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- (21) Application No. 51048/77 (22) Filed 8 Dec. 1977  
 (31) Convention Application No.  
 9194/76 (32) Filed 13 Dec. 1976 in  
 (33) Austria (AT)  
 (44) Complete Specification published 13 May 1981  
 (51) INT. CL.<sup>3</sup> D06F 47/06  
 (52) Index at acceptance  
 D1A 24E  
 B5F 13A 13X 3A 3C 6B



(54) PRESS FOR EXPELLING LIQUID FROM BATCHES OF  
 GOODS

(71) I, ARNFRIED MEYER, a Citizen of the Federal Republic of Germany, of Wurzbürger Strasse, 7100 Heilbronn, Federal Republic of Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a press for expelling liquid from batches of goods, more especially laundry, comprising a flexible membrane, to one side of which can be supplied a pressure medium to urge the batch towards a conveyor belt which serves to transport the batches of goods from a loading station to a pressing station opposite the membrane and, after pressing, to an unloading station.

20 Already known, from German (Federal Republic) Offenlegungsschrift No. 24 40 818, is a pressing installation for squeezing-out liquid in which a raisable and lowerable metallic bell is provided which has an elastic membrane which extends across the mouth of the bell. For effecting squeezing, this bell is lowered over a batch of goods lying on a conveyor belt. Then the bell is locked mechanically by claws to a supporting body which lies thereunder and which resists the downwardly directed pressure force. Then, by introduction of pressure medium between the bell and the membrane, the latter is forced against the batch of goods and the liquid present therein is squeezed-out. Upon conclusion of the squeezing-out, the pressure medium is pumped out of the bell, the bell and the supporting body are unlocked by lateral disengagement of the claws, and the bell is raised, after which the batch of goods is progressed by the conveyor belt to the unloading station. Thus, to carry out the pressing, a series of auxiliary measures are necessary which involves considerable expenditure on adjusting and control means. Furthermore, the various movements involved need time to be carried out, which disadvantageously has the effect of extending the time taken by the pressing phase of

the operation of the apparatus. Moreover, the bell, the supporting body and the claws have to be produced as separate parts and be suitably robust in design to absorb the high pressing force. They therefore represent, weightwise, heavy parts which have to be moved by the adjusting means which must be constructed to be equally and correspondingly large. Finally, to check the exact assumption of the many end positions, checking means have to be provided by which signals are passed to the control means, in order to ensure the correct functional sequence. The known pressing installation is therefore expensive in its construction and complicated in its operation.

An object of the invention is therefore to provide an improved and simplified press for expelling liquid from batches of goods.

Accordingly the invention provides a press for expelling liquid from batches of goods such as laundry, comprising a tubular housing, a liquid permeable conveyor extending through the housing, a support, in the housing on one side of the conveyor and, on the other side of the conveyor and within the housing a flexible membrane which can have pressurised fluid supplied to its side remote from the conveyor to urge it towards the conveyor to compress a batch of goods between it and the conveyor to expel liquid therefrom.

Advantageously the support for the conveyor has channel and/or passages for liquid passing through the conveyor and pipes for removal of expelled liquid.

Conveniently the flexible membrane has a sealing lip extending around its periphery, which lip is sealingly connected to an inner wall of the housing.

In accordance with a further preferred feature of the invention, the membrane can have side edges lying parallel to the axis of the housing and its ends extending upwardly and outwardly.

As a further feature the housing can have, at each end, a slide which extends through a slot in the housing adjacent the corresponding end of the membrane and can close off the housing.

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The resilient membrane can, in accordance with a further possible feature of the invention, be in the form of a resilient hose which is closed at both ends and which is arranged in the housing.

The advantages achieved with the invention consist more especially in that the housing forms a self-contained unit which, because of its tubular design, is particularly suitable for absorbing high tensile forces. Because of the opposed arrangement of membrane and support effective expulsion of liquid can be achieved. Batches can be brought into position in a simple manner and, after squeezing, be transported away again. As a result of the design of the invention, the housing does not specifically have to be arranged to have a horizontal axis. As a result of the arrangement of the pressure body in one circumferential half of the housing, substantially all of the resulting pressing forces are absorbed internally. Therefore, all connecting means for the connection of the housing parts, such as claws, and the adjusting, control and checking means thereof, are abolished. Thus the press of the invention for squeezing out batches of goods is very considerably simplified, namely both in its construction and in its mode of operation, as compared with the prior known proposals. It therefore has high operational reliability and involves low maintenance expenditure.

The invention will be described further by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a side view of a first embodiment of the press of the invention;

Fig. 2 is a sectional view taken along the line II-II of Fig. 1;

Fig. 3 is a sectional view taken along the line III-III of Fig. 1;

Fig. 4 is a longitudinal section through a second embodiment of the press of the present invention;

Fig. 5 is a sectional view taken along the line V-V of Fig. 4; and

Fig. 6 is a sectional view along the line VI-VI of Fig. 4.

Referring firstly to Figs. 1 to 3, the illustrated press for expelling liquid from batches of goods, consisting, for example, of laundry, comprises a loading station 1, a pressing station 2 and an unloading station 3. These stations 1, 2 and 3 are connected by a conveyor belt 4, which is perforated so as to be pervious to water. In front of the loading station 1 there is positioned a washing machine 5 from a drum of which batches of goods are periodically discharged. These drop into a funnel or hopper 6, which opens out at the bottom into a moulding box 7 standing above the conveyor belt 4 and having vertical side walls 8 and downwardly and outwardly spread end walls 9

and 9'. The batch of goods 10 which has dropped into this moulding box 7 is thus preformed to an approximately prismatic shape. The funnel 6 with the moulding box 7 rests on a belt guide 11 which supports both the forward run and the return run of the conveyor belt 4 and is pervious to water due to perforation 12 therein. Inwardly-directed deflector walls 13 at the lower end conduct downwardly-emerging squeezed-out liquid into an inclined trough 14 which lies thereunder and which is provided on its lower end wall with an outlet pipe 15. The belt guide 11 and the trough 14 are carried by uprights 16 and 16', end upright 16 of which also serves for the mounting of a guide roller 17 for the conveyor belt 4.

The end wall 9', considered in the transportation direction of the batch of goods 10, of the moulding box 7 is mounted so as to be tiltable about an axis 18 which is at the upper end. In the depicted closed position shown in Fig. 1, an angled extension 19 of the upper end lies on a stationary stop 20. In the transportation direction, on both sides in front of the lower end of the end wall 9', there projects lock bolts 22 which are adjustable by adjusting motors 21, for example pneumatic cylinders, and which lock the end wall 9' in its closure position against swinging in the anticlockwise direction.

Arranged subsequent to the loading station 1 is the pressing station 2 comprising a tubular housing 23 which is mounted on supports 24. Arranged in this housing 23, which is preferably designed as an undivided (or not-split) tube, is a flexible membrane or pressure body 25. This is designed as a flat tube which is closed at both ends, and is connected by a pressure medium pipe 26 to a pressure-medium source (not shown). The pressure-medium pipe 26 has, in the pressure body 25, a supporting plate 26' and is screwed or bolted, by a nut 27, releasably to the housing 23. This screwing or bolting forms the sole mounting support of the pressure body 25 relative to the housing 23. Arranged underneath the pressure body 25, preferably in a lower half of the housing 23, is a support in the form of a bearing body 28 which is flat at its upper surface and which, for example, is of concrete or metal and rests on the inside of the housing 23 and on which the lower run of the conveyor belt 4 slides. Provided in the bearing body 28 are channels or ducts 29 which emanate from the upper surface and which are connected vertically and horizontally longitudinally and transversely with pipes 30 which extend in the longitudinal direction of the housing 23. The pipes 30 open out into the trough 14. Arranged between the upper and the lower runs of the conveyor belt 4 is a plate 31 which is pre-

vious to liquid by reason of perforations therethrough. The liquid from the batch of goods 10 can thus pass through the previous conveyor belt 4, the plate 31 and the connecting channels 29 into the pipes 30. The conveyor belt 4 and the plate 31 are so mounted, one above the other, that in the squeezing phase direct contact arises in the pressure direction and the permeability to water is at all times maintained. In the transportation phase, on the other hand, the conveyor belt 4 can move to transport the batch of goods lying thereon. Provided between the lower edges of the pressure body 25 and the bearing body 28 are wedge-shaped ribs 32 which prevent the pressure body 25 from extruding itself between the edges of the belt 4 and the body when in use.

Pressure-medium is supplied via a pipe 26 which is connected by a pipeline 33 to a connection 34 of a four-way valve 35. In the depicted position of the four-way valve 35, the connection 34 is connected to the connection 36 which communicates, through a pressure line 37, with the pressure side of a motor-driven pump 38. A suction line 50 connects the suction side of the pump 38 to the connection 39 of the four-way valve 35, which, in the depicted position, is connected to the connection 40. From the latter, a pipeline 41 leads into a storage container 42 which is preferably filled with water and which is seated on bearing blocks 43 on the housing 23. Connected to the suction line 50 is a safety line 44, also ending in the storage container 42, with an adjustable check valve 45, which only allows a flow of liquid in the direction of the suction line 50 and this only after a relatively low pressure has been overcome. An excess-pressure line 46 connects pipeline 33 to the storage container 42 and has a check valve 47 which only allows a flow of liquid into the storage container 42 when a relatively high pressure, has been reached. This pressure level is monitored by a pressure gauge 48 which is connected, in front of the check valve 47, to the excess-pressure line 46 and which may also be designed as a pressure monitor for automatically monitoring the maximum pressure. Serving for adjustment of the four-way valve 35 is an adjusting (or operating) cylinder 49 which, upon extending into the position indicated in dot-dash lines, rotates a valve member of valve 35 through a right angle in the clockwise direction, so that the connections 36 and 40, as well as the connections 34 and 39, are connected to one another.

In the unloading station 3, the conveyor belt 4 is reversed in direction by a guide roller 52 which is mounted in an upright 53 and which is driven by a geared motor 51.

The mode of operation of the device is such that a batch of goods 10 drops out of the washing machine 5 into the moulding box 7 of the loading station 1 and adapts itself there, to some extent, to the shape of the moulding box 7, surplus water running off downwardly into the trough 14. As soon as the preceding pressing operation is concluded, the adjusting motors 21 draw the lock bolts 22 out of the region of the front end wall 9' and the conveyor belt 4 is switched on. It begins to run in the direction of the pressing station 2. In this respect, the moving batch of goods 10 forces the end wall 9' upwards into the position indicated in dot-dash lines, so that now a closed transfer channel 54 is formed, by which the rectangular cross-section of the batch of goods 10 is converted to a generally trapezium shape as is indicated in Fig. 2 at 10', in order to achieve high utilisation of the free cross-section in the housing 23 underneath the pressure body 25. After the passage of the batch of goods 10, the end wall 9' tilts downwards once again, of its own accord, and is locked. The next batch of goods 10 can be loaded into the moulding box 7.

The batch of goods 10' running-in into the housing 23 is halted centrally by a monitoring mechanism, for example a light barrier which is not shown, which stops the conveyor belt 4. The four-way valve 35 is then moved into the position shown in Fig. 1. Because of the pump 38 is constantly running water is pumped through the pipeline 41, the connections 40 and 39 of the four-way valve 35, the suction line 50 and, after the pump 38, through the pressure line 37, the connections 36 and 34 of the four-way valve 35, the pipeline 33 and the pressure-medium pipe 26 into the pressure body 25. In this way the latter expands downwardly and applies itself with increasing pressure against the batch of goods 10', in which case this latter assumes approximately the shape 10'' and is finally compressed into the shape 10''''. The pressure body or membrane 25 is urged by the pressure medium into contact with the batch of goods 10'' and forces it against the conveyor belt 4, as is indicated by numeral 25', so that the batch of goods 10'' is effectively disposed in a closed pressure chamber. After the maximum set pressure is reached, the water flows through the excess-pressure line 46 and the check valve 47, back into the storage container 42.

In the modified embodiment of the invention in accordance with Figs. 4 to 6 the pressure body or flexible membrane 25 is held by a sealing lip 25'' in an annularly-closed holder 51 tightly against the inner wall of the housing 23. The holder 51 is fastened by screws 52 to the inside of the

housing 23, so that the pressure body 25 can also be easily exchanged. The pressure body 25 is, furthermore, arranged in the central region of the housing 23 parallel and close above the support 28 or the conveyor belt 4 respectively and at the two ends of the housing with obliquely upwardly and outwardly extending front ends 25'''. Serving for closing the two openings of the tubular housing 23 are slides 53 which extend approximately parallel to the front ends 25''' of the pressure body 25 into slots 54 in the housing 23 to the conveyor belt 4. Provided for further guidance of the slides 53 are guides 55 in which the slides 53 can be drawn out upwardly up to the complete release of the openings of the housing 23. Serving for this purpose is, in each case, a rope 56 which is placed about a roller 57 mounted between the guides 55 and which is connected to the piston rod of a hydraulic or pneumatic actuating cylinder 58. It is evident that the slide 53 can be raised out of the lower closure position by retracting the piston rod into the upper release position indicated in dot-dash lines in Fig. 4. It is furthermore clear that, by sucking out the water, the pressure body 25 can be brought into an initial position 25''' butting against the inside of the housing 23 and indicated in dot-dash lines in Fig. 4. The loading of the press can, moreover, be assisted by mounting, inclined in the transportation direction, on the supports 24 of the housing 23 between the washing machine 5 and the housing 23 a funnel-shaped moulding box 7'. The exit-side end of the moulding box 7' projects into the housing 23.

The batch of washing which has dropped out of the washing machine 5 thus slides through the moulding box 7' into the housing 23 and assumes there, with the outlet-side slide 53 closed, approximately the position 10'''. In this respect, the conveyor belt 4 may stand still or may move in the transportation direction. By lowering the inlet-side slide 53, the housing 23 is closed and the pressing procedure can begin in the above-described manner by introducing pressure water through the pressure-medium pipe 26, in which respect the pressure body 25 placed itself out of its initial position 25''' onto the batch of goods 10''' and squeezes this out. After the pressing, the slides 53 are moved into their release positions and the wrung-out batch of goods is transported out of the housing 23 by switching-on the conveyor belt 4. After closure of the outlet-side slide 53, the following pressing operation can begin with the filling of the housing 23.

Naturally, also the batch of goods can be conveyed solely by sliding into the housing 23, in which case the conveyor belt 4

serves only for the transporting away and can be correspondingly shorter in design. The housing 23 may also be mounted so as to be tiltable, so that it may assume, for the filling and emptying, a respectively suitable position. In further development, also the one slide 53 may be constantly closed; in other words the filling and emptying may be effected through a single opening.

#### WHAT I CLAIM IS:—

1. A press for expelling liquid from batches of goods such as laundry, comprising a tubular housing, a liquid permeable conveyor extending through the housing, a support, in the housing on one side of the conveyor and, on the other side of the conveyor and within the housing a flexible membrane which can have pressurised fluid supplied to its side remote from the conveyor to urge it towards the conveyor to compress a batch of goods between it and the conveyor to expel liquid therefrom.

2. A press as claimed in claim 1, wherein the support is pervious to water, and pipes for removal of squeezed-out liquid are provided beneath the support.

3. A press as claimed in claim 1 or 2, wherein the flexible membrane is flat and has a peripheral sealing lip which is held, by a holder, tightly against the inner wall of the housing.

4. A press as claimed in claim 1, 2 or 3, wherein the longitudinal edges of the membrane extend parallel to this axis of the housing over a central portion thereof and the ends thereof extend upwardly and outwardly to the inner wall of the housing.

5. A press as claimed in any preceding claim wherein the housing has, at each end, a slide which extends adjacent the corresponding end of the pressure body in a slot in the housing.

6. A press as claimed in claim 1 or 2, wherein the flexible membrane is in the form of an elastic tube which is closed at each end and which is arranged in the housing.

7. A press as claimed in claim 6, wherein the tube, when relaxed, is of inverted U-shape transversely of the housing and lies adjacent the wall of the housing.

8. A press as claimed in claim 6 or 7, wherein the flexible membrane has a pressure-medium pipe which is conducted through the housing and serves as the sole mounting support or holder for the membrane.

9. A press as claimed in any preceding claim characterised by the provision between the membrane and the support of generally wedge-shaped supports.

10. A press as claimed in any preceding claim characterised in that both a forward run and return run of the conveyor belt are conducted over the support and there is provided between the two runs a plate which

has slots and/or bores for the removal of the squeezed out liquid.

11. A press as claimed in any preceding claim characterised in that the housing is  
5 arranged to slope downwardly from inlet to outlet.

12. A press as claimed in any preceding claim characterised in that a slide for  
batches of goods to be treated is provided  
10 at one end of the housing while the other end is constantly closed.

13. A press for squeezing-out liquid from

batches of goods, substantially as herein-  
before described with reference to and as  
illustrated in Figs. 1 to 3 or in Figs. 4 to 15  
6 of the accompanying drawings.

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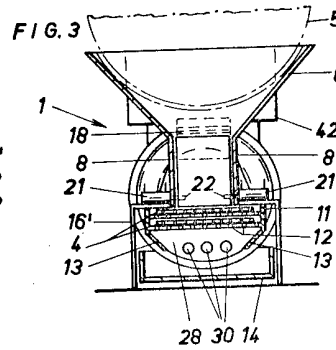
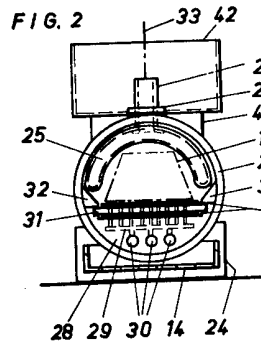
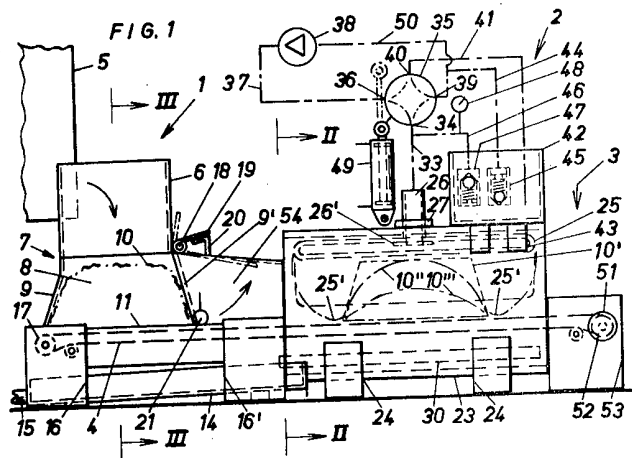
Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1981.  
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies  
may be obtained.

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## COMPLETE SPECIFICATION

2 SHEETS

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Sheet 1



## COMPLETE SPECIFICATION

*This drawing is a reproduction of  
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Sheet 2

FIG. 4

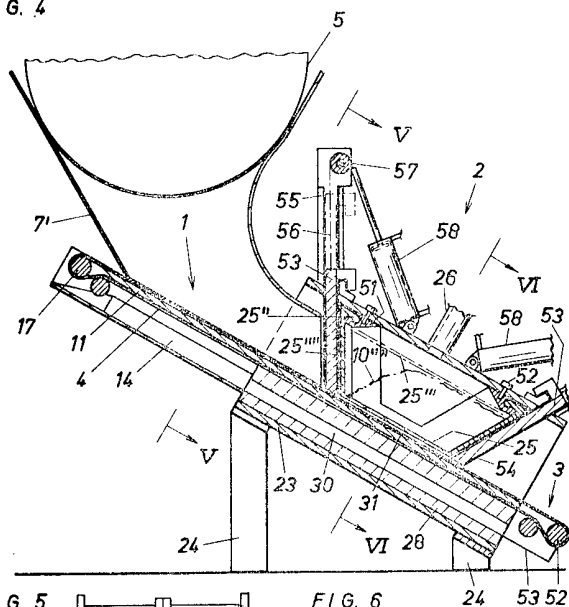


FIG. 5

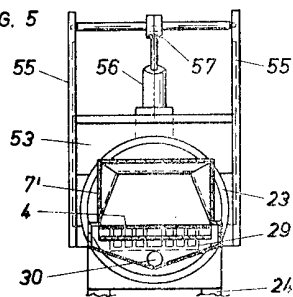


FIG. 6

