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[54] **CONVEYORS FOR METAL CLIPS**

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[51] **Int. Cl.** **B65g 15/30**

[58] **Field of Search** 198/189, 201, 196, 198/75, 195, 202, 208, 204

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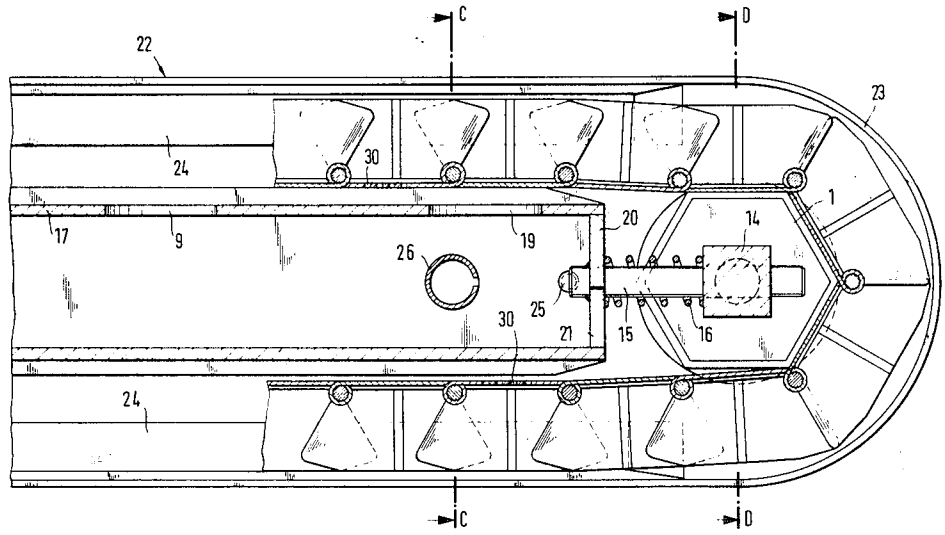
[57] **ABSTRACT**

A conveyor more particularly for metal chips comprises a hinged belt made up of individual plates. The hinged belt is guided around polygonal wheels, against the peripheral faces of which bear the plates whilst being guided, one of the polygonal wheels being arranged to act as the drive wheel. No lateral chains are provided since such are not required.

6 Claims, 10 Drawing Figures



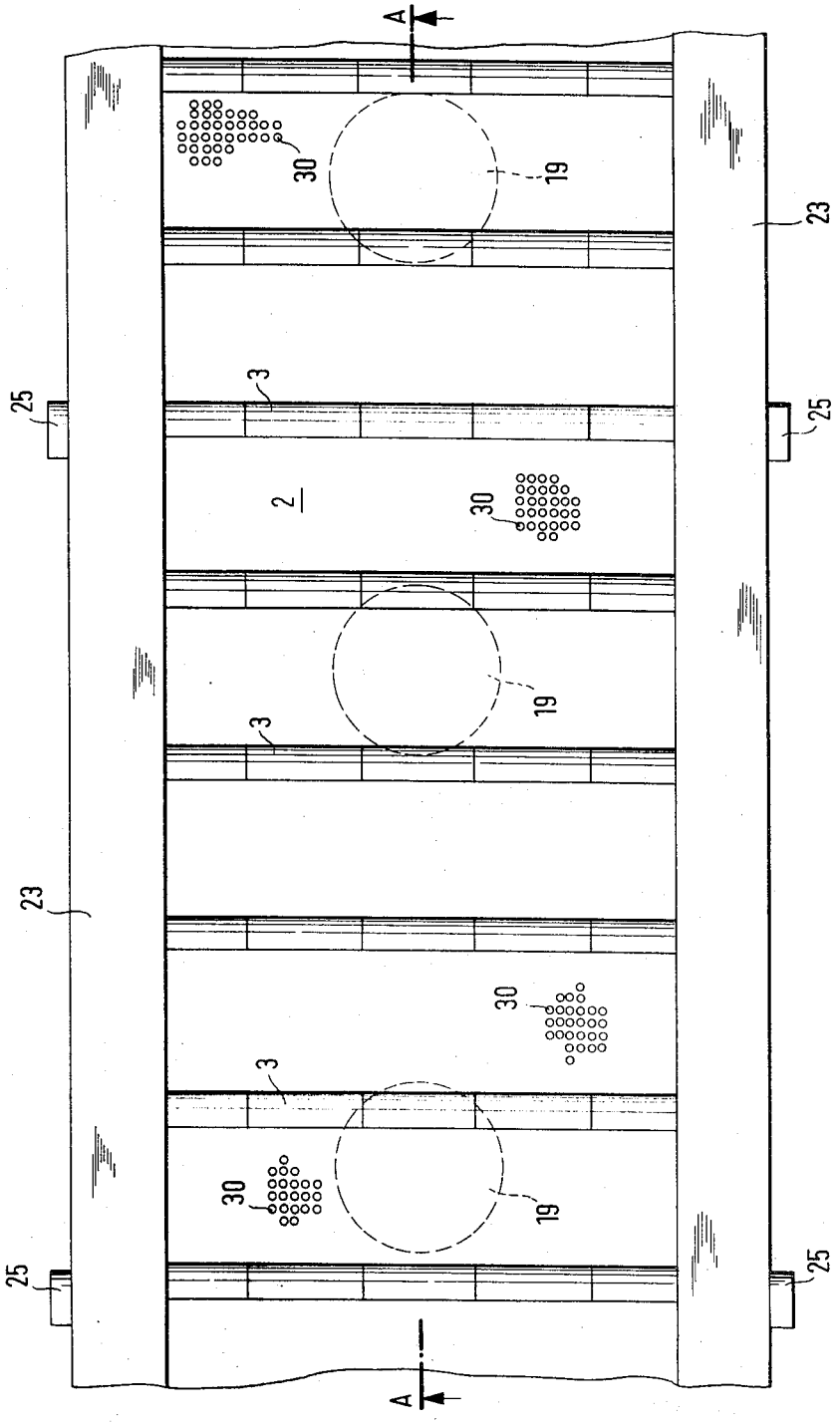


Fig.1

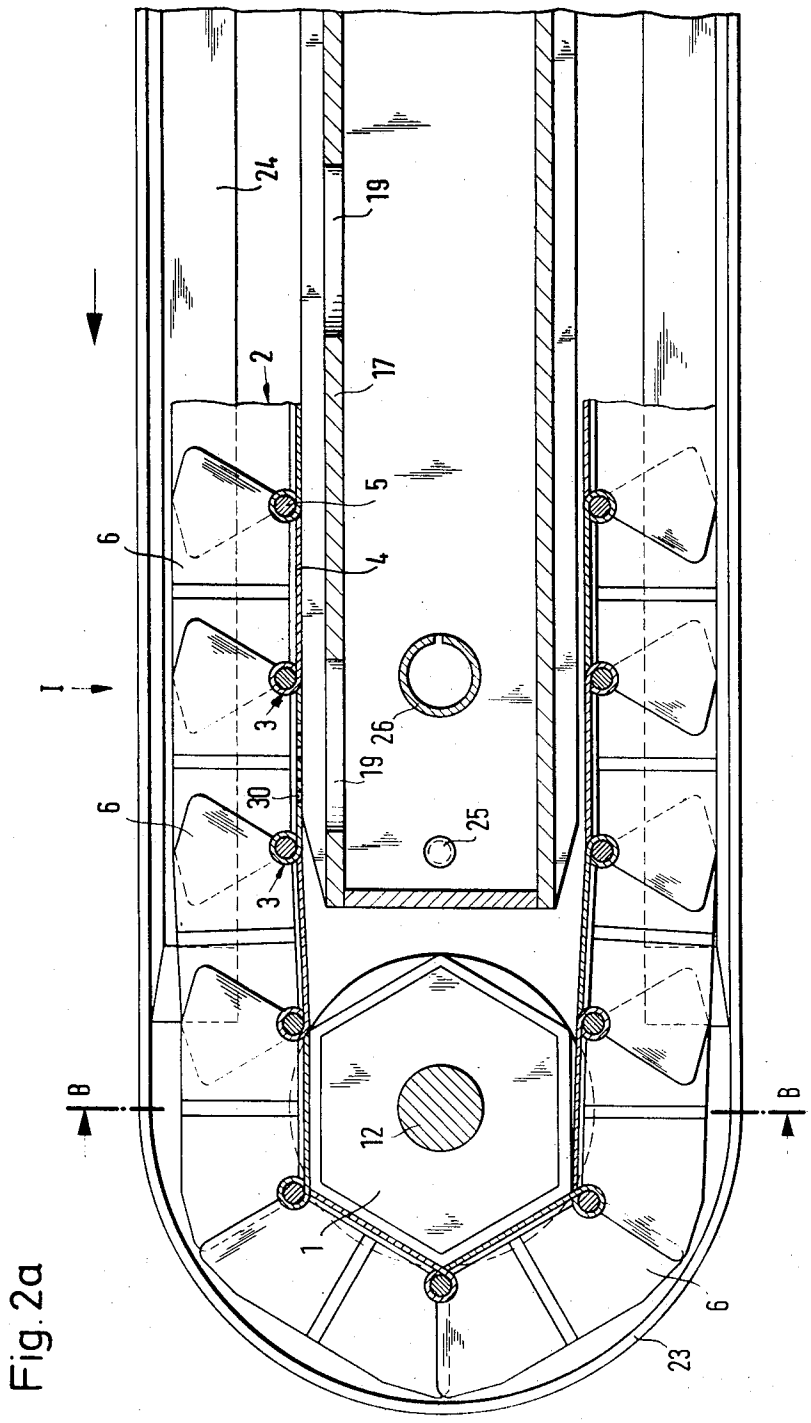


Fig. 2a

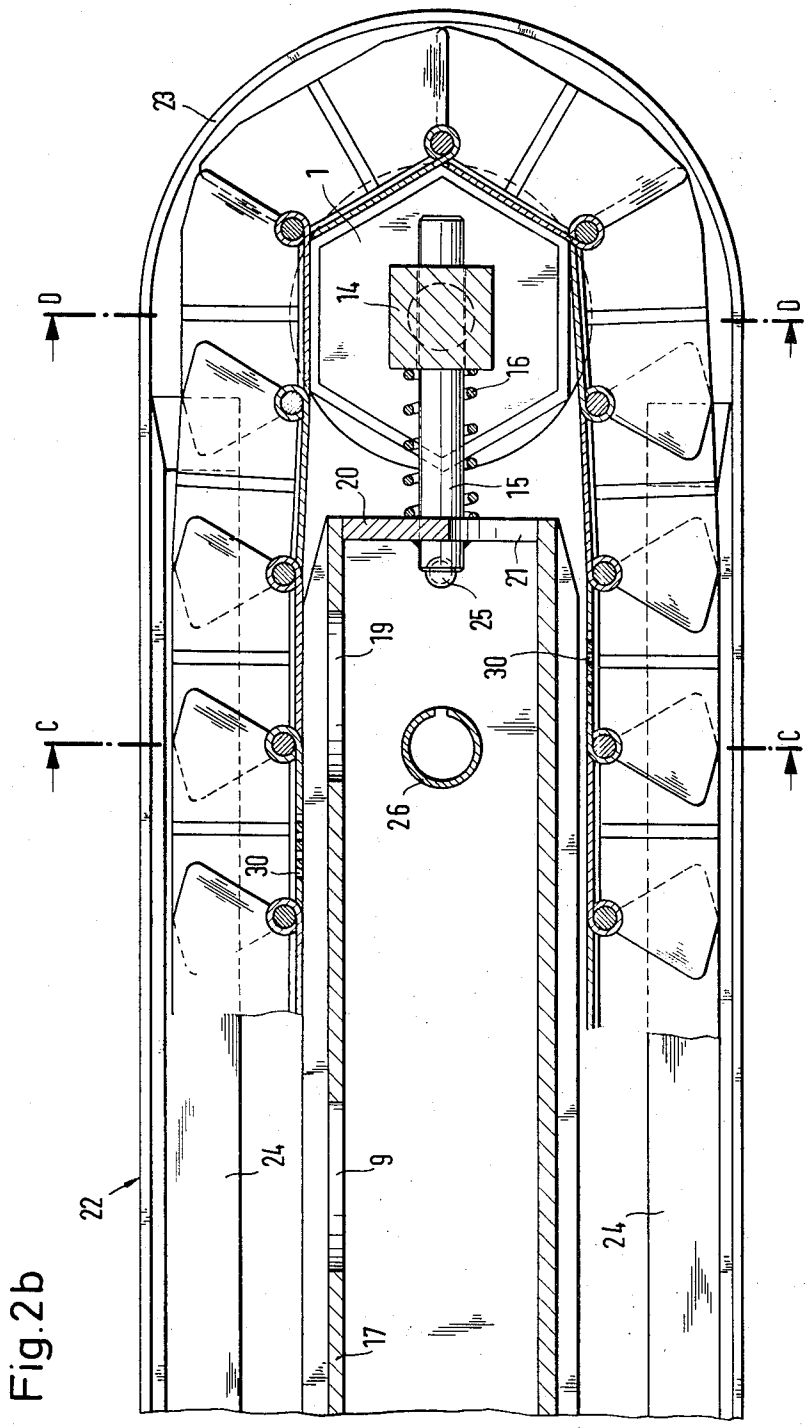


Fig.2b

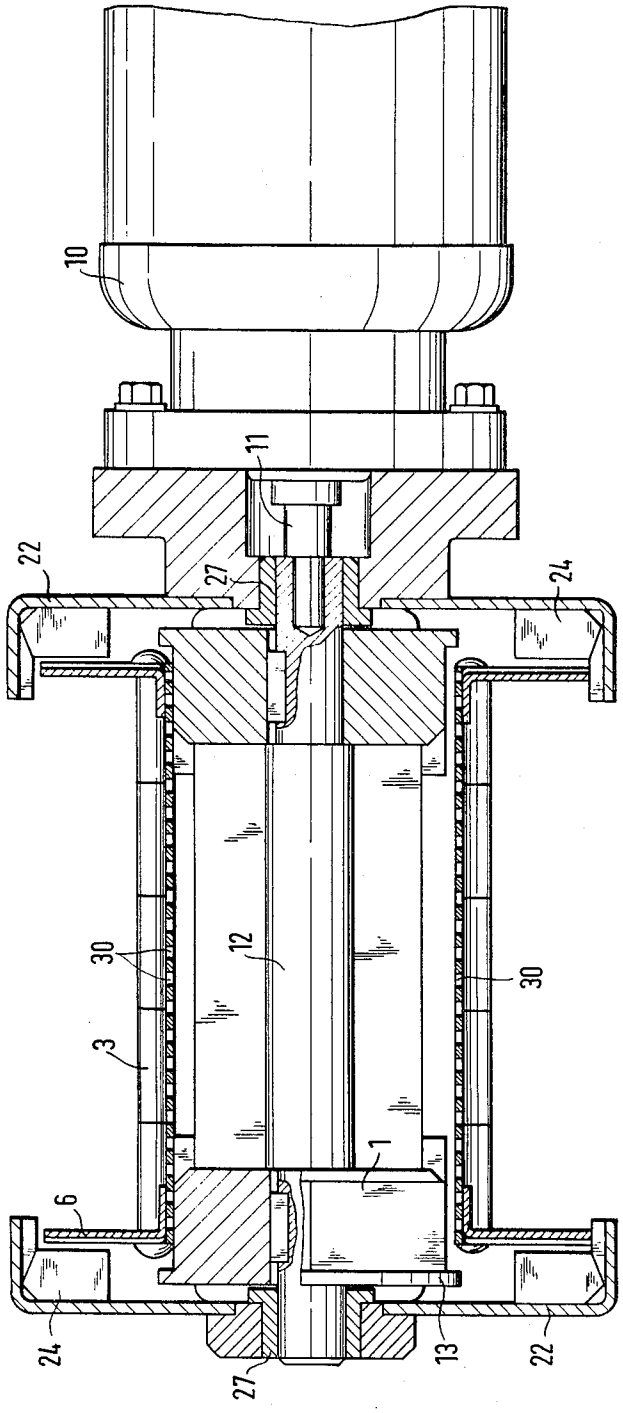


Fig.3

Fig.4

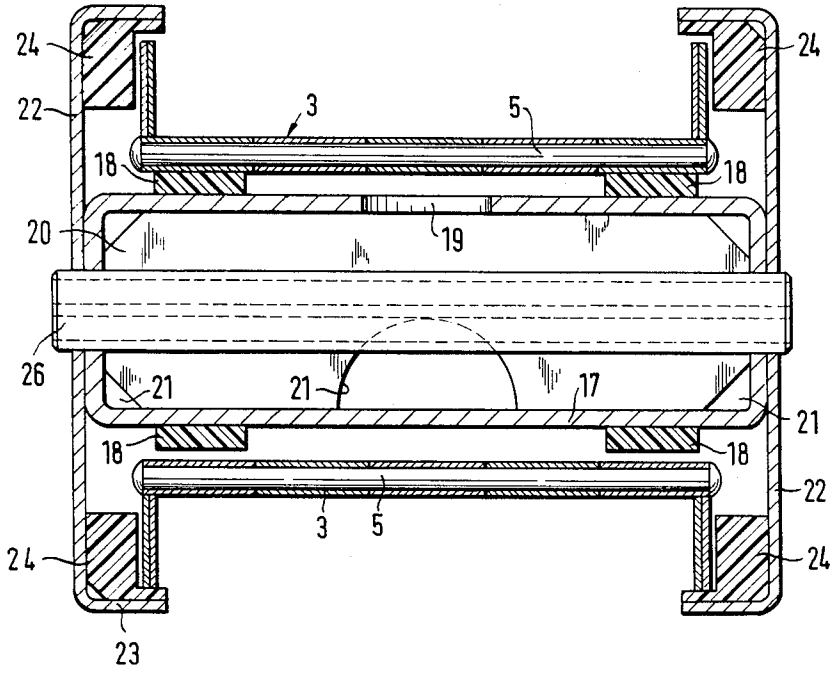
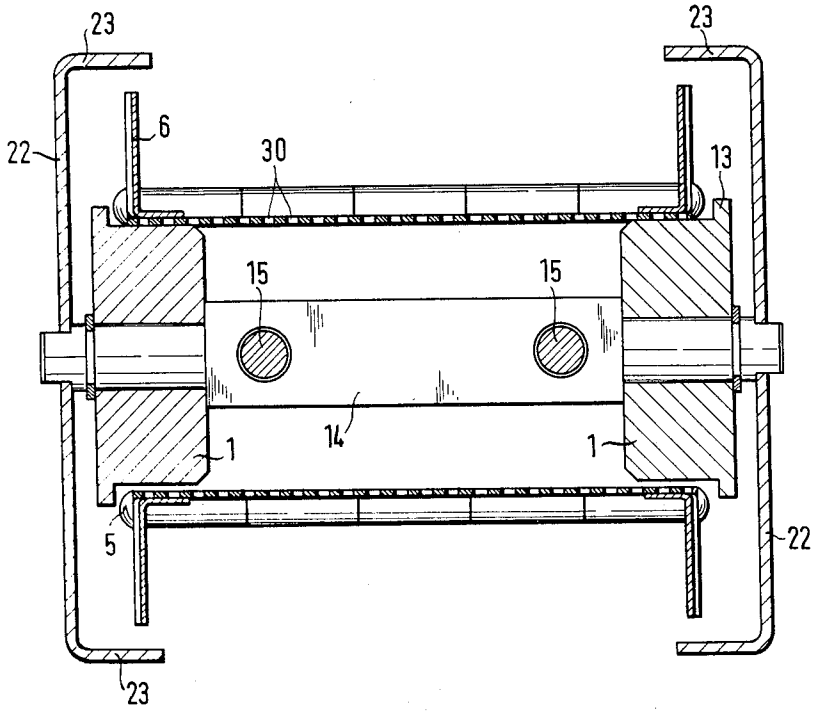


Fig.5



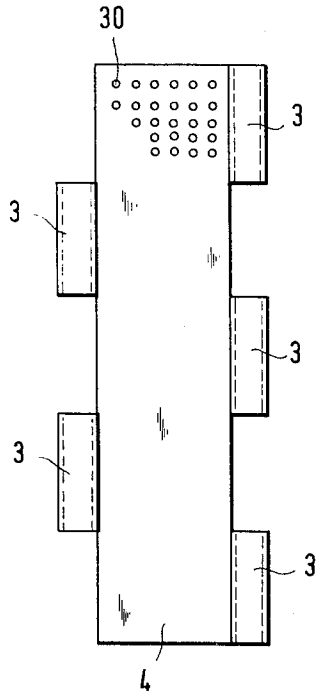


Fig.6a

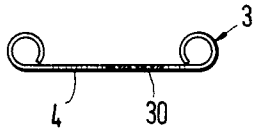


Fig.6b

Fig.7a

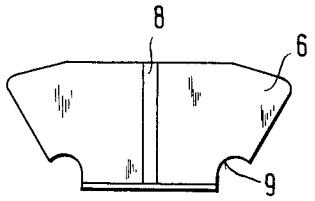
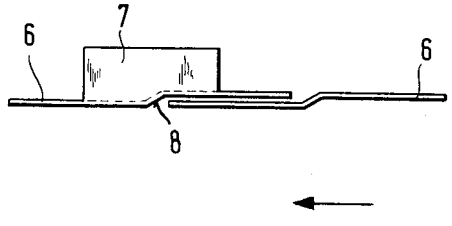


Fig.7b



CONVEYORS FOR METAL CLIPS

BACKGROUND OF INVENTION

This invention relates to a conveyor, more particularly for conveying metal chips or similar fine and bulky objects, the conveyor having a hinged belt which is made up of individual plates and which is drivable via a guide wheel.

In the prior art hinged belt conveyors, chains are disposed along each side of the belt which chains run over matching sprocket wheels at the deflecting places and absorb the tensile force of the belt. The hinged belt is disposed freely between the lateral chains, which are supported by rails over the conveyor length. The hinges of the belt are so constructed that their axes lie in the plane of the plates of which the belt is made up. In these prior art conveyors, a sliding clutch or the like must be provided between the drive motor and the drivewheel as a safety device against overloading. The prior art type of hinged belt conveyors is less suitable for very small conveyors, which can for example be disposed for the automatic removal of the chips at the places they occur, even for fairly small machine tools, for instance, automatic machines for making watch and clock parts, since the prior art type of conveyors is too expensive and takes up too much room.

It is an object of the present invention to provide a conveyor more particularly for conveying metal chips or similar fine and bulky objects, which is simple and therefore relatively cheap and very compact in construction without any significant adverse effect on safety or reliable operation.

According to the present invention there is provided a conveyor for metal chips, having a hinged belt which is made up of individual plates and which can be driven via a guide wheel, the improvement comprising the guiding of the hinged belt around polygonal wheels against whose peripheral faces the individual plates bear while being guided, one of the polygonal wheels acting as the drive wheel.

It will be appreciated that, by employing the present invention, the lateral chains of the prior art conveyors are eliminated, thus cheapening construction, and less space is occupied for the same belt width. To avoid having to provide recesses for the hinges at the places where the peripheral faces of the polygonal wheels meet, in which the hinges engage during deflection, the hinges are preferably so formed on the individual plates that their axes lie above the bearing and conveying faces of the plates, so that the latter from a smooth continuous surface on the opposite side, with which they engage with the polygonal wheels. This is an advantage, since the hinges projecting on the conveying face act as entraining elements.

The conveyor according to the invention is substantially simplified by the utilization of the preferred feature that the idling polygonal wheel is resiliently borne in the longitudinal direction of the conveyor. If a hard chip which might jam the apparatus should get in between the guidewheel and the belt, which as a rule is suitably perforated for the passage of the coolant, such guide wheel can so yield as to shorten the total axial distance between the guide wheels. In this way, the drive-wheel can be directly coupled to a motor without the interposition of a safety clutch. This feature simplifies construction and makes it more compact.

Preferably, a collar for guiding the hinged belt is formed at the outer edges of the polygonal wheels. Between the polygonal wheels the hinged belt may advantageously be borne, at least over the conveying run, on skids along which the individual plates slide. Since the conveyor is preferably to be used for the removal of metal chips in the machining of small components, and is therefore intended for small conveyed quantities, slight loading and relatively short conveying paths, in this embodiment it requires an increased drive performance. Preferably the skids are made of a self-lubricating plastics material, to reduce noise and wear.

To form a U-shaped conveying channel, the individual plates of the hinged belt may be provided with overlapping lateral flanges. So that they overlap also in the deflecting zone and, therefore, prevent metal chips from sliding out at the side, the individual lateral flanges are advantageously substantially trapezoidal, in dependence on the polygonal wheel used, and have in their centre a shoulder extending over their height and are formed at the corners of the short side with recesses receiving the hinges. The lateral flanges also conveniently have bent attaching straps via which they are welded to the individual plates.

To make this structure of the conveyor as closed as possible and help in avoiding accidents, over the length of the hinged belt in the top and bottom runs, the lateral flanges are advantageously provided with a cover consisting of lateral portions of substantially U-shaped cross-section whose bent edges engage over the free edges of the lateral flanges. Advantageously, in the zone of the free edges of the lateral flanges, plastics material strips made, for instance, of nylon are disposed on such lateral portions for sealing off the metal chips and guiding the hinged belt. Advantageously, the plastics material strips are of substantially L-shaped cross-section, one arm being disposed opposite the outside of the lateral flanges, the other arm being disposed opposite their free edge.

According to another preferred feature of the invention, the hinged belt is guided around an elongate box-shaped reinforcement at whose ends the polygonal wheels are disposed and against which the conveying run bears. This construction contributes towards reinforcing the conveyor, but more particularly allows the interception of the coolant passing through the perforations in the hinged belt plates. To this end, skids are disposed closely adjoining one another on the box-shaped reinforcement along the lateral edges, and apertures are provided between the skids below the conveying run; the coolant can flow into the box-shaped structure through the apertures. To avoid the coolant having to flow through the idling run of the hinged belt again when removed from the conveyor, advantageously the box-shaped reinforcement is liquid-tight and is formed laterally with at least one discharge aperture, so that the coolant can readily be drawn off. In this way the chips can quickly be separated from the coolant, thus substantially lengthening the life of an emulsion coolant, as experience has shown.

To simplify assembly and facilitate the cleaning of the conveyor, conveniently the lateral portions which overlap the lateral flanges are releasably attached to the box-shaped reinforcement, for instance, by screws.

DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention and to

show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

FIG. 1 shows a diagrammatic plan view of a conveyor according to the invention,

FIGS. 2*a* and 2*b* show diagrammatical sectional views taken along the line A—A of FIG. 1,

FIG. 3 shows a sectional view taken along the line B—B of FIG. 2*a*,

FIG. 4 shows a sectional view taken along the line C—C of FIG. 2*b*;

FIG. 5 shows a sectional view taken along the line D—D of FIG. 2*b*,

FIGS. 6*a* and 6*b* shows a plan view and a side elevational view of an individual hinged belt plate, and

FIGS. 7*a* and 7*b* show a plan view and a side elevational view of an individual lateral flange.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the conveyor illustrated in FIGS. 1 and 2 may have, for instance, a total length of about 110 cm and a width of about 13 cm. As a result of these very small dimensions, the conveyor can even be used with a small machine tool for the automatic removal of chips at the places where they occur, for instance, in the machining of clock and watch parts and the like.

FIG. 2*a* shows a polygonal wheel 1, which is hexagonal in the embodiment illustrated. A square wheel, for instance, could also be used. Running around the polygonal wheel 1 is a hinged belt 2 made up of individual plates 4 having hinges 3 disposed offset in relation to one another, an individual plate 4 being illustrated in FIG. 6. The plates 4 were punched from wear-resistant steel plate and perforated in known manner for the passage of the coolant and cutting oil. The bent hinges 3 are so constructed that their axes lie above the plate conveying faces and the plates can bear on the underside smoothly against the peripheral faces of the polygonal wheel, as shown in FIG. 2*a*. Extending through each interengaging hinge 3 is a pin 5 pivotably holding together the individual plates 4.

On both sides, each individual plate 4 has a lateral flange 6 welded to the plate via an attaching strap 7. So that the individual lateral flanges 6 can overlap one another, they have substantially in the centre a shoulder 8 extending over their height, so that the individual halves engage in one another without causing local thickening, as shown in detail in FIG. 7. So that the lateral flanges 6 can also overlap in the deflecting zone, they are substantially trapezoidal, the lateral faces enclosing an angle which depends on the kind of polygonal wheel used. In the embodiment illustrated the angle is about 60°. The corners of the shorter side of the lateral edges are formed with recesses 9 to receive the hinges 3. The individual lateral flanges so overlap in relation to the conveying direction (see the arrow in FIG. 7) that the gap formed between the overlapping halves extends from the mouth in the conveying direction, viewed from the inside of the conveying channel. As a whole, the construction of the plates 4 having the lateral flanges produces a relatively tightly closed U-shaped conveying channel in which the projecting hinges 3 act as entraining elements.

FIG. 3 shows a drive motor 10 coupled directly via a step-down transmission to the polygonal wheel 1. As shown in FIG. 3, a pin 11, connected, for instance, to a gearwheel, engages in a matching recess in a shaft 12 on which the polygonal wheel 1 is disposed for rotation, the polygonal wheel 1 being sub-divided in this embodiment into two relatively thin individual wheels. A collar 13 is formed on each of the outer edges of the polygonal wheels 1 for the lateral guidance of the hinged belt 2.

At the opposite end of the conveyor, polygonal wheels constructed in the same manner are rotatably mounted on a fixed pivot 14 (shown in detail in FIG. 5) which can be displaced on two spaced-out pins 15 against the force of compression spring 16 which between the pivot 14 and the anchoring of the pins 15 enclose the latter. As a result, a corresponding tensile force on the hinged belt 2 can displace the pivot 14, together with the polygonal wheels 1 in the conveying direction, thus reducing the axial distance between the two deflecting places. This construction enables the drive motor 10 to be coupled directly to the drive wheel without the interposition of a safety clutch, since if necessary the idling deflecting wheel can yield in the conveying direction.

Disposed between the two deflecting plates is an elongate box-shaped reinforcement 17 (shown in section in FIG. 4). The conveying run of the hinged belt 2 bears against the top of the box-shaped reinforcement 17 via skids attached to the reinforcement bearing tightly thereagainst along the lateral edges of the hinged belt 2. To improve sliding properties and reduce wear, the skids 18 are preferably made of polytetrafluoroethylene or a similar plastics material. Plastics material skids also help to reduce noise. To this end skids of this kind are also disposed on the underside of the reinforcement 17, so that if the idling run starts to oscillate, it knocks against such plastics material skids. More particularly, the box-shaped reinforcement 17 can advantageously catch the coolant 30 flowing through the perforations in the plates 4 and collecting between the skids 18. So that the coolant can get into the box-shaped structure, apertures 19 are provided spaced-out between the skids 18. In the embodiment illustrated, there is provided at the end of the reinforcement 17 a wall 20 (see FIG. 4) to which the pins 15 are welded. So that the coolant can emerge, the wall is formed with apertures 21. Conveniently, however, the end wall 20 is disposed in fluid-tight relationship on the reinforcement 17, which then forms a fluid-tight container having a discharge aperture at its side, so that the coolant can be drawn off without contacting the idling run. In this way the coolant and chips can be quickly and neatly separated.

The conveyor, comprising the reinforcement 17, polygonal wheels 1 and hinged belt 2, is held together by lateral portions 22 extending over the whole conveyor. Mounted in the lateral portions 22 in bushes 27 is the shaft 12 of the drive wheel, while the pivot 14 is disposed in slots (not shown) in the lateral portions 22, so that it can be displaced longitudinally of the conveyor. The lateral portions are attached to the reinforcement 17 by screws 25 and form a cover, the lateral portions 22 being of substantially U-shaped cross-section, so that the bent edges 23, extending around the whole periphery of the lateral portions 22, engage over the free edges of the lateral flanges 6. To prevent chips from getting into the resultant gap, there are disposed in the zone of the free edges of the lateral flanges on such lateral portions plastics material strips 24 of substantially

L-shaped cross-section, one arm of each plastics material strip **24** being disposed opposite the outside of the lateral flanges **6** and, therefore, contributing towards guidance, while the other arm engages to some extent over the lateral flanges and therefore acts as a slideway in the zone of the idling run (see FIG. **4**).

Extending through the lateral portions **22** and the reinforcement **17** in the embodiment illustrated are sleeves **26** in which a fastening pin or the like may be inserted.

The construction described produces a very compact, robust and reliable conveyor which, due to the resilient bearing of one deflecting wheel, can be connected directly to a drive motor without the need for any safety clutch. Moreover, although the construction is compact and self-contained, the coolant can readily be isolated.

Obviously, the present invention is not limited to the specific details as herein described, but is capable of other modifications and changes without departing from the spirit and scope of the appended claims.

I claim:

1. A conveyor including a continuous belt having an inner drive surface and an outer conveying surface, said belt including a plurality of substantially rectangular metal plates having upwardly curved opposite edges providing hinge sockets receiving hinge pins to define hinges for hingedly connecting said plates transversely of said belt, said hinges lying completely on said outer surface so that said inner surface is substantially smooth, a pair of spaced-apart rotatable guide wheels extending transversely of said belt and engaging said drive surface, said wheels having polygonal cross-sectional configurations including flat surfaces for engaging said plates, at least one of said wheels being rotatably driven, means for mounting the other of said wheels for movement toward said one wheel, said mounting means including spring means biasing said other wheel away from said one wheel, whereby said other wheel provides an automatic overload drive release by yielding toward said one wheel, said belt extending around said wheels in an upper run and a lower run, and skid means extending between said wheels for engaging said inner surface of said belt to support said upper run, said wheels including opposite ends having guide collars thereon for guiding said belt.

2. The conveyor of claim **1** wherein said belt has opposite side edges and said conveyor includes a support frame having opposite side frame members including upper and lower flanges overlapping said side edges.

3. The conveyor of claim **2** and including synthetic plastic material strips attached to said flanges between said flanges and said side edges of said belt.

4. The conveyor of claim **3** wherein said side edges of said belt includes side flanges extending upwardly on said outer conveying surface, said flanges including terminal edges and outer surfaces, said plastic material strips having a substantially L-shaped cross-sectional configuration and including portions facing said terminal edges and outer surfaces of said side flanges.

5. The conveyor of claim **4** wherein said belt has perforations therein for allowing coolant liquid to flow through said belt, and including a box-like trough member positioned between said upper and lower runs and opening upwardly for receiving coolant liquid flowing through said upper run.

6. The conveyor of claim **5** wherein said trough member includes a side outlet opening.

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