Oct. 24, 1944. W. R. SCHMITZ, JR 2,360,984

SCREW PRESS

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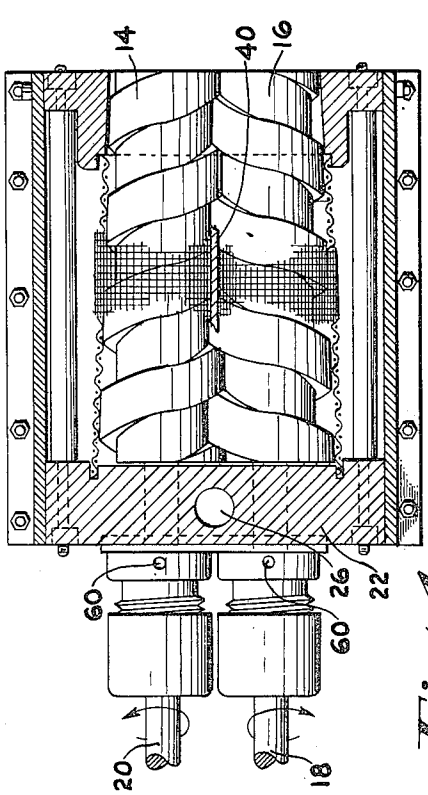


Fig. 4

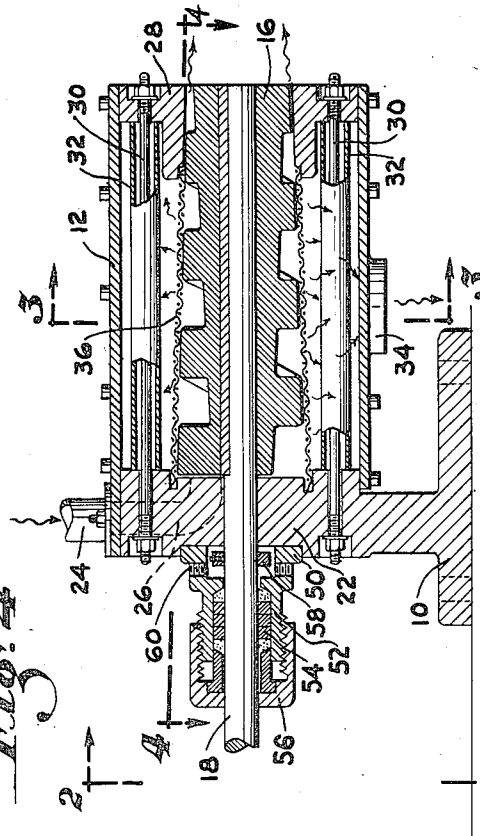


Fig. 1

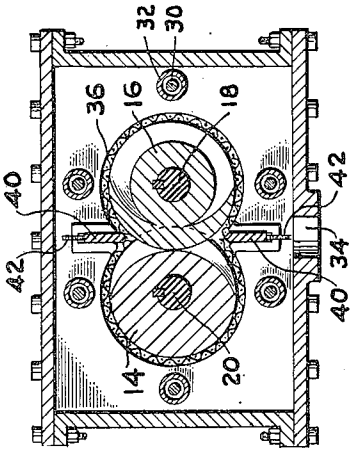


Fig. 3

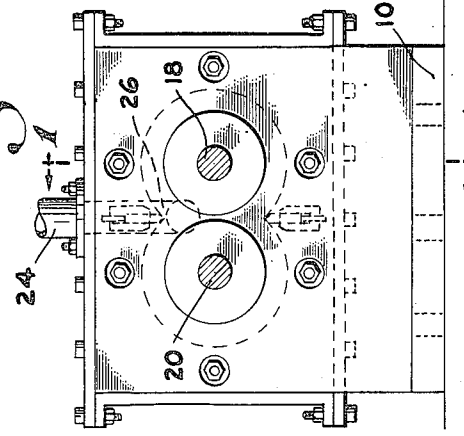


Fig. 2

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SCREW PRESS

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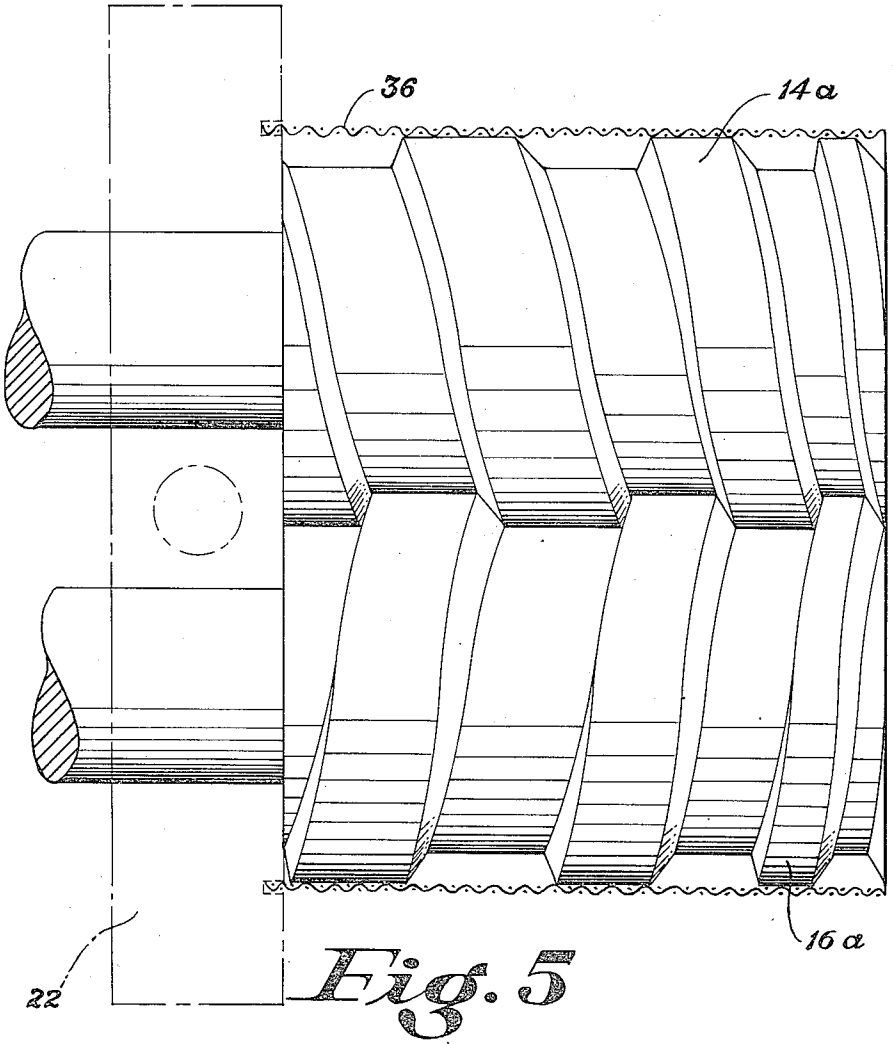


Fig. 5

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Patented Oct. 24, 1944

2,360,984

UNITED STATES PATENT OFFICE

2,360,984

SCREW PRESS

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Application November 24, 1942, Serial No. 466,810

5 Claims. (Cl. 100—48)

This invention relates to a screw press, and more particularly it relates to a positive action, screw press having a definite volumetric compression ratio between the inlet and outlet thereof.

It is an object of the present invention to provide a screw press which will forward a material containing a liquid in a positive manner and compress the volume of the material a given amount between the inlet and outlet thereof.

It is another object of the present invention to provide a screw press which will forward a material containing a liquid in a positive manner and compress the liquid from the material in accordance with a given compression ratio.

It is still another object of this invention to provide a screw press which will forward a material containing a liquid in a positive manner and compress the liquid from the material in accordance with a given compression ratio, and which will compact the residual material a given amount.

Other objects of the invention will appear hereinafter.

The objects of the invention may be accomplished, in general, by constructing a screw press with a pair of rotatable screws having intermeshing threads which, in one position of rotation, completely fill opposed intervening spaces between threads, the volumetric capacity of said screws gradually decreasing in the direction of movement of the material contained therein, and a perforated covering positioned closely about non-intermeshing portions of said screw threads.

The invention will be more clearly understood by reference to the following detailed description when taken in connection with the accompanying illustrations, in which;

Figure 1 is a sectional view taken along the line 1—1 of Figure 2, and showing one embodiment of the screw press constructed in accordance with the present invention.

Figure 2 is a front end view of the screw press shown in Figure 1.

Figure 3 is a sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a sectional plan view taken along the line 4—4 of Figure 1, and showing the twin screws in top plan view.

Figure 5 is a plan view, similar to Figure 4, showing two intermeshing screws of gradually diminishing pitch.

Referring to Figs. 1 to 4 of the drawings, reference numeral 10 designates a fixed base for the screw press. Part 12 is a casing comprising top and bottom and side walls connected to the base 10. Two square threaded screws are mounted in intermeshing relationship within the casing 12. The two screws are identical in every respect evcept that one is a lefthand screw and the other is a righthand screw. Both screws have a constant pitch and have a constantly decreasing thread depth. The width of the threads and the spaces between threads are substantially the same so that the threads are completely interlocked with each other, in a close fitting relationship. The threads of the screws, at their point of maximum intermesh completely fill the oppositely disposed intervening grooves between threads. By this construction, the grooved passages between threads are completely blocked and therefore provide for a positive action in feeding material contained in the grooves between threads. The screws 14 and 16 are mounted respectively on drive shafts 20 and 18, and means are provided for rotating the shafts in opposite directions as shown by the arrows in Fig. 4. A supply conduit 24 is positioned on the front plate 22 for feeding material into the screw press. The supply conduit 24 is positioned above a bore 26 in the front plate 22. The bore 26 as shown in Figs. 1 and 2 passes the material to the front end of the two screws approximately at the point of intermesh with each other. The rear end of the screw press is comprised of a somewhat annular shaped form 28. The form 28 is positioned closely about the two intermeshing screws and functions as an outlet forming die through which the material is forced from the screw press. The outlet opening through which the material is pressed will therefore be in the approximate shape of the Figure 8. The annular form 28 is maintained in position by means of bolts 30 and sleeve spacer members 32. A perforated cover member 36 is positioned closely about the peripheral surfaces of the screws 14 and 16 which are not in mesh with each other. This perforated cover extends from the front plate 22 to the inner end of the annular shaped form die 28. The cover is maintained in close contiguity with the peripheral portions of the threads on screws 14 and 16 by means of wedge bars 40 positioned against those sections of the threads which are just beginning to mesh with each other and again with those sections of the threads which are just breaking mesh with each other. The wedge bars 40 may be provided with forcing screws 42 in order to force the wedge bars into close contact with the threads of the screws.

Any liquid material expressed from the material fed to the screw press will be forced outwardly through the perforated cover members 36. Space is, therefore, provided about the cover member 36, within the casing, for passage of the liquid from the press. An outlet opening 34 for the liquid is provided at the bottom of the press. If desired, means for applying a vacuum to the outlet opening 34, such as a conventional vacuum pump may be attached to the outlet opening. The screw shafts 18 and 20 are preferably provided with a special packing gland to prevent contact of the liquid with the packing gland material. This packing gland is provided with a flange 50 whereby to attach the same to the front end plate 22. A small cavity is formed in the packing gland adjacent the flange 50. This small cavity is to provide room for a splash ring 58 mounted on the shaft 18 as shown in Figure 1 of the drawings. The remainder of the packing gland is conventional in that it is composed of male and female connections 52 and 56 and a packing gland material 54 positioned within the male connection 52. If desired, an outlet opening 60 may be connected with the cavity in the packing gland, to which opening a source of vacuum may be attached so that in the event of a volatile liquid the latter may be removed from the cavity by vacuum before it can contact the packing gland material 54.

The embodiment of the present invention disclosed in the drawings operates substantially as follows: A material, containing a liquid, is forced into the press through conduit 24 and bore 26. In order to insure that the material will fill the grooves between threads of the screws 14 and 16, it is preferred that the material is passed into the conduit 24 under pressure. As the screws 14 and 16 rotate, the grooves between threads opening to the bore 26 are continuously filled and positively forwarded between closely fitting and completely interlocking screw threads. As above set forth, the depth of the screws gradually decreases from the inlet opening to the outlet opening of the press. Thus, the volumetric capacity of the groove passages between threads gradually decreases in the direction of travel of the material. As the volumetric capacity of the screws decreases, the liquid will be expressed from the material through the perforated cover 36. Since the cover 36 is pressed into close contiguity with the peripheral portions of the threads which are not in mesh with each other, the only outlet of the material is through the perforated cover member or to remain within the groove passages between threads of the screws.

Inasmuch as the completely interlocking square threads of the screws cause a positive forwarding of the material with a definite compression ratio, the reduction in volume of the material will be constant. After the material has passed the end of the perforated cover member 36, it will be compacted within the forming die 28 since from the end of the perforated cover member to the outlet end of the press the only escape of the material is between the grooved passages between threads of the screws and the forming die 28. The decreasing volumetric capacity of the screws is continued through the section of the forming die 28.

In order that the material be forwarded in a completely positive manner, it is necessary that the screws be provided with substantially square threads so that the grooved passages between threads will be substantially blocked from the position where the threads first mesh to the position where the threads unmesh. The perforated cover will be pressed into close contact with the screw threads on all peripheral positions thereof, except those in actual mesh with each other. Therefore, with square threads, the material forwarded between screws must necessarily be either pressed through the perforated cover or forwarded along the grooved passages between threads. The apparatus of the present invention will, however, approach a positive forwarding action when provided with threads approaching square threads, for example, modified acme type threads.

The perforated cover means may be comprised of a screen of fine mesh or it may be comprised of perforated sheet metal or the like.

In accordance with the preferred embodiment of the invention as illustrated, the gradual decrease in volumetric capacity of the screws is provided for by decreasing the depth of the threads of the screws from the inlet to the outlet opening of the screw press. The gradual decrease in the volumetric capacity of the screws may, however, be provided for by any other desired construction thereof, for example, by a gradually decreasing space between threads.

The apparatus of the present invention, although of general utility in removing liquid from solid material, is of particular utility in the removal of carbon bisulfide from cellulose xanthate and compacting the remaining cellulose xanthate in order to remove most of the entrained air therefrom.

In the construction of a press for use in expressing carbon bisulfide from cellulose xanthate, it is preferred that the threads of the press have a gradually decreasing depth between the extreme ends of the screws to give a reduction in volumetric capacity of the order of about 3:1. Furthermore, it is desired that the casing surrounding the screws and the perforated covering be substantially air-tight so that a vacuum may be applied to the outlet opening for the carbon bisulfide and thereby permit flash evaporation of at least a part of the carbon bisulfide as it is pressed from the cellulose xanthate slurry. Such flash evaporation of carbon bisulfide will impart a sufficient cooling action to prevent overheating of the press and thereby creating an explosion hazard.

Fig. 5 of the drawings illustrates a modified form of the invention in which the gradual decrease in the volumetric capacity of the screws 14a and 16a is provided for by a gradual decrease in the axial pitch of the screws with a uniform depth of the threads throughout the length of the screws. The general construction of the press, except for the form of the screws, may be the same as that shown in Figs. 1 to 4 of the drawings.

Since it is obvious that many changes and modifications can be made in the above described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited to the above described details except as set forth in the appended claims.

I claim:

1. A screw press comprising a casing, a pair of rotatable screws having intermeshing threads in said casing, the intermeshing threads of said screws, in one position of their rotation, completely filling the opposed intervening spaces between threads, an inlet opening to said screws

in said casing and an outlet opening from said screws in said casing, the volumetric capacity of said screws gradually decreasing from said inlet opening to said outlet opening, a perforated cover positioned closely about non-intermeshing portions of said screw threads between the said inlet and outlet openings, and a solid forming die positioned closely about the non-intermeshing portions of said screw threads between said perforated cover and said outlet opening.

2. A screw press comprising a casing, a pair of rotatable screws having intermeshing square threads in said casing, the intermeshing threads of said screws, in one position of their rotation, completely filling the opposed intervening spaces between threads, an inlet opening to said screws in said casing and an outlet opening from said screws in said casing, the volumetric capacity of said screws gradually decreasing from said inlet opening to said outlet opening, a perforated cover positioned closely about non-intermeshing portions of said screw threads between the said inlet and outlet openings, and a solid forming die positioned closely about the non-intermeshing portions of said screw threads between said perforated cover and said outlet opening.

3. A screw press comprising a casing, a pair of rotatable screws having intermeshing threads of constant pitch in said casing, the intermeshing threads of said screws, in one position of their rotation, completely filling the opposed intervening spaces between threads, an inlet opening to said screws in said casing and an outlet opening from said screws in said casing, the depth of said threads gradually decreasing from said inlet to said outlet opening whereby to gradually decrease the volumetric capacity thereof, a perforated cover positioned closely about non-intermeshing portions of said screw threads between said inlet and said outlet openings, and a solid forming die positioned closely about the non-intermeshing portions of said screw threads between said perforated cover and said outlet opening.

4. A screw press comprising a casing, a pair of rotatable screws having intermeshing square threads of constant pitch in said casing, the intermeshing threads of said screws, in one position of their rotation, completely filling the opposed intervening spaces between threads, an inlet opening to said screws in said casing and an outlet opening from said screws in said casing, the depth of said threads gradually decreasing from said inlet to said outlet opening whereby to gradually decrease the volumetric capacity thereof, a perforated cover positioned closely about non-intermeshing portions of said screw threads between said inlet and said outlet openings, and a solid forming die positioned closely about the non-intermeshing portions of said screw threads between said perforated cover and said outlet opening.

5. A screw press comprising a casing, a pair of rotatable screws having intermeshing square threads in said casing, the intermeshing threads of said screws, in one position of their rotation, completely filling the opposed intervening spaces between threads, an inlet opening to said screws in said casing and an outlet opening from said screws in said casing, the volumetric capacity of said screws gradually decreasing from said inlet opening to said outlet opening, a perforated cover positioned closely about non-intermeshing portions of said screw threads between the said inlet and said outlet openings, and wedge means for forcing said perforated cover against said screws along the line of intermesh of said screw threads.

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