Dec. 24, 1968 A. SCHMID 3,417,992

ALIGNING AND TRANSPORT MECHANISM FOR CABLELESS BOWLING PIN SETTING MACHINES

Filed Nov. 4, 1964 3 Sheets-Sheet 1

Fig. 1

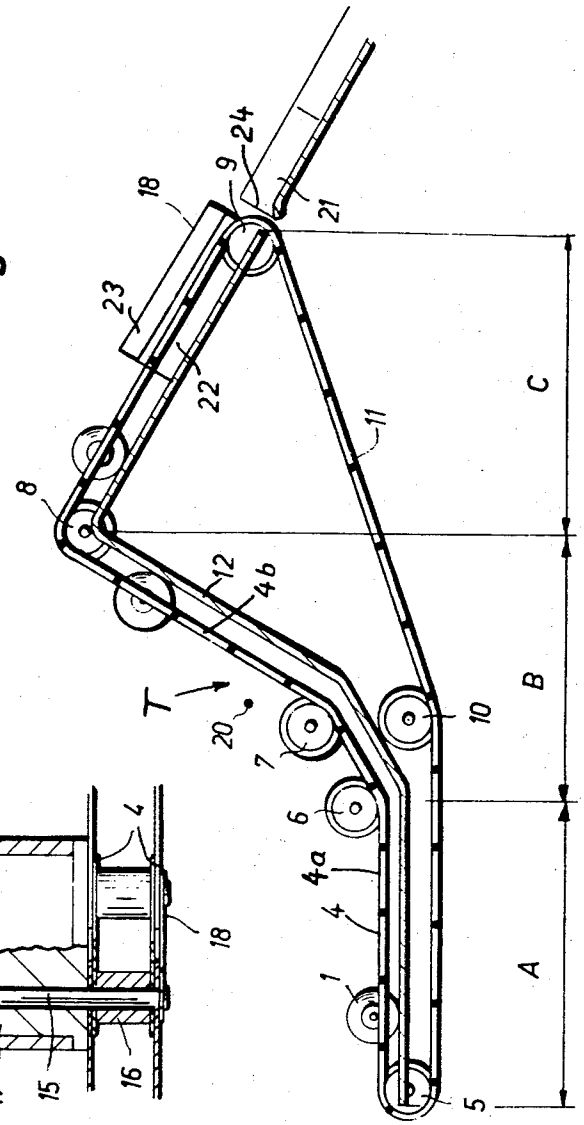

Fig. 2

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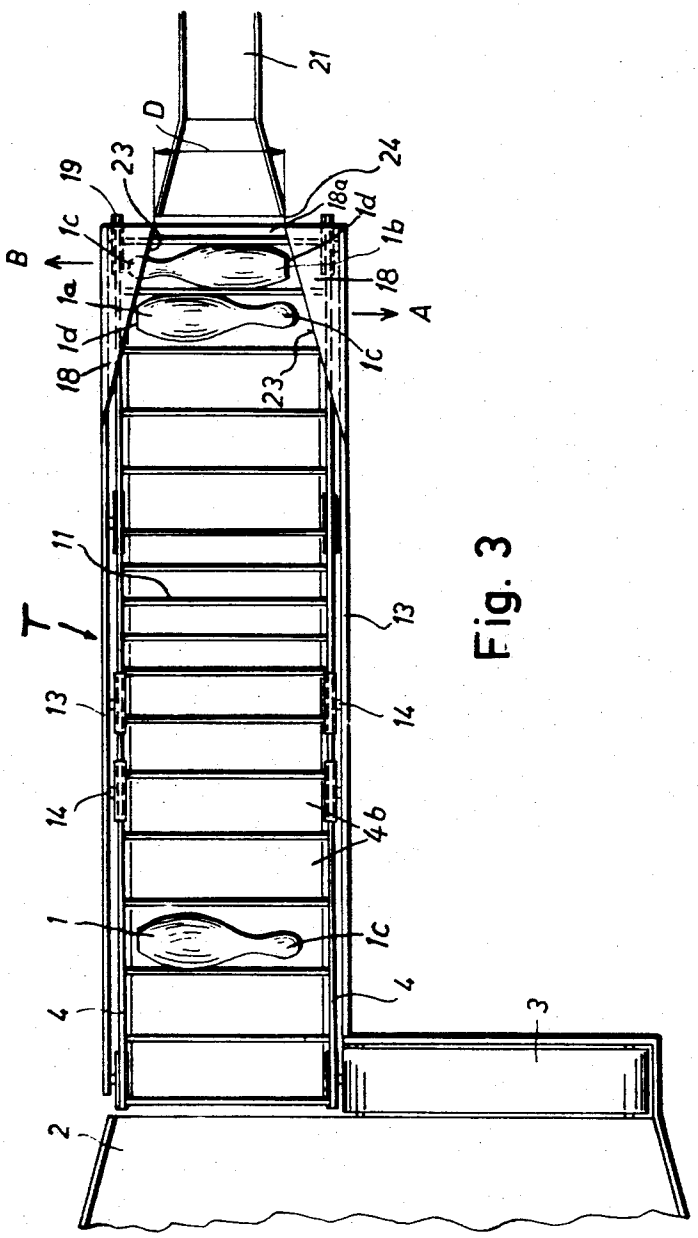

Fig. 3

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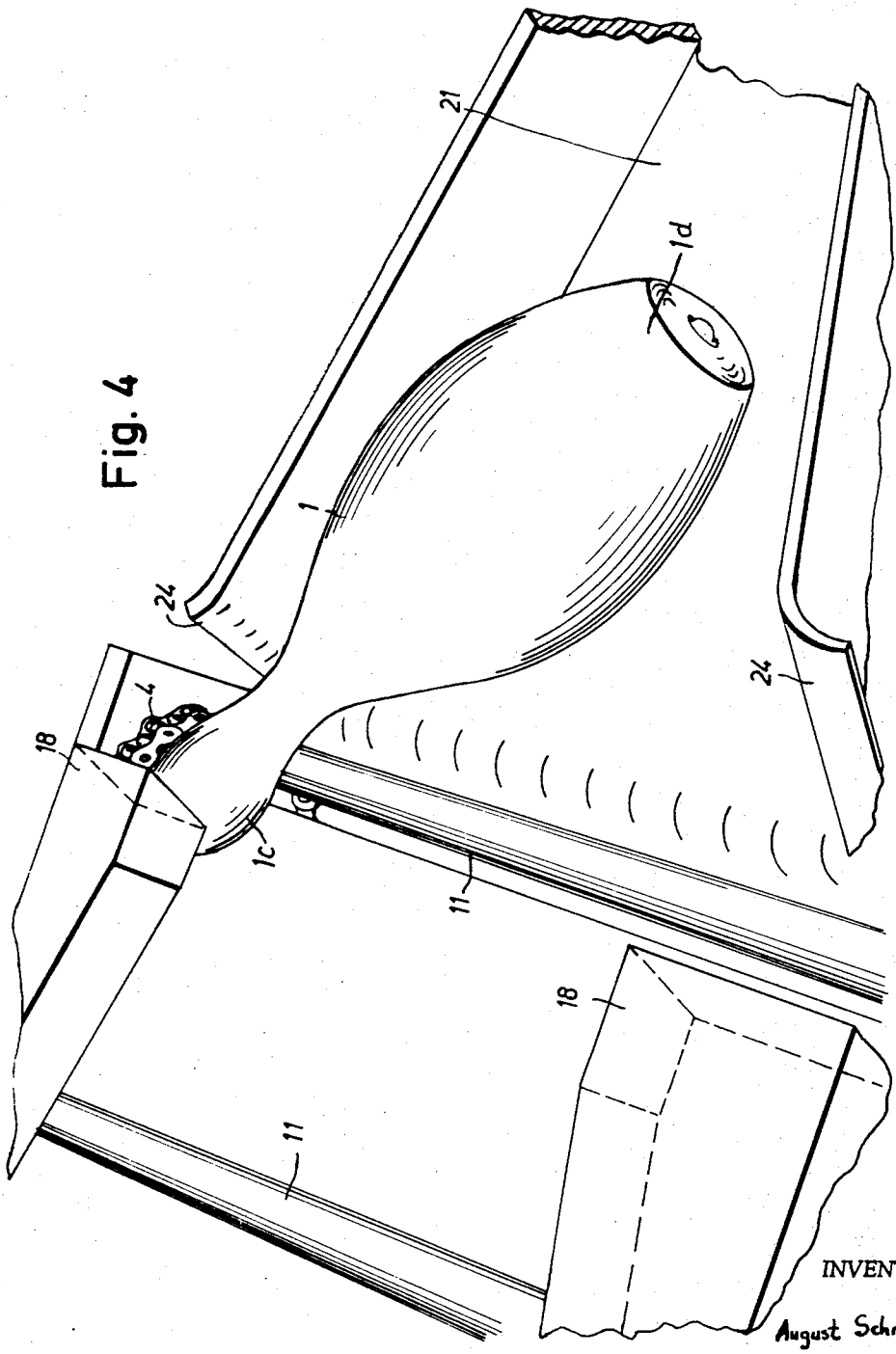
Fig. 4



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3,417,992

ALIGNING AND TRANSPORT MECHANISM FOR CABLELESS BOWLING PIN SETTING MACHINES

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Claims priority, application Switzerland, Nov. 11, 1963, 13,802/63
5 Claims. (Cl. 273—43)

ABSTRACT OF THE DISCLOSURE

An aligning and transport mechanism for cableless bowling pin setting machines incorporating bowling pin conveying means formed of a pair of endless spaced conveying means formed of a pair of endless spaced conveyor elements, such as conveyor chains, which are guided through a predetermined path of travel. Extending between the spaced and substantially parallel conveyor chains are a plurality of transverse bars between each two adjacent pair of which there can be supported a bowling pin. A base plate is disposed beneath the conveyor chains at a suitable distance. The base plate successively includes in the direction of travel of the bowling pins a substantially horizontal portion which is in substantial parallelism with the conveyor chains, an upwardly inclined ascending portion and a merging downwardly inclined descending portion.

The present invention has reference to an improved aligning and transport mechanism for cableless automatic bowling pin setting machines.

In such type bowling pin setting machines the randomly positioned knocked-down pins or deadwood are raised, thereafter aligned in the same direction and then deposited in a bowling pin reservoir or magazine, whereafter there occurs placing of the bowling pins in correct position upon the pin spotting section of the bowling alley.

The present invention, therefore, has as one of its primary objects to provide a relatively simple and operationally reliable apparatus for aligning in a common direction the bowling pins and for further conveying the same after they have been raised by a lifting mechanism.

Another important object of the present invention has reference to an improved aligning and transport mechanism for arranging the bowling pins in a predetermined direction in a highly reliable and positive manner, with further conveyance of these pins being prevented until each has assumed its proper position.

Still a further important object of this invention is directed to the provision of an improved mechanism for aligning and transporting bowling pins to a handling station, such mechanism incorporating means which continually act upon each bowling pin which is ot properly positioned such that such pin is repeatedly subjected to a tumbling action until it assumes the position required for further conveyance, whereupon such pin is then transported to the next handling station.

Yet another significant object of the present invention is directed to an improved aligning and transport mechanism for bowling pins which is relatively simple in construction, highly reliable in operation, economical to manufacture, and which incorporates means ensuring for the proper alignment of the pins before such are transported to a subsequent handling station as well as means for acting upon the pins such that they move into the handling station in a predetermined position.

The aforementioned objects are generally achieved

through the provision of the inventive aligning and transport mechanism which is manifested by the features that, there are provided two substantially parallel, spaced arranged, conveyor elements, for instance endless chains or bands, between which there are spacedly arranged at the periphery of these conveyor elements a plurality of transverse rods or bars. Furthermore, there are provided deflecting elements, for example deflecting gears or rollers, over which the chains or bands are guided over at least a portion of their length in a direction substantially parallel to a base plate, whereby the bowling pins which arrive in random position come to rest between the spaced transverse bars, and at least a portion of the base plate scends in order ot eject those bowling pins where the longitudinal axis thereof does not extend approximately parallel to the transverse bars.

Other features, objects and advantages of the invention will become apparent by reference to the following detailed description and drawings in which:

FIGURE 1 schematically illustrates a vertical cross-sectional view through the inventive aligning and transport mechanism for bowling pins;

FIGURE 2 is an enlarged cross-sectional view through the point of connection of a transverse bar to a conveyor chain;

FIGURE 3 is a top-plan view of the aligning and transport mechanism for bowling pins depicted in FIGURE 1; and

FIGURE 4 is an enlarged perspective view showing details of the portion of the aligning and transport mechanism of FIGURE 1 which ejects the bowling pins in proper position into the next handling station.

Describing now the drawings it will be understood that the inventive aligning and transport mechanism for bowling pins constitutes a portion of a cableless automatic pin setting machine and essentially serves to align in the same direction the bowling pins which, after their conveyance by a lifting mechanism, appear in random orientation. The details of the lifting mechanism used for raising the knocked-down bowling pins or deadwood swept-off the bowling alley are not important to the understanding of the present invention, yet reference may be had to my co-pending United States application, Ser. No. 408,846, filed Nov. 4, 1964, entitled "Lifting Mechanism For Automatic Pin Setting Machines", now abandoned, and in which there is described a lifting mechanism suitable for use in conjunction with the inventive algning and transport mechansm.

It will be further appreciated that this aligning and transport mechanism is generally located at the rear end of the bowling alley above the pin spotting section. Furthermore, under the term "cableless pin setting machine" there is to be understood such an installation in which, after the bowling of the ball, the pins are not raised by means of cables, rather without cables are transported upwardly by means of the aforementioned lifting mechanism or elevator and from above are deposited at their predetermined location.

Considering now specifically FIGURES 1 and 3, it will be seen that the bowling pins **1** are raised in lying position by means of a non-illustrated lifting mechanism and continuously arrive via a chute **2** in random orientation at the inventive aligning and transport mechanism, generally designated by reference character T. Since this chute **2** is considerably wider than the transport mechanism T, as best seen by referring to FIGURE 3, an endless, substantially horizontally arranged conveyor band **3** or the like is located at the region of one end of the chute **2** which feeds the downwardly sliding or rolling bowling pins **1** in a direction towards the aforesaid transport mechanism T.

This aligning and transport mechanism T will be seen to embody two spaced, endless conveyor elements, in this case endless chains **4**, which are guided about a plurality of deflecting elements, such as deflecting gears **5** to **10**. Between these conveyor chains **4** and throughout their entire periphery there are connected thereto a plurality of transverse bars or rods **11** extending in parallelism with one another. The length of such bars **11** is somewhat larger than the length of the pins **1**, the mutual spacing between any two neighboring bars **11** being somewhat larger than the greatest thickness or diameter of the aforesaid bowling pins. A base or floor plate member **12**, arranged substantially parallel to the upper runs **4***a* of the chains **4** and somewhat beneath the latter is provided in order that the pins **1** to be transported can tumble or roll therefrom or bear thereagainst, respectively, as will be more fully explained shortly.

The inventive aligning and transport mechanism T can be considered to incorporate three sections, namely a section A neighboring the chute **2** where the base plate **12** extends in substantially horizontal direction, a section B where the base plate **12** ascends from the bottom to the top, and finally a section C where the base plate **12** descends from the top to the bottom. Moreover, the spacing of this base plate **12** from the transverse bars **11** approximately corresponds to half the diameter of a bowling pin **1**, measured at its largest diameter or thickest location.

The attachment of the individual transverse bars **11** to the mutually spaced and substantially in parallelism guided conveyor elements e.g. chains **4**, is more clearly depicted in FIGURE 2. Here, it will be seen that the chain bolts **15** project laterally past the chain rollers **16** and piercingly extend through a guide plate **17** over which the respective hollow transverse bar **11** is pushed. At both ends of the respective chain bolts **15** there is located a suitable chain lock or securing device **18** in order to safeguard against axial displacement.

The deflecting gears or rollers **5** to **10** for the chains **4** are rotatably mounted in a frame **13** through the intermediary of bolt means **14**, with one of these deflecting gears being operatively connected with a suitable drive motor (not shown) in order to drive the chains **4**. A respective plank- or board-shaped holder or support member **18** which is rigidly connected with the frame **13** or else with another suitable stationary member, is located above and in the region of the respective ends of the revolving transverse bars **11** at the location of the rearmost deflecting gear **9**.

When viewed from the top, and as best illustrated in FIGURE 3, each such holder **18** is advantageously of triangular configuration and extends past the head **1***c* of the bowling pins **1** passing therebeneath. On the other hand, these holder members **18** are spaced at such a distance from the base plate **12** that the foot or base **1***d* of the pins **1** cannot move beneath these holder members **18**, rather bears against the associated inclined surface **23** thereof, whereby the head **1***a* of each such bowling pin **1** is pushed beneath the overlying holder member **18** in the event this head **1***c* is not already located in this desired position. Consequently, the spacing D between the confronting holder members **18** at the outlet end **18***a* of the transport mechanism T is smaller than the length of the pins **1**.

While keeping the foregoing description in mind, the mode of operation of the described aligning and transport mechanism T of the subject invention will now be considered:

The bowling pins **1** which are continuously raised by the non-illustrated lifting mechanism or elevator, or equivalent expedient, arrive at the chute **2** and from the latter come either directly into the aligning and transport mechanism T, or, however, are conveyed towards such in random orientation by means of the approximately horizontal conveyor band **3**. In so doing, the

bowling pins **1** come to rest in the openings or compartments **4***b* formed between the neighboring spaced transverse bars **11** and bear against the base plate **12**. Such positioning of the bowling pins **1** is only possible with those pins whose lengthwise axis is essentially parallel to the longitudinal direction of the transverse bars **11**. Those randomly incoming pins **1** which lie transversely with regard to the lengthwise axis of the transverse bars **11** cannot initially move into the openings **4***b* between such bars, thus roll for such time upon the remaining pins **1** and the transverse bars **11** until they likewise assume a position in which they are carried along by these aforesaid transverse bars.

Since the chains **4** together with the transverse bars **11** are continuously moved in the section A of the described transport mechanism T there takes place an entrainment of such pins **1** which lie in the spacing or openings **4***b* between these transverse bars **11**. In so doing, it is irrelevant whether the bowling pins **1** lie head to head next to one another, or if one pin has its head **1***c* lying next to the base **1***d* of an adjacent pin (see FIGURE 3). What is important is that their respective lengthwise axes lie approximately parallel to one another and to the transverse bars **11**, and further that the pins **1** do not laterally extend past the chains **4**.

In the section B of the aligning and transport mechanism T in which the base plate **12** is inclined with respect to the horizontal, all those pins **1** are thrown-off which are not located in proper position between the transverse bars **11**. This so-called throwing-off or tumbling operation is still further supported by means of an elastic cable or band **20** possessing a somewhat larger spacing from the base plate **12**—measured at right angles to the latter—than the largest thickness or diameter of the pins **1**. The inclination of the base plate **12** with respect to the horizontal lies between approximately 45° and 85°, preferably amuonting to approximately 65°. This angle is selected in dependence upon the diameter of the pins **1** and the spacing of the transverse bars **11** from the base plate **12**, wehreby there is desired that those bowling pins are positively thrown-off which lie in inclined position between or upon the transverse bars **11** or extend laterally past the chains **4**.

In the subsequent section C of the transport mechanism T the pins **1**, which now are all disposed in correct position between the transverse bars **11**, are again downwardly conveyed, with the head **1***c* of each such pin arriving beneath one of the holder members **18** at the discharge zone of such transport mechanism T. Assuming correct positioning of the pins **1** at the section C there appears a small intermediate compartment or spacing between each of the holder members **18** and the associated pin heads **1***c*, so that each such pin head does not clamp between this holder member and the base plate **12**. It will further be appreciated that since two holder members **18** are provided it does not make any difference whether neighboring pins are arranged head to head or foot to head.

Now, as soon as that transverse bar **11** against which the pin **1** bears starts to rotate about the deflecting gear **9** then the central portion of the pin **1** is freed, whereby the latter strives to roll or fall into the exit chute **21**. On the other hand, the head **1***c* of the pin **1** is initially still fixedly held or clamped between the associated holder member **18** and the transverse bar **11**, as best depicted in FIGURE 4. Only after the chains **4** and therewith the transverse bar **11** have moved further through a small path will the head **1***a* of such pin also be released, so that this pin can then, with its foot or base **1***d* leading, fall into the exit chute **21**. The same operation occurs if a pin is located in the opposite position, that is, turned through an angle of substantially 180°, between the transverse bars **11**. In this event clamping of the head **1***c* of this pin takes place by means of the other of these two holder members **18**. It will be appreciated that by virtue of this

arrangement there is always ensured that each pin 1, with its base 1*d* leading, falls into the exit chute 21 and, thus, is properly aligned to reach a further handling station, for instance, a bowling pin reservoir or magazine.

While there is shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practised within the scope of the following claims.

What is claimed is:

1. Aligning and transport mechanism for the bowling pins of a cableless automatic pin setting machine comprising, in combination, a pair of substantially parallel, spaced, endless conveyor elements in the form of conveyor chains, a plurality of spacedly arranged transverse bars operatively connected between and with said conveyor chains, a base plate cooperating with said transverse bars, said base plate successively including an upwardly inclined ascending portion and an oppositely inclined descending portion, deflecting means for guiding said conveyor elements over at least a portion of their length approximately parallel to said base plate, said deflecting means incorporating sprocket wheels, each two neighboring spaced transverse bars providing a pin receiving opening therebetween for the receipt of a bowling pin, the bowling pins which are in random orientation each coming to rest in a respective pin receiving opening between two neighboring transverse bars and said base plate, said aligning and transport mechanism successively including a pin receiving section, an intermediate section incorporating said inclined ascending portion of said base plate, and a pin delivery section incorporating said oppositely inclined descending portion of said base plate, said ascending portion of said base plate enclosing an angle with respect to the horizontal which is less than 90° and extending through said intermediate section, said ascending portion serving for the ejection of all bowling pins whose lengthwise axis is not disposed substantially parallel to said transverse bars, means provided at said pin delivery section for insuring that each bowling pin will fall away from said pin delivery section with its base portion leading, a chute member cooperating with said pin delivery section for receiving the falling bowling pins, said ensuring means at said pin delivery section incorporating a respective projecting member spacedly arranged above each end of said transverse bars passing therebeneath and extending over the head of bowling pins passing therebeneath, each projecting member being provided with an inclined surface cooperable with the base of a bowling pin in order to push the base of this bowling pin away from the edge of the conveying device, the minimum spacing between the respective projecting members being less than the length of a bowling pin, whereby said bowling pin falls base first into said chute member.

2. An aligning and transport mechanism as defined in claim 1, wherein said base plate includes a substantially horizontal extending portion which is in parallelism with said conveyor chains disposed before said upwardly inclined ascending portion in the direction of conveyor travel, said pin receiving section incorporating said horizontally extending portion of said base plate.

3. An aligning and transport mechanism as defined in claim 2, wherein said inclined surface of each said projecting member comprising said ensuring means further serves to push the head of the bowling pin beneath the opposite projecting member.

4. Aligning and transport mechanism as defined in claim 1 further including at least one elastic member comprising an element disposed at the region of the start of said ascending inclined portion and above said transverse bars for assisting the throwing-off of non-correctly positioned bowling pins from said transverse bars.

5. An aligning and transport mechanism as defined in claim 1, wherein the angle of inclination of said ascending inclined portion is approximately between 45° and 85° with respect to the horizontal, and wherein said descending inclined portion possesses an inclination of less than 85° with respect to the horizontal.

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