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Ahrweiler

[11] **3,792,953**

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[54] **MACHINE FOR COMPRESSING A TRAVELING WEB**

[75] Inventor: **Karl-Heinz Ahrweiler,** Krefeld, Germany

[73] Assignee: **Edward Kusters Maschinenfabrik,** Krefeld, Germany

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[52] **U.S. Cl.** **425/371,** 100/154, 425/115, 425/406

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

[58] **Field of Search** 100/153, 154; 425/371, 115, 425/406

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Primary Examiner—Robert L. Spicer, Jr.

Attorney, Agent, or Firm—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

Endless elongated loops of metal bands have cooperating linear spans between which a traveling flat workpiece is passed for receiving compression transmitted through the bands. The compression is applied by self-contained presses having platens which span the bands and which are juxtapositioned throughout at least the compression zone, the bands and presses traveling at the traveling speed of the workpiece. On opposite side edges of the bands the presses have mounting side frames provided with means for forcing the platens together. These side frames are separable and at the back end of the compression zone they separate, the platens also separating, the separated press parts being carried back to the front end of the zone where they re-engage. Thus, the presses continuously recirculate.

8 Claims, 6 Drawing Figures

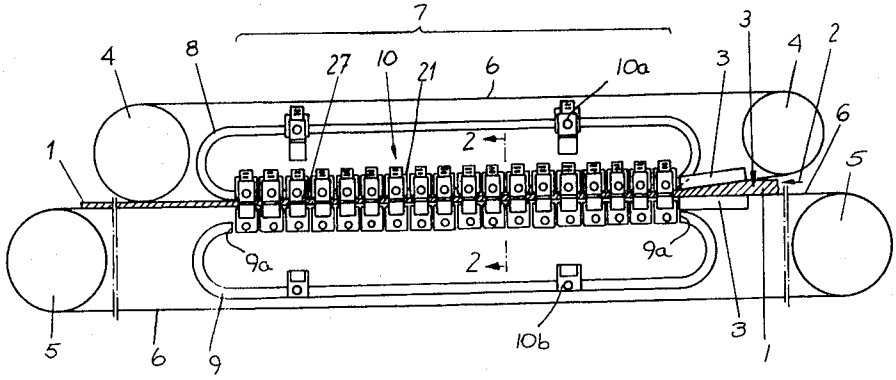

Fig. 1

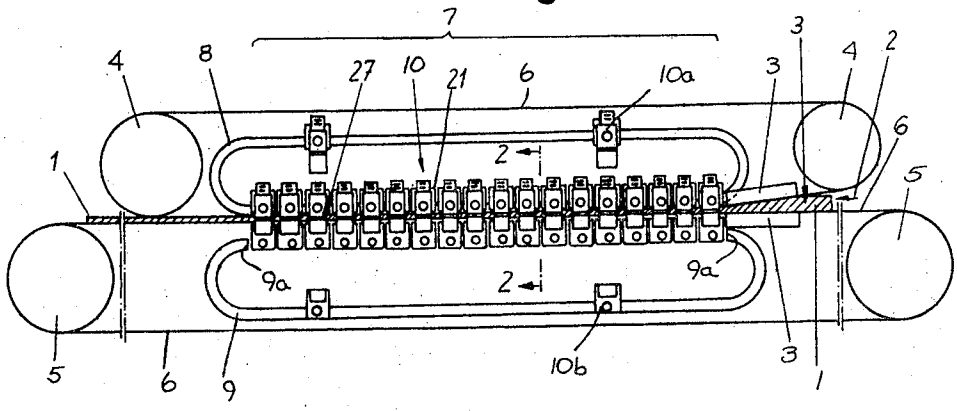
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Fig. 2

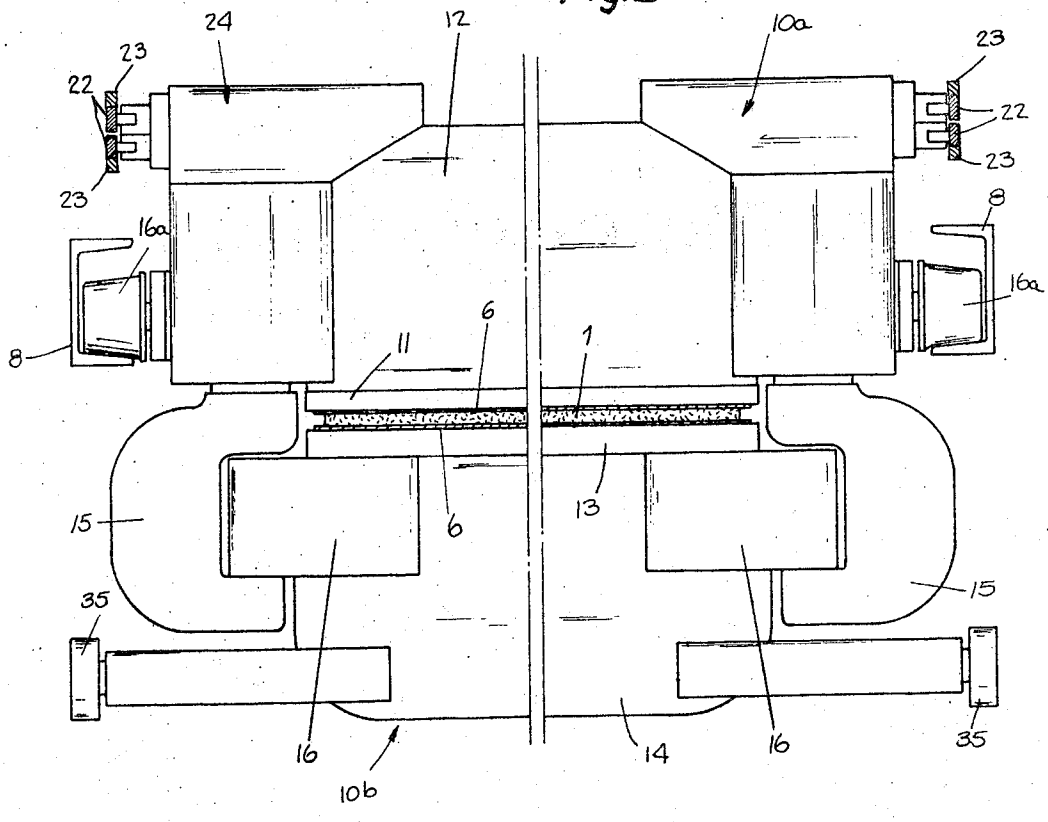
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Fig.3

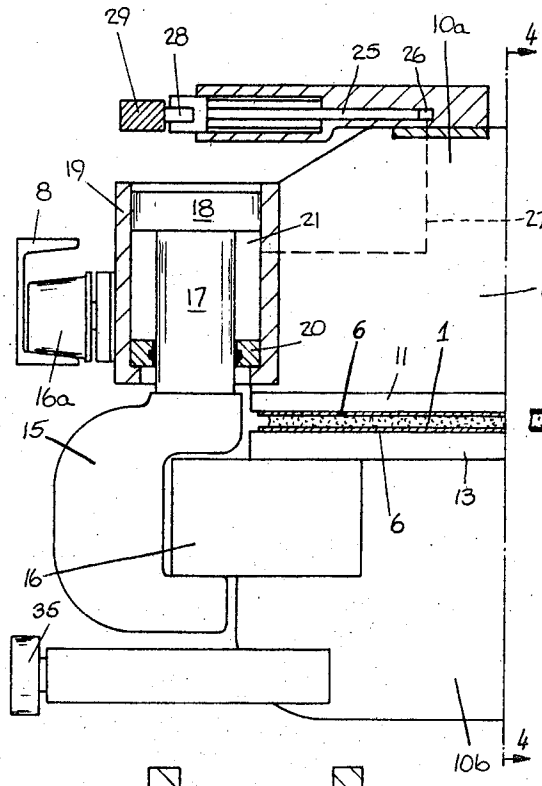


Fig.4

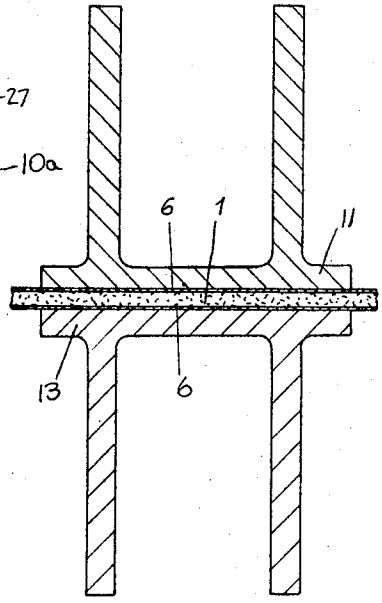


Fig.5

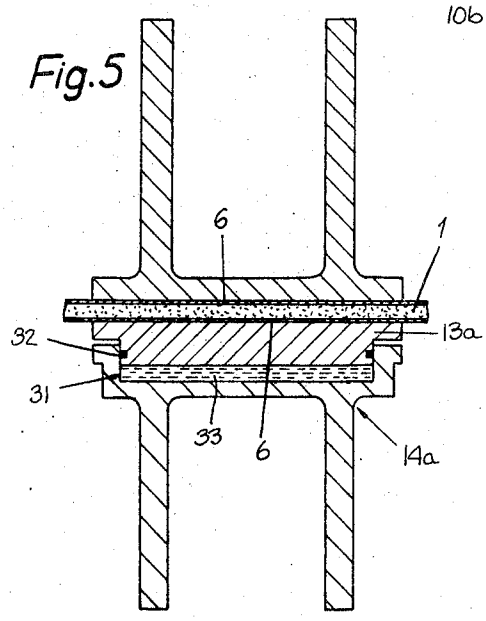
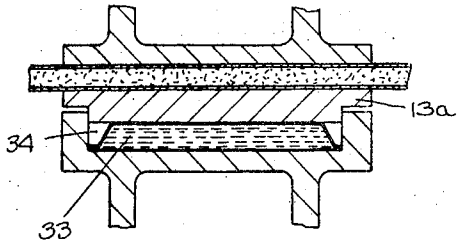


Fig.6



MACHINE FOR COMPRESSING A TRAVELING WEB

BACKGROUND OF THE INVENTION

This invention relates to machines for compressing traveling flat work, such as wood-chip panels and composition board panels in general.

Work of this type must be processed by the use of high compressive forces, usually with heating, from a thicker, relatively non-coherent condition to a dense hard and firm condition as required for finished panels made from composition materials in chip or fibrous form. Extremely high pressures are usually required.

It is possible to compress such work by stationary bed presses with the work being stationary during the treatment. However, to meet modern production and labor saving demands, it is more desirable to use a machine capable of operating on the work while it travels continuously through the machine, either in the form of panels or as a traveling continuous web from which, after the processing, the panels may be cut into the lengths desired.

DESCRIPTION OF THE PRIOR ART

A continuous machine is disclosed by German Pat. No. 936,718. With this machine the web is passed between two linear spans engaging the opposite sides of the web and formed by elongated metal band endless loops, the metal bands in the spans engaging the web and traveling with the latter. Pressure is applied through these spans by a series of juxtapositioned plates which span the bands and are carried by endless chains, the construction being like the treads of the well-known "Caterpillar" tractor. While applying pressure, the plates must be clamped together by having end rollers in roller guides suitable held together and which apply the compressive forces required.

Such a construction, particularly in the case of wide webs or when a long compression zone is required, must be constructed with heavy and massive parts. The plates' end rollers, their roller guides and the means holding these guides together, all are highly stressed and must be constructed to resist the stresses.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a machine of the above type capable of applying adequate compression to wide traveling webs and throughout long compression zones, and which may be constructed with parts which are relatively lighter but which are equally or better able to resist the stresses involved while applying high compressive force to the web.

This object is attained by eliminating the massive plate rollers and roller guides and the supporting parts for these guides, previously used. Instead, roller guides of relatively light construction are used and which provide support only against gravitational forces. These guides are in the usual elongated loop form.

These guides support the opposite ends or side frames of a plurality of individually self-contained presses having platens transversely spanning and engaging the opposite sides of the bands and with the press platens juxtapositioned while traveling through the compressive zone. Only the weight of these presses requires this support. Each press has separable side

frames guided by the roller guides in a recirculating manner and which engage together at the front end of the compression zone and separate at this zone's back end, with the respective dissociated parts at the back end traveling via the roller guides to the front end. These side frames travel on each side edge of the metal bands and mount the platens which transversely span the bands, and the side frames are provided individually with means for applying oppositely directed force or press action to the ends of the platens to clamp the latter on the opposite sides of the two bands and apply the compression to the web between these bands.

The effect is that of a plurality of individual self-contained presses which, while assembled, can function individually as presses. The power required during the compression action may be controlled or applied from an external source while the presses travel through the compression zone.

BRIEF DESCRIPTION OF THE DRAWINGS

Specific examples of a machine and modifications thereof embodying this invention are illustrated by the accompanying drawings in which:

FIG. **1** is a side elevation with the roller guides facing the observer eliminated to reveal the invention construction to better advantage;

FIG. **2** is a cross-section taken on the line **2—2** in FIG. **1**;

FIG. **3** shows the left-hand side of FIG. **1** but with a modified construction and with partial sectioning to reveal this construction;

FIG. **4** is a cross-section taken on the line **4—4** of FIG. **3**;

FIG. **5** is the same as FIG. **4** but shows a further modification; and

FIG. **6** shows a portion of FIG. **5** and illustrates a still further modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. **1** of the above drawings, the web **1** of material requiring the compression, travels from right to left as indicated by the arrow **2.** This web may consist of relatively loose material impregnated with a bonding medium and which requires hardening by the use of high compression and heating.

At the right end or front of the machine the web **1** receives an initial or sizing compression by wedging between upper and lower die plates **3,** after which it enters the high compression zone. Heating means for this zone are not shown because the heating is not part of the present invention.

Upper and lower rotary drums **4** and **5** carry the endless metal bands **6** which form the linear spans engaging the top and bottom of the web throughout the compression zone. These may be conventionally mounted and are not highly stressed.

Throughout the compression zone, indicated by the bracket **7,** upper and lower roller guides **8** and **9,** respectively, are arranged adjacent to the bands' side edges. The upper guides **8** are in the form of endless loops providing linear spans extending parallel to the compression spans of the bands but at a slightly higher level. The guides **9** form linear spans which extend parallel to the compression spans of the bands but at a slightly lower level; however, the curving ends of the guides **9** terminate as at **9*a*** at the front and back ends

of these band spans. The mutually adjacent curved or semicircular portions of both the upper and lower roller guides form mutually tangential portions.

Contrasting with the very strong and necessarily heavy roller guides of the prior art, these roller guides **8** and **9** may be relatively very lightly constructed since they must carry primarily only gravitational forces. That is to say, the only function of these guides **8** and **9** is to support and carry the separable parts of the individual self-contained presses, indicated generally in FIG. 1 at **10.** These are shown juxtapositioned and applying the necessary pressure throughout the compression zone through the bands **6.** At the back end of this zone, each press separates into its separate parts and is carried via the guides **8** and **9** back to the front end where each press is reassembled and goes back into operation. In FIG. **1** only the separable parts **10***a* and **10***b* of two of the presses are shown being returned. However, a greater number of the presses would naturally be provided to accommodate high speed operations and reduce the traveling speed of the press parts from the back end of the zone, to the front end.

Referring now to FIG. **2,** one of the presses is shown with two component parts **10***a* and **10***b* assembled or interassociated and applying compression to the web or panel **1.** The endless roller guide **8** is shown, the lower roller guide **9** not appearing, of course, because the view of FIG. **2** is between its ends **9***a*.

As shown by FIG. **3** as well as FIG. **2,** the upper press part **10***a* comprises the upper platen **11** and its supporting beam **12,** these parts spanning the metal bands. The lower part **10***b* comprises the lower platen **13** and its supporting beam **14,** which are likewise spanning members. The separable side frames comprise hooks **15** which depend from the upper part **10***a* and cooperate with lugs **16** extending from the lower part, these parts mounting the ends of the platens of the respective parts. The upper part **10***a* is carried by rollers **16** which run continuously in the roller guide **8,** the lower part **10***b*, while the press is assembled, being carried by the upper part **10***a*. Compression or pressure is applied by reason of the hooks **15** depending from the piston rods **17** of pistons **18** reciprocating in cylinders **19** having piston rod seals **20,** so that when hydraulic fluid is introduced to the spaces **21** beneath the pistons **18,** the clamps **15** are drawn upwardly, thus clamping the platens **11** and **13** together on the metal bands **6** so as to apply the compression to the work **1.** Note that each press must be only strong enough to apply the pressure throughout the relatively limited area of the platens **11** and **13.** Relatively large compressive forces may be handled by what are essentially relatively light press constructions, since each press operates individually.

The upper press part **10***a* may have a low enough center of gravity so that while traveling back via the guide **8** it remains rotatively oriented properly. No means for rotatively orienting the lower press parts are shown by the drawings, but since the parts are light, they may be oriented manually while being moved to the front end of the compression span. Furthermore, no means are shown for moving the parts back to the front end, but this again may be done manually. Obviously in a commercial machine power means will be provided for returning the parts and a guiding system will be provided for maintaining the orientation of the bottom press parts, all being constructions well within the skill of a good mechanical engineer.

As shown by FIG. **2,** actuation of the presses while traveling through the compression zone may be effected by providing each upper press part with electric power connecting rollers **22** which run along electric power rails **23** shown in FIG. **2;** and although not shown in FIG. **1,** they may run along the length of the compression span. In such instances, these may power hydraulic pumps, generally indicated at **24,** which provide hydraulic pressure for application to the spaces **21,** it being understood that suitable hydraulic surge tanks may be provided for each press. If the spaces **21** of both cylinders of each press are hydraulically interconnected, the pressure is transversely uniform and only one motor and pump is needed.

As shown in FIG. **3,** each press is provided with small hydraulic plungers **25** working in cylinders **26** and connected by lines, indicated at **27,** with the spaces **21.** Each plunger **25** has an actuating roller **28** which runs along a cam rail **29** which again spans lengthwise the compression zone of the machine. As each press enters this zone, and its parts are assembled by engagement of the hooks **15** with the lugs **16** of the two parts, the cam **29,** when properly contoured, pushed the plungers **26** in and apply great pulling force on the hooks **16,** the piston areas of the pistons **18** being very great relative to the piston areas of the plungers **25.** Again each press may have a suitable surge tank and suitable valving. The cam **29** may be contoured (not shown) to provide a gradually increasing compression movement of the plungers **25** at the front end of the machine and a gradually decreasing or decompressing one at the back end of the machine. In this way the work compression may be gradually applied and released.

It is to be understood that the press art is in an advanced state and that mechanical and hydraulic engineers are well acquainted with the construction and operation of self-contained presses in general. The difference here is only that the side frames are separable and are formed by the parts previously described, essentially consisting of the hooks **15** and the lugs **16.**

Because of the high beam stresses on the beams **12** and **14** of the two press parts of each press, they are subject to beam deflection particularly when these beams must be of substantial lengths because the work being processed is of wide widths. Therefore, as shown by FIG. **4,** these beams are in the form of two vertical plates or webs integrally joined with the platens **11** and **13** as by either being castings or comprising a welded assembly of plate members. If the pressures involved are not too great, and the lengths of the platens and beams are not too long, such a construction is satisfactory.

On the other hand, under other conditions the construction indicated by FIG. **4** may be subject to beam flexure under the pressures exerted at their ends by the side frame elements and the compression resistance of the work. If this occurs, the web or panel being compressed will, of course, be compressed more at the side edges than at its central portions, a condition that is ordinarily undesirable.

Therefore, as shown by FIG. **5** the lower beam, here shown at **14***a*, may be made to include a chamber forming an elongated rectangular cylinder **31** which extends for at least the full extent of the web or other flat work being compressed. It is to be understood that this cylinder **31** is not cylindrical, but is an elongated rectangle in shape. The platen **13***a* is in the form of a correspond-

ingly shaped piston reciprocatively fitting this cylinder and provided with a piston seal **32.** The cylinder **31** contains a hydraulic fluid **33.** With this arrangement, if the upper beam platen **11** and beam **12** deflect, the piston **13***a* correspondingly deflects and since it is supported by the hydraulic liquid **33** applying a uniform pressure throughout the lengths of the two platens, or at least the compression extents of the web or work, the two bands, and therefore the work, receive a uniform pressure in a transverse direction. The beam **14***a* may deflect reversely or downwardly to a greater or lesser extent as a typical beam, but this deflection does not effect the uniform pressure exerted by the hydraulic liquid **33** on the platen **13***a*. Although not shown, the cylinder **31** may be hydraulically connected with an enclosure containing air above the hydraulic liquid level so as to permit the displacement and replacement of the liquid **11** during the beam flexure action.

In FIG. **6** an alternate form is shown, the parts being the same as in FIG. **5,** but the hydraulic liquid **33** being in this instance enclosed by a flexible container **34,** thus providing a permanent hydraulic cushion between the platen **13***a* and its beam **14***a*.

It can be seen from the foregoing that according to this invention a recirculating series of individual self-contained hydraulic presses are provided. The presses are separable into upper and lower parts, each providing one of the platens, the latter being mounted by the separable side frame parts, interconnected via the hooks and the projections on the respective parts.

At the machine's front end the two parts approach each other, and by slight relative angular and horizontal motions, interhook. As the presses travel along the compression zone while assembled each as a unit, power is applied to each so that each acts as an individual press. Each press being self-contained, it carries its own power source with it and which is controlled preferably either by electrical conductor rails, if electric power is involved, or by cam rails, if hydraulic power is involved. The need for the prior art necessarily strong and, therefore, heavy rollers, roller guides and their supports, is eliminated. Because the platen press area of each individual press is small relative to the overall area being compressed, the press platens and side frame elements, including their powering elements, may be made as relatively light weight units. Their rollers and the roller guides support only the weight of these units.

As previously indicated, the lower parts **10***b* are recirculated via the discontinuous lower roller guides **9.** Therefore, the lower parts of each press have supporting rollers **25** which run in these roller guides. The lower press parts are carried by the upper press parts supported by the upper guides **8** via the rollers **16,** while the presses are assembled and traveling through the zone **7.** At the back end of this zone when the press parts separate the rollers **35** of the roll press parts **10***b* enter the adjacent ends **9***a* of the lower roller guides **9** and so are guided back to the front of the machine where before leaving the lower roller guides at that end, they engage with the upper press parts, to be carried onward by the latter.

What is claimed is:

1. A machine for compressing a traveling web while passing through the machine and comprising a plurality of individual presses each having upper and lower platens spanning the top and bottom of the web and means for forcing these platens together on the web, each press having separably connected side frame parts mounting the platens, said parts separating so that the presses may sequentially act on the web in a recirculating manner by separation and reassembly of their side frame parts, while the presses travel with the web.

2. The machine of claim **1** in which said side frame parts are provided with guides which are in the form of elongated loops having linear spans extending lengthwise adjacent the side edges of the web, said guides supporting mainly only the weight of said presses while traveling with the web and of the press parts during recirculation thereof.

3. The machine of claim **1** in which said side frame parts each comprise interengaging hooks and lugs which engage and disengage by relative transverse motion thereof.

4. The machine of claim **2** in which said side frame parts each comprise interengaging hooks and lugs which engage and disengage by relative transverse motion thereof.

5. The machine of claim **2** in which each of said presses is a self-contained press including power-operated means for forcing said platens together and having an operator for this power-operated means, the machine having means for controlling said means as the press travels with the web for turning its power on and off.

6. The machine of claim **4** in which each of said presses is a self-contained press including power-operated means for forcing said platens together and having an operator for this power-operated means, the machine having means for controlling said means as the press travels with the web for turning its power on and off.

7. The machine of claim **1** in which as to each of said presses at least one of said platens has means for supporting it substantially throughout its length on hydraulic liquid.

8. The machine of claim **6** in which as to each of said presses at least one of said platens has means for supporting it substantially throughout its length on hydraulic liquid.

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