United States Patent [19]

Williams

[11] **3,871,809**

[45] **Mar. 18, 1975**

[54] **EXTERNAL SWIVEL CONNECTIONS FOR CORRUGATING MACHINE**

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[52] **U.S. Cl.** **425/370,** 425/336, 425/396, 198/175

[51] **Int. Cl.** **B29c 15/00**

[58] **Field of Search** 425/336, 370, 396, 369; 198/175

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Primary Examiner—Robert L. Spicer, Jr.
Attorney, Agent, or Firm—William W. Haefliger

[57] **ABSTRACT**

A corrugating machine includes a series of longitudinally axially elongated rods and two generally parallel chains, and means interconnecting the ends of the rods with chain links of the two chains so that the rod ends can swivel relative to the links to which they are connected, and including a universal joint between each rod end and associated link, the joint including a member having axially slidable telescopic connection with the rod end.

7 Claims, 6 Drawing Figures

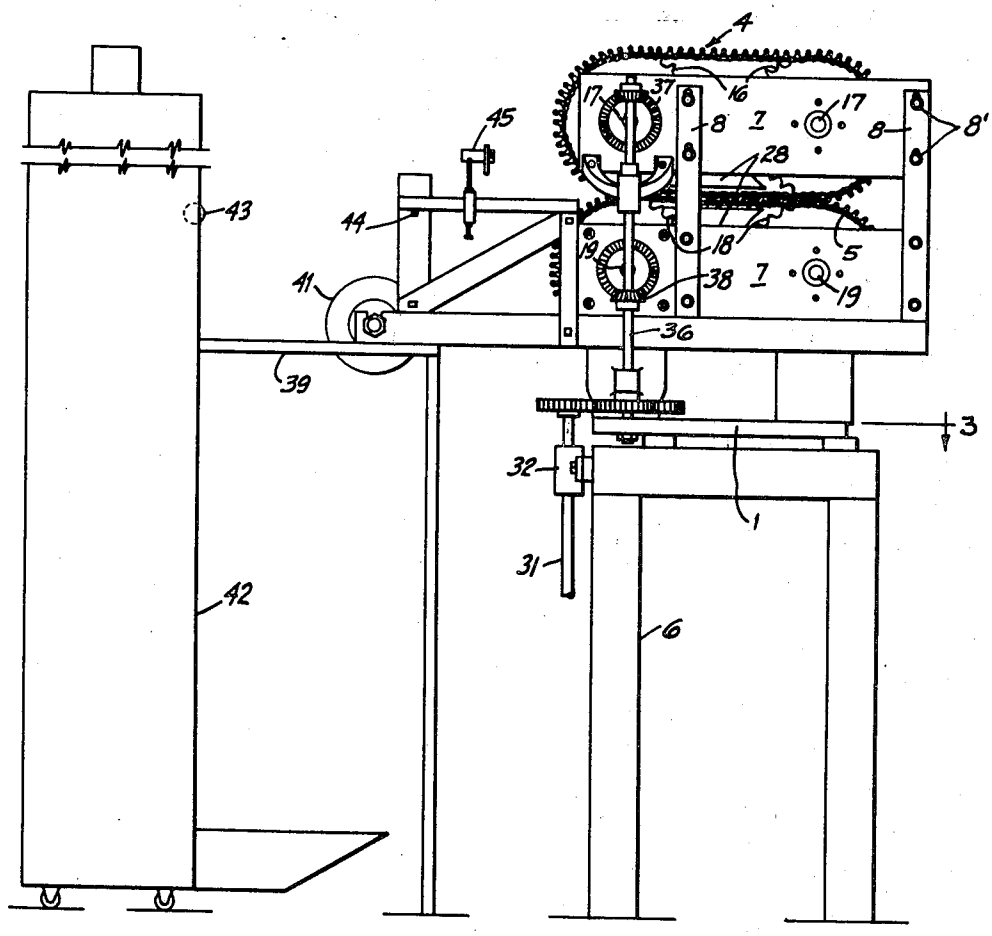


FIG. 2.

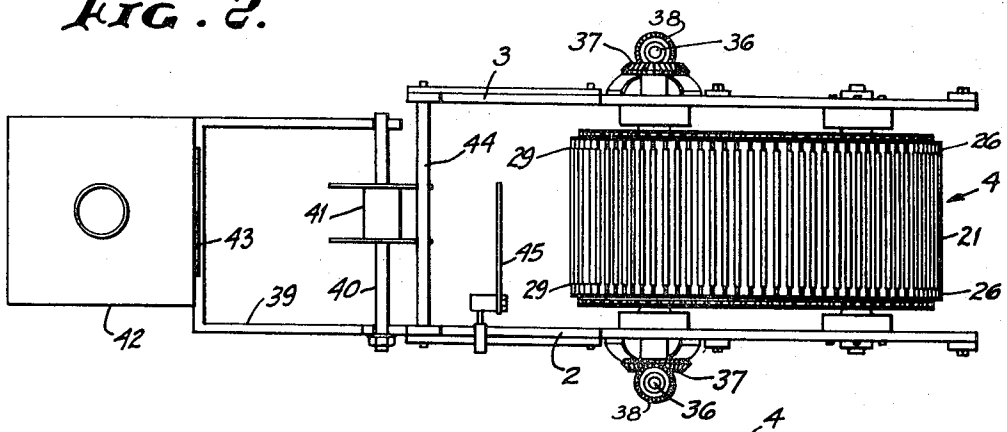

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FIG. 1.

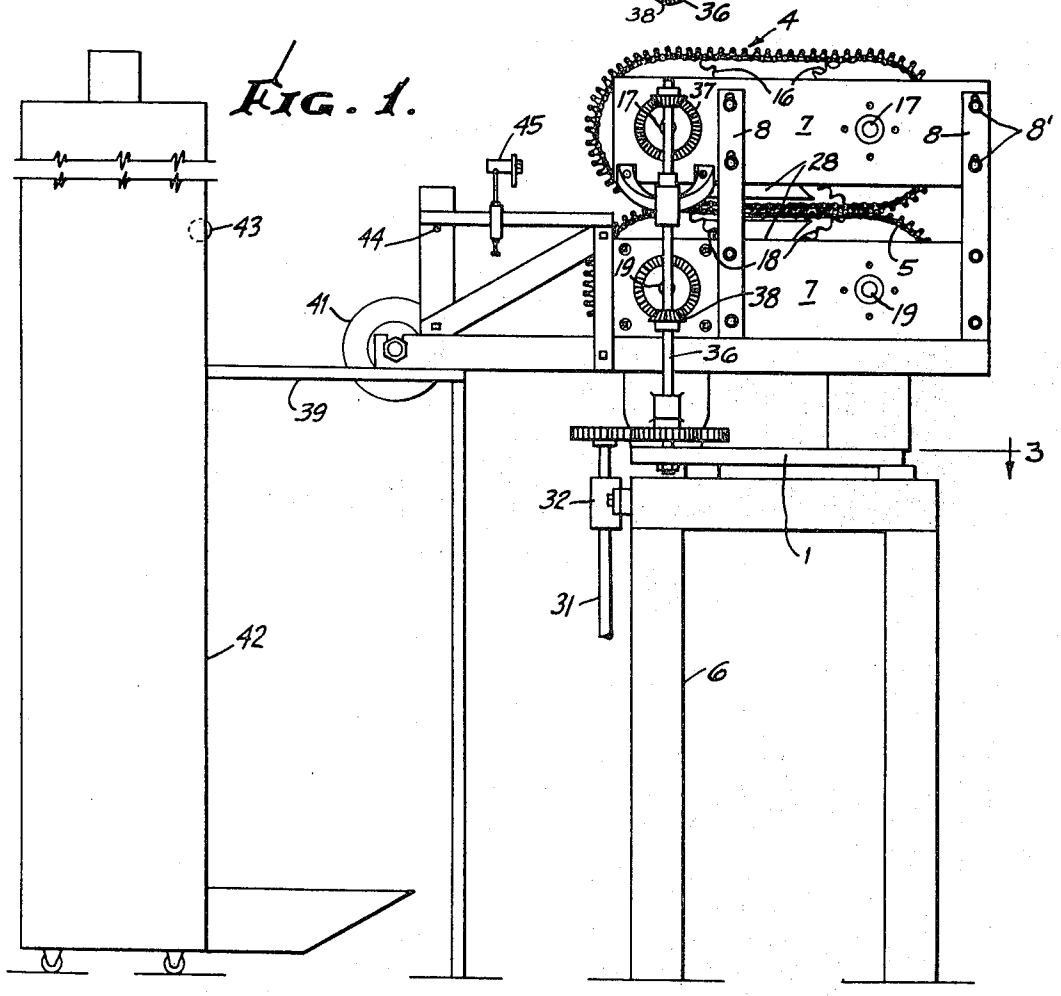

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16
17
8
7
8'
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44
19
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41
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32
1
31
42
6

FIG. 3.

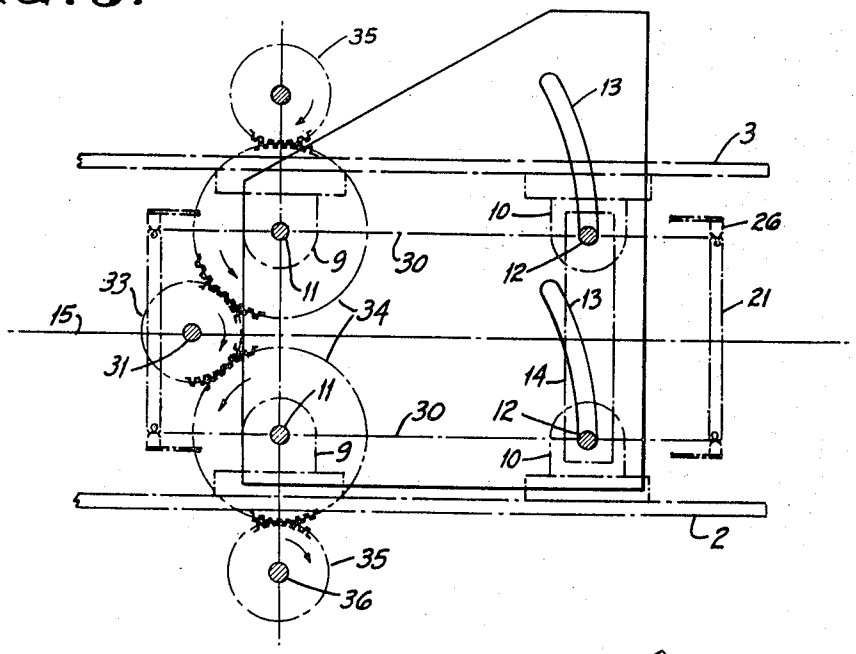

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FIG. 4.

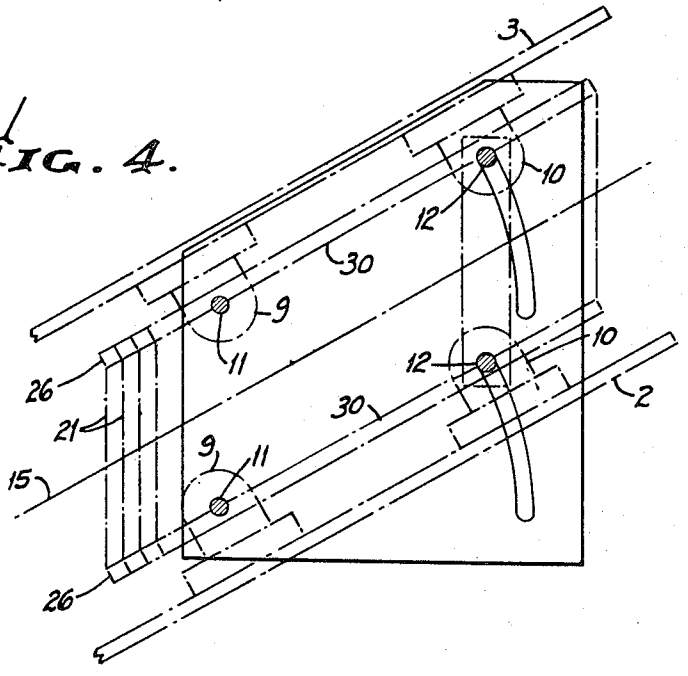

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FIG. 5.

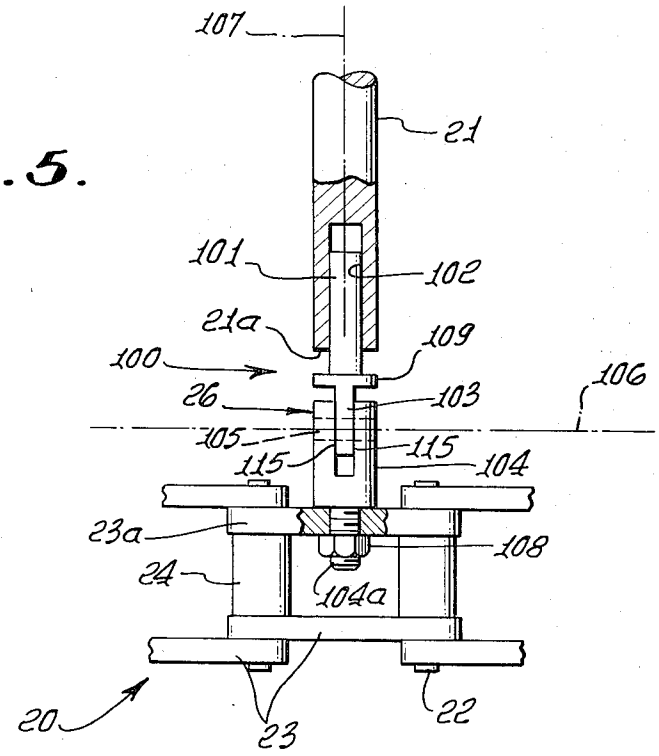
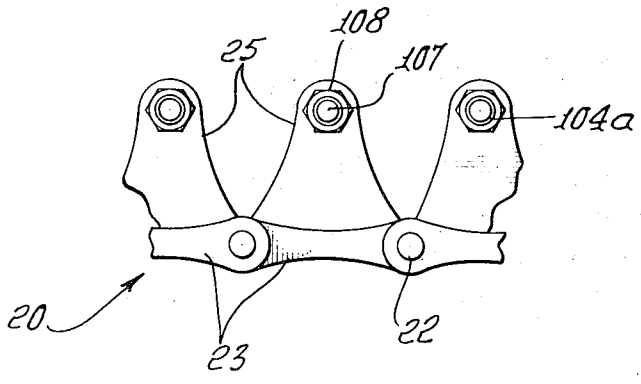

107
21
101
102
21a
109
100
106
26
103
105
115
115
104
23a
108
24
104a
20
23
22

FIG. 6.


108
25
107
104a
20
23
22

EXTERNAL SWIVEL CONNECTIONS FOR CORRUGATING MACHINE

BACKGROUND OF THE INVENTION

This invention relates generally to improvements on corrugating machines, and more particularly concerns improvement in machines of the type disclosed in U.S. Pat. No. 2,663,351 to Osborne et al.

The Osborne machine incorporates parallel corrugating rods advanced by endless chains, the rods connected with the chains to swivel relative thereto. Such connections are provided by ball and socket elements located within rod end portions; however, in practice this required a relatively small diameter pin connection to the ball element, which was subject to breakage under operating loads. No way was known prior to the present invention to overcome this problem, considering the space and operating limitations imposed by the special type of corrugating machine to which the invention is applicable.

SUMMARY OF THE INVENTION

It is a major object of the invention to provide a solution to the above described problem. Basically, the invention involves the provision of a universal joint connection between the rod end and chain link and which is principally external to the rod end, the joint including a member having axially slidable telescopic connection with the rod end. Further, the telescopic connection may be defined by a bore in the rod end to receive the member for rotation therein, the joint may include parts external to the rod and having tongue and groove interfit, with a transverse pin interconnecting such parts for relative pivoting about a transverse axis normal to the longitudinal axis defined by the rod and member. One of such parts may be integral with the member and the other past removably connected with a chain link; and there may be a stop flange on the one part to engage the end of the rod and limit penetration of the member into the bore as the rod swivels in the manner to be described.

These and other objects and advantages of the invention, as well as the details of an illustrative embodiment will be more fully understood from the following description and drawings, in which:

DRAWING DESCRIPTION

FIG. 1 shows a side view of a corrugating machine embodying the invention;

FIG. 2, a top plan view of the same;

FIG. 3, shows diagrammatically a horizontal section taken along line 3—3 of FIG. 1, with the machine set for making corrugations at a right angle to the line of travel;

FIG. 4, a similar section, with the machine set for making corrugations at an oblique angle with respect to the line of travel;

FIG. 5, a fragmentary detail view in plan of a portion of a chain conveyor employing the invention; and

FIG. 6, a fragmentary detail view in side elevation of a portion of said conveyor.

DETAILED DESCRIPTION

Referring to the drawings in detail, a typical machine comprises in its principal features, a base 1, a pair of frames 2 and 3 having a series of sprocket wheels revolvable therein, and a pair of endless conveyors 4 and 5 carried by the sprockets.

The base 1 is suitable supported, at a desired elevation, on a table 6, and presents a flat and horizontal top surface.

The two frames 2 and 3 are substantially identical in form, except for some minor details to be described, and may be of any suitable shape for accommodating the elements supported thereby. Each frame is here shown as comprising a pair of plates 7 set on edge and joined by straps 8, and each frame has two brackets 9 and 10 projecting inwardly from the lower portion thereof.

The brackets 9 of the two frames are pivoted to the base 1, as at 11, on vertical axes, and with freedom of swinging movement in horizontal planes, the pivots being suitably spaced, as shown.

The brackets 10 carry pins 12 which are slidable in slots 13 in the base curved circularly about the pivots 11, and the distance between the pivots 11 and the pin 12 of one frame corresponds to that of the other.

A bar 14 connects the two pins 12 in such a manner that the distance between the pins 12, center to center, is the same as the distance between the two pivots 11, center to center.

Thus the two pivots 11 and the two pins 12 may be positioned to form the four corners of a rectangle, as in FIG. 3, with the two frames occupying positions of parallelism with respect to a median plane of the machine, indicated at 15, or they may be positioned to occupy the four corners of any desired shape of parallelogram, within the range of the machine, as shown in FIG. 4, with the two frames arranged parallel to one another but obliquely with respect to the former position. Any desired change in the angularity of the frame may be brought about by the mere turning of one of the frames about its pivot 11.

Each frame carries a pair of upper sprockets 16, mounted on shafts 17, and a pair of lower sprockets 18 mounted on shafts 19, the upper sprockets of each frame being in horizontal alinement with one another, longitudinally of the machine, and the lower sprockets being also horizontally alined longitudinally of the machine. The sprockets are all of the same size and corresponding sprockets of the two frames are axially alined. All the sprockets of each frame are disposed in the same vertical plane.

The sprockets are mounted parallel to the frames, and the upper and lower sprockets are closely related, while there is a certain amount of spacing between the front and rear sprockets.

The two conveyors 4 and 5 are of identical construction and are made for training over the upper and lower sprockets respectively. Each conveyor comprises a pair of side chains 20 and transverse rods 21 connecting the same. Each of the chains comprises a series of pivot pins 22 and double sets of links 23 connecting the same with spacers 24 on the pins serving to space the links. These chains are dimensioned and proportioned for training over the sprockets. The inner links, that is the links of opposing chains facing each other, are formed with outwardly projecting lips 25 (see FIG. 6), and the

outer ends of these lips have short stubs **26** projecting therefrom perpendicularly toward the opposing chain. The stubs may be secured by studs **104***a* for easy removal and replacement.

The two chains of each conveyor are mounted on their respective sprockets in such a manner, that the stubs of one chain are alined with registering stubs of the other chain when the two frames occupy the positions of FIG. **3,** which may be described as the rectangular position.

More comprehensively, and referring to FIGS. **5** and **6,** means is provided to interconnect the ends of the rods **21** with chain links of the two chains so that the rod ends can swivel relatively to the chain links to which they are connected. Such means includes a universal joint **100** between each rod end and associated chain link, the joint including a member as for example at **101** having axially slidable telescopic connection with the rod end **21***a*. Such telescopic connection is with unusual advantage defined by a bore **102** in the rod end, the circular cross section member **101** rotatably received in the bore and having a diameter at least half that of the rod, for strength. Further, the joint **100** may also include first and second parts external to the rod, as for example tongue part **103** and yoke part **104,** having tongue and groove interfit, a transverse pin **105** interconnecting the parts for relative pivoting about transverse axis **106** normal to the longitudinal axis **107** defined by the rod **21** and member **101.** Note the sliding engagement of parts **103** and **104** along flat sides at planes **115,** for added strength. Part **103** is integral with swivel member **101,** and part **104** has removable connection with chain link **23***a*. The latter connection may include a threaded stud **104***a* on part **104** projecting through the link **23***a* and a nut **108** on that stud, as shown.

It will be noted that each rod bears upon the material at the same time throughout the width of the material and is free to roll into the wave thus eliminating any tendency of the material to tear or crack, and causing the material to travel in a straight line.

If the strip of material is to be corrugated obliquely with respect to its length, the operator may grasp either of the frames and turn it to the desired angle. The two frames being interconnected by the member **14,** both will swing in unison on their pivots **11** and will retain their parallel positions. The feeding device will swing with one of the frames and will retain its position along the median plane between the two frames.

The chains along the sides of the two conveyors will turn with the frames, and the rods **21** will swing on their pivots, as shown in FIG. **4,** to assume the desired angularity with respect to the median plane between the frames.

It should be noted that the entire swing movement is in a horizontal plane, and that each rod retains its horizontal position, not only while passing through the horizontal stretches of the conveyors, but also when passing around the sprockets. While the sprockets have shifted with respect to one another in a fore and aft direction, still each rod is connected to both chains at the same elevation, no matter where positioned in its endless path, which is an important factor in the forming of the waves in the strip of material.

As now the strip of material is passed between the conveyors in a horizontal plane, the first rod to engage it, also approaches it while positioned horizontally, with the result that, in spite of the angularity, the entire active length of the rod strikes the material at the same time to form a uniform wave in the strip.

This feature is desirable since it prevents tearing or rupturing of the sheet material, such as would tend to occur if the rods were to engage the material in a tilting movement, beginning at one end and ending up at the other end.

Any suitable and conventional means may be employed for heat-treating and drying the material as it passes through the machine, for applying flat sheets of material to the upper or lower surfaces of the corrugated material or both, and for spiralling the material upon a mandrel, which should be positioned and dimensioned to apply the corrugations parallel to the axis of rotation.

It is not necessary to combine all the novel features in order to produce an operative machine. Where a manufacturer, for instance, desires to only corrugate material at a right angle to the length of the strip, the feature of adjustability to different angles might be omitted. Where again, the manufacturer desired to corrugate the strip at a definite single angle throughout its operation, the machine might be built to conform to that particular angle, again omitting the feature of angular adjustability.

Where a manufacturer desired a universal machine that may be set for any desired angle, the novel features may be combined into a single structure.

If any one of the rods **21** should break or become deformed, it may be readily removed, with its stubs **26,** upon unscrewing of the threaded part **104***a*, as permitted by rotation of stem member **101** in bore **102,** for replacement of a new rod.

While one specific means for mounting the frames **2** and **3** with freedom of adjustment to produce angularity of the corrugating elements has been shown, it is apparent that other means serving the same purpose may be substituted. The two endless conveyors, here shown as being of the same length, may be made of different lengths, and it is also feasible to carry the conveyors on single pairs of sprockets, in which case each rod would follow a circular path.

The rods **21,** which have been shown as single units pivoted centrally, may be made in groups of two or more parallel rods pivoted about a common center, particularly where the corrugations are to be closely spaced. The rods. might also be made in the form of bars having multiple serrations and mounted in the same manner.

The upper plates **7** are preferably mounted on the straps **8** with freedom of vertical adjustment, as by the bolt and slot arrangement **8'** to allow of control of the depth of the corrugations.

If desired, idler sprockets may be substituted for the shoes **28.**

Further, a stop shoulder is provided on part **103,** and may take the form of an integral flange **109** engagable with the end **21***a* of the rod to limit axially slidable penetration of member **101** into bore **102.**

It should be noted that the rods, from pivot to pivot, should correspond in length to the distance between the pivots **11,** and to the distance, center to center, between the pins **12** on the base, and that all the ball and socket joints, on each side of the machine, should lie in the vertical planes defined by the pivots **11** and the pins **12,** these planes being indicated in FIGS. **3** and **4** and

5 by the numeral **30.** This arrangement allows the rods to follow any swinging movement of the frames about their pivots.

The confronting stretches of the conveyors between the sprockets are guided by shoes **28** to prevent sagging or buckling.

Rotary movement may be imparted to the sprockets by any suitable drive. In the form shown, I provide a central vertical power shaft **31** mounted in a bearing **32** secured upon the table. This shaft drives, through a gear **33,** two gears **34** mounted concentric with the fixed axes or pivots **11.** The gears drive, through gears **35,** vertical shafts **36** mounted upon the outer faces of the frames **2** and **3.** And each of the shafts drives the upper and lower front sprockets through bevel gears indicated at **37** and **38.**

One of the frames has a forward extension **39** which carries a shaft **40** and a spool **41,** the latter being in central alinement with conveyors. The extension may also carry a suitable material treating tank **42,** used as a rule for heating or pre-treating the material coming from the spool, and having an exit roller **43,** over which the strip of material is guided toward the space between the two conveyors, the material passing over the cross-member **44** and possibly an inclined guide **45,** which is old in the art and is used to bias the strip to follow a straight track while passing through the machine.

The machine can be used on any sheet material having such characteristics that it may be corrugated as is well known to those familiar with corrugating machines and methods.

If it is desired to corrugate the strip of material transversely to its length, the machine is adjusted to the position illustrated in FIGS. **1, 2** and **3,** with the pins **12** in the inner ends of the slots **13,** and the pivots **11** and pins **12** arranged to form a rectangle.

Assuming that the material is such as to require softening before being corrugated, it can be fed into the machine, that is, between the two conveyors, in slightly moistened condition. The confronting stretches of the two conveyors are sufficiently close to cause the projecting rods **21** to interlace and, as the strip enters, the first rod striking it will form a wave in one direction, while the second rod will form a wave in the opposite direction, and so on.

The relatively long stretch between the sprockets will cause each rod to remain in its groove or wave for an extended time period so as to allow the wave to set before leaving the machine.

I claim:

1. In a corrugating machine, the combination comprising

a. a series of longitudinally axially elongated rods and two generally parallel chains,

b. means interconnecting the ends of the rods with chain links of the two chains so that the rod ends can swivel relative to the links to which they are connected, and including a universal joint between each rod end and associated link, the joint including a member having axially slidable telescopic connection with the rod end and wherein said telescopic connection is defined by a bore in the rod end, the member rotatably received in the bore.

2. The combination of claim **1** wherein said joint includes first and second parts having tongue and groove interfit, and a transverse pin interconnecting said parts for relative pivoting about a transverse axis normal to the longitudinal axis defined by said rod and said member.

3. The combination of claim **2** wherein one of said parts is integral with said member, and the other of said parts is removably connected with a chain link.

4. The combination of claim **3** including a stop shoulder on said one part and engagable with the end of the rod to limit axial penetration of said member into said bore.

5. The combination of claim **3** including a first vertical frame and means for swingably mounting said frame on a vertical axis, a second vertical frame and means for swingably mounting said second frame on a vertical axis and in confronting and spaced relation to the first frame, upper and lower sprockets carried by each frame in parallel relation thereto, and a pair of conveyors mounted on the sprockets so as to present confronting sections, the conveyors including said rods operable to change their angularity when the frames are swung on their respective axis and mounted to interlace at the confronting sections.

6. The combination of claim **3** wherein said parts are external of the rod end.

7. The combination of claim **6** including a stop flange on said one part and located in spaced relation to the rod end, said flange directly facing the rod end.

* * * * *