may be continuous, hence to minimize marking the paper, the seam is constructed by stitching to the under side of one end of the felt parallel to its end but spaced inwardly therefrom two pieces of webbing 12 and 12' of different width laid together with the wider piece 12' next to the felt. The pieces 12 and 12' are selected so as to have selvage edges and are laid together so that the selvages 14 are in registration and toward the end. Corresponding pieces of webbing 18 and 18' having registering selvages 20 are stitched to the opposite end of the felt 10 with their registering selvages 20 parallel to but extending beyond the end of the felt. Wire clips 24 and 26 are then placed along the registering selvages 14 and 20 at regularly spaced intervals, these clips having loops 28 and 30 disposed in spaced parallel planes vertical to the plane of the felt and clinching toes 32 for engagement with the selvages. The clips at the opposite ends of the felt are so arranged that when the ends are brought together, as illustrated in Fig. 2, the clips at the opposite ends may be enmeshed so that their loops 28 and 30 overlap as shown in Fig. 3 to provide a continuous passage from one edge of the felt to the other through which a pintle member 36 may be introduced for joining the ends of the felt.

The drying felts frequently are six to twenty feet wide and heretofore the pintle material used was twisted bronze wire laid up in cable fashion. The softness of the bronze cable made it impossible to push the cable through the passage, hence it was necessary to weld, braze or otherwise fasten the end of the cable to a long stiff flexible steel needle or pilot which was at least as wide as the drying felt, and then to push the needle through the passage, grasp its leading end at the opposite side and then pull the cable through the enmeshed clips to form the hinge. The cable was then cut free of the needle at the farther side and cut free from the supply at the near side.

The foregoing procedure is not wholly satisfactory from the standpoint of making and/or repairing the seam and does not provide an especially satisfactory pintle since there is no good way of securing the ends of the cable after it is introduced into the seam. Moreover the softness of the bronze cable does not provide a very durable hinge nor a very good bearing for the heavy parts.

According to the present invention there is provided a novel pintle material which is of sufficient stiffness so that it may be introduced through the long hinge without a pilot and yet which is flexible enough to give the desired flexibility needed in this type of hinge. Additionally the pintle material is of extremely good bearing qualities, being resistant to wear, to the heat to which it would be exposed in the paper-making processes, to the chemicals which might be encountered, and to moisture. As herein illustrated the pintle material has a flexible steel core 38 (Fig. 4) comprised of seven cables 40 laid up in cable fashion, as shown in Fig. 5. Each of the component cables 40 is comprised of seven steel strands 42 also laid up in cable fashion, and

preferably each of the steel strands 42 is galvanized. Moreover when the steel strands 42 are laid up in cable form they have applied to their surfaces a lubricant. The cable 38 is then coated with nylon or the like material to give it a comparatively thick covering 44. The resulting pintle material 36, as shown in Fig. 7, has a smooth cylindrical surface, is flexible, and yet is stiff enough so that it may be thrust through the passage formed by the over-lapping loops 28 and 30 extending from one side to the other of the belt, that is, through distances of from six to twenty feet, without the need for a pilot. It is to be observed that due to the nylon covering when the material is cut the freshly cut end will not easily fray by separation of the individual strands of the embedded cable, hence it is not necessary to prepare the end of the cable by brazing the end or otherwise treating it to prevent fraying. This, together with the fact that the surface of the nylon is smooth and frictionless, makes it easy to push the material through the long passage with a minimum of effort.

The steel core itself has an outside diameter of approximately 0.045 inch and the coating of nylon on the outside is of sufficient thickness to make the diameter of the coated cable approximately 0.90 inch. The steel cable is eight to ten times as strong as one of the constituent strands of the usual twisted bronze pintle member.

The name "nylon" has been defined as a generic term for any polymer which has recurrent amide groups as an integral part of the polymer chain and which is capable of being formed into filaments in which the structural elements are oriented in the direction of the axis and is used in this sense herein and in the appended claims.

The nylon used for the coating referred to herein is preferably that known as Du Pont's Nylon Type 3003. This is resistant to heat and abrasion and will withstand a temperature of 397° F. While Du Pont Nylon Type 3003 is stipulated because it seems at present to be the most highly resistant to heat and abrasion of any of the nylons available, any of the nylons which have bearing-like qualities are suitable. For example, the synthetic bearing material described in U. S. Patent 2,246,086 granted June 17, 1941 to Paul R. Austin may be used to coat the core. The nylon may be applied in liquid form by coating, dipping and the like, or by extrusion, and when applied will adhere closely to the contour of the core.

In making the seam or joint after the pintle material is furnished, a length thereof is thrust through the aligned clips, it is cut off so as to leave portions thereof projecting from each side of the belt and then these projecting ends are heated, for example by holding a lighted match close to the nylon cover until the latter is soft enough so as to be rolled back or pushed back along the core to form a washer-like rib 46 (Fig. 8) of substantially larger diameter than the body portion of the pintle. The formed-up rib 46 when allowed to cool sets and forms a permanent keeper or cap at each end of the pintle, thus preventing it from working out of the seam. The exposed ends of the core are then cut off flush or nearly flush with the outer sides of the keepers 46. It is to be observed that the melting or softening of the nylon coating with an open match flame is not inconsistent with the statement that the nylon coating is highly resistant to heat made heretofore, since the temperature previously referred to is in the order

of 397° F. while the heat of an open match flame is in the order of 1500° F.

The formation of keepers at the ends of the pintle to hold the pintle in place is preferred, however, it has been observed that after the pintle has been in use for some time the clips wear and/or depress shallow annular grooves in the surface of the nylon cover which in themselves prevent the pintle from working out. Accordingly it is also within the scope of this invention to omit the keepers and rely solely on the aforesaid grooves to hold the pintle in place.

While the pintle material as heretofore described is illustrated for use in making the seam at the ends of paper-drying felts, it is obvious that it has characteristics which make it valuable for use in joining the ends of other endless belts such as conveyor belts or power-transmitting belts, and that if desired it might be used in hinging paper binders, books or other folders, or in fact wherever a multi-knuckle hinge is employed and in particular where the hinge is of considerable width so that the passage through which the pintle must be introduced is of great length.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. A pintle for joining the component parts of a flexible hinge for use in a paper-drying felt, each having a plurality of component parts which when intermeshed form a continuous pintle hole, said pintle comprising a flexible stranded steel core embedded within a homogeneous covering of nylon.

2. A pintle for a flexible clip-type hinge seam for use with a paper-drying felt and constituted by opposed enmeshed clips, comprising a flexible composite structural element adapted to be introduced through the clips to hold the opposed clips in hinged relation, said element consisting of a plurality of steel strands, each laid up in a twist to form a cable, and said cable being embedded within a homogeneous covering of nylon having high resistance to heat and abrasion.

3. A pintle for joining multi-knuckle hinge parts comprising a flexible steel core, a flexible homogeneous coating on said core, the composite outside diameter of the core and coating being of uniform cross section throughout for hinged engagement with the hinge parts, and said coating having at the ends of the pintle, portions of larger diameter than the pintle body serving as keepers to prevent the pintle from working out of the hinge.

4. A paper drying felt of flexible webbing having cooperating ends provided with a plurality of component parts intermeshed to form a continuous pintle hole, and a pintle positioned in said hole and comprising a flexible steel core embedded within a homogeneous covering of nylon.

5. A paper drying felt of flexible webbing having cooperating ends, each end having attached thereto a plurality of clips, the clips of one end being intermeshed with the clips of the adjacent end and forming therewith a flexible pintle hole, and a pintle positioned in said hole and comprising a flexible steel cable embedded within a homogeneous covering of nylon.

6. A paper drying felt of flexible webbing having cooperating ends provided with a plurality of component parts intermeshed to form a continuous pintle hole, and a pintle positioned in said hole and comprising a plurality of steel strands each laid up in a twist to form a cable, and said cable being embedded within a homogeneous covering of nylon having high resistance to heat and abrasion.

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