Feb. 25, 1958 D. L. SCHUBERT ET AL. 2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Filed Aug. 23, 1952 6 Sheets-Sheet 1

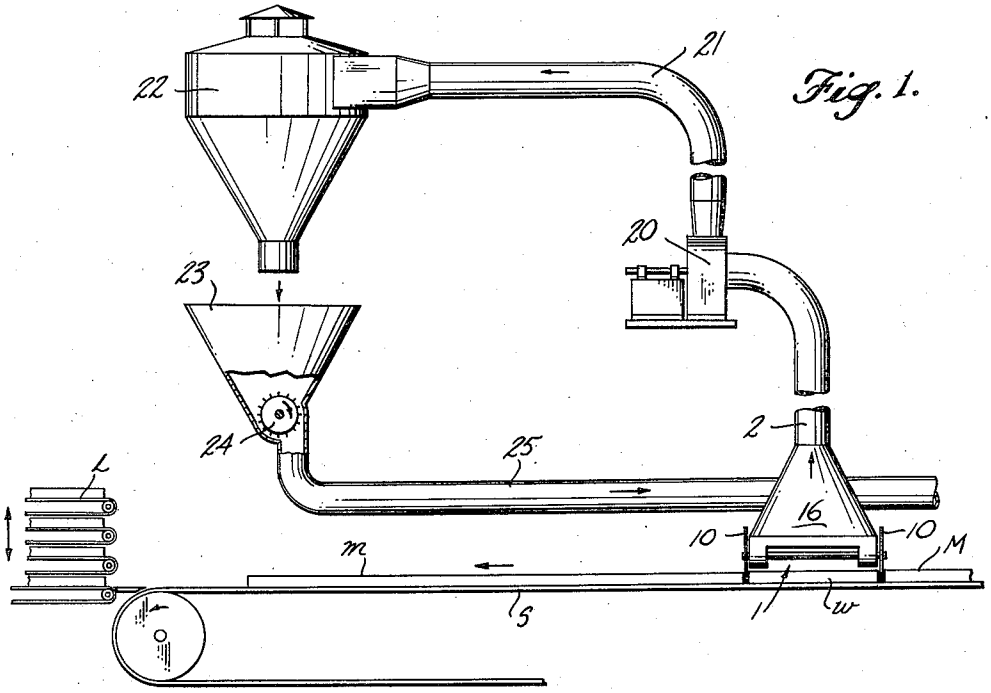


Fig. 1.

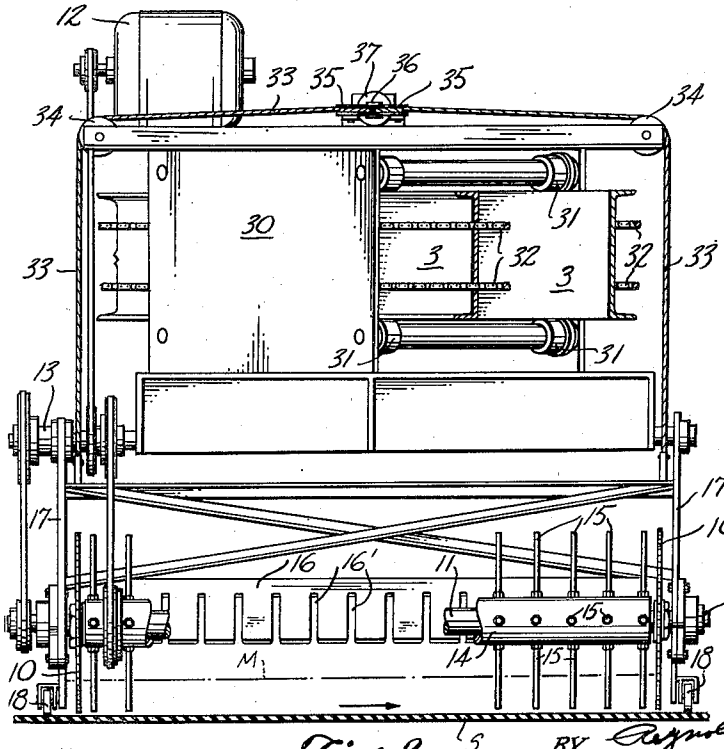


Fig. 2.

INVENTORS.
DALE L. SCHUBERT
HAROLD E. ERICKSON
NORMAN E. NELSON
DAVID A. BROWN

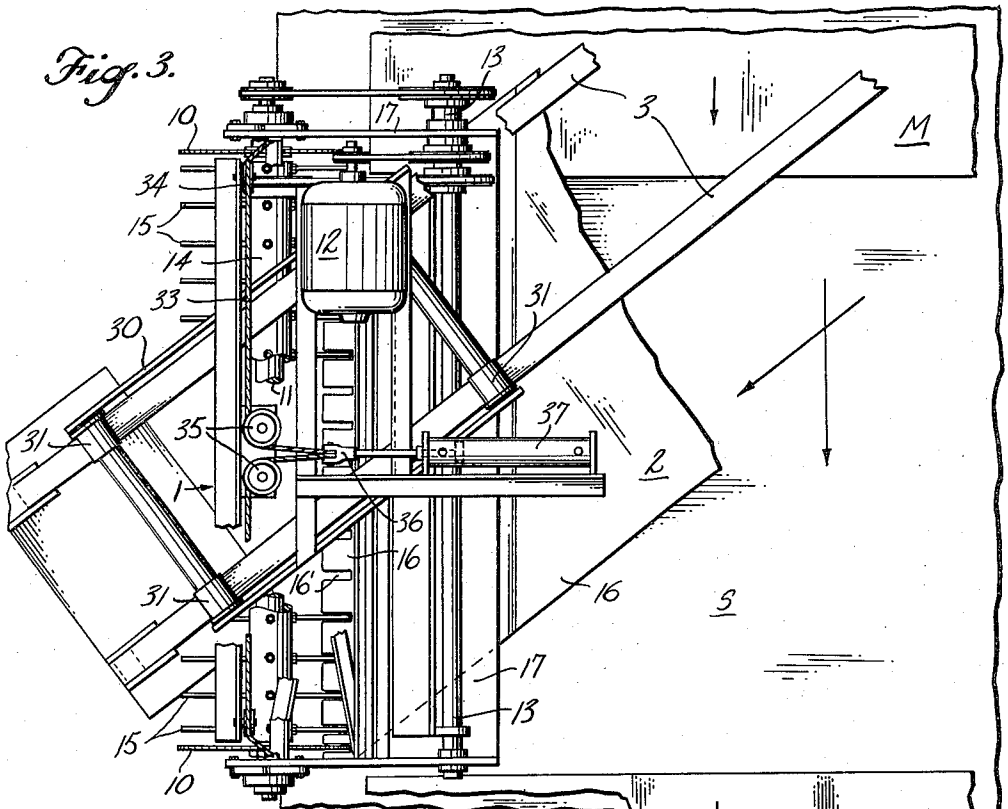
BY Reynolds, Beach & Christensen
ATTORNEYS

Feb. 25, 1958 D. L. SCHUBERT ET AL 2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Filed Aug. 23, 1952 6 Sheets-Sheet 2

Fig. 3.



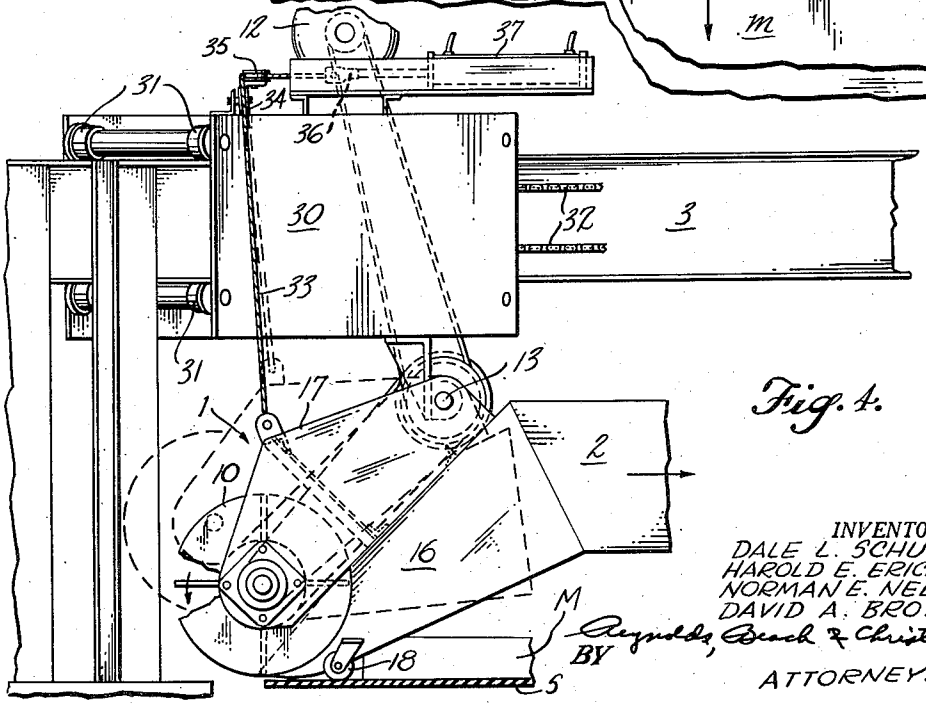


Fig. 4.

INVENTORS.
DALE L. SCHUBERT
HAROLD E. ERICKSON
NORMAN E. NELSON
DAVID A. BROWN
BY Reynolds, Beach & Christensen
ATTORNEYS

Feb. 25, 1958 D. L. SCHUBERT ET AL 2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Filed Aug. 23, 1952 6 Sheets-Sheet 3

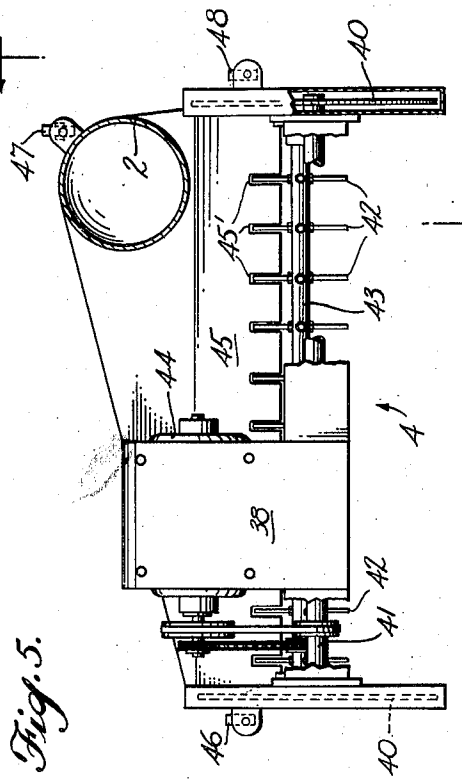


Fig. 5.

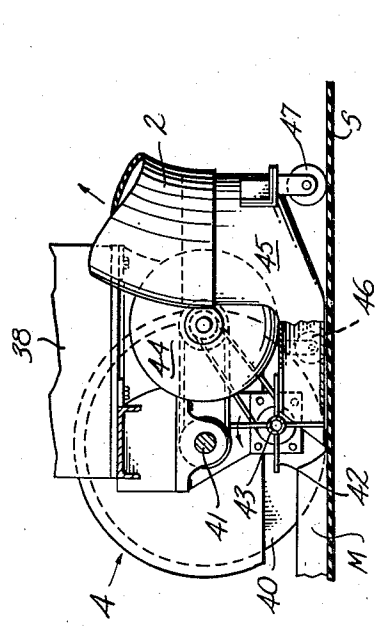


Fig. 6.

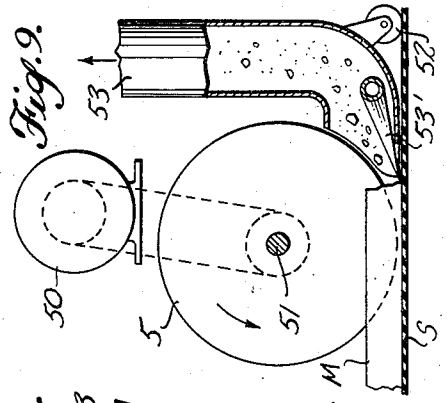


Fig. 9.

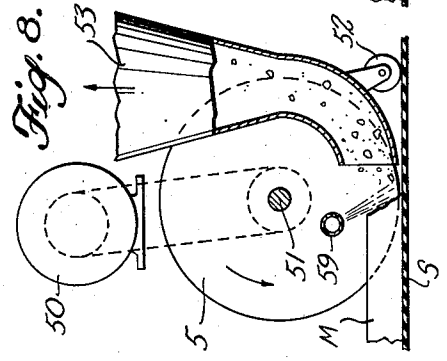


Fig. 8.

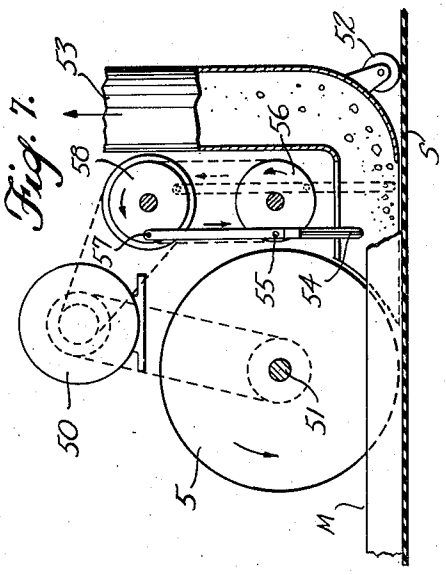


Fig. 7.

INVENTORS.
DALE L. SCHUBERT
HAROLD E. ERICKSON
NORMAN E. NELSON
DAVID A. BROWN

BY Reynolds, Beach & Christensen
ATTORNEYS

Feb. 25, 1958 D. L. SCHUBERT ET AL 2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Filed Aug. 23, 1952 6 Sheets-Sheet 4

Fig. 11.

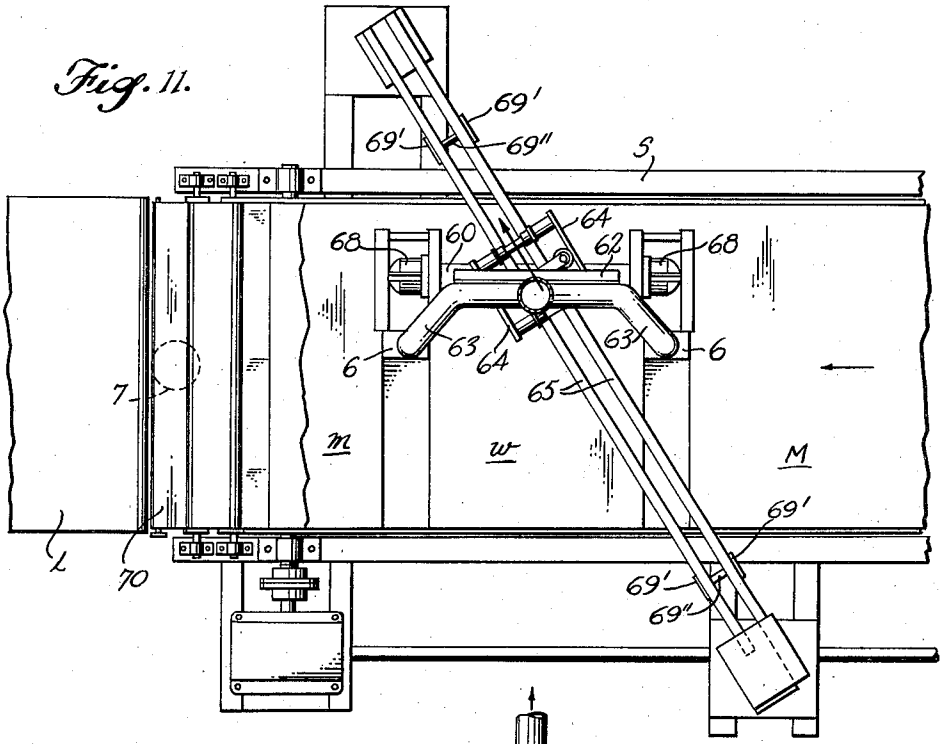
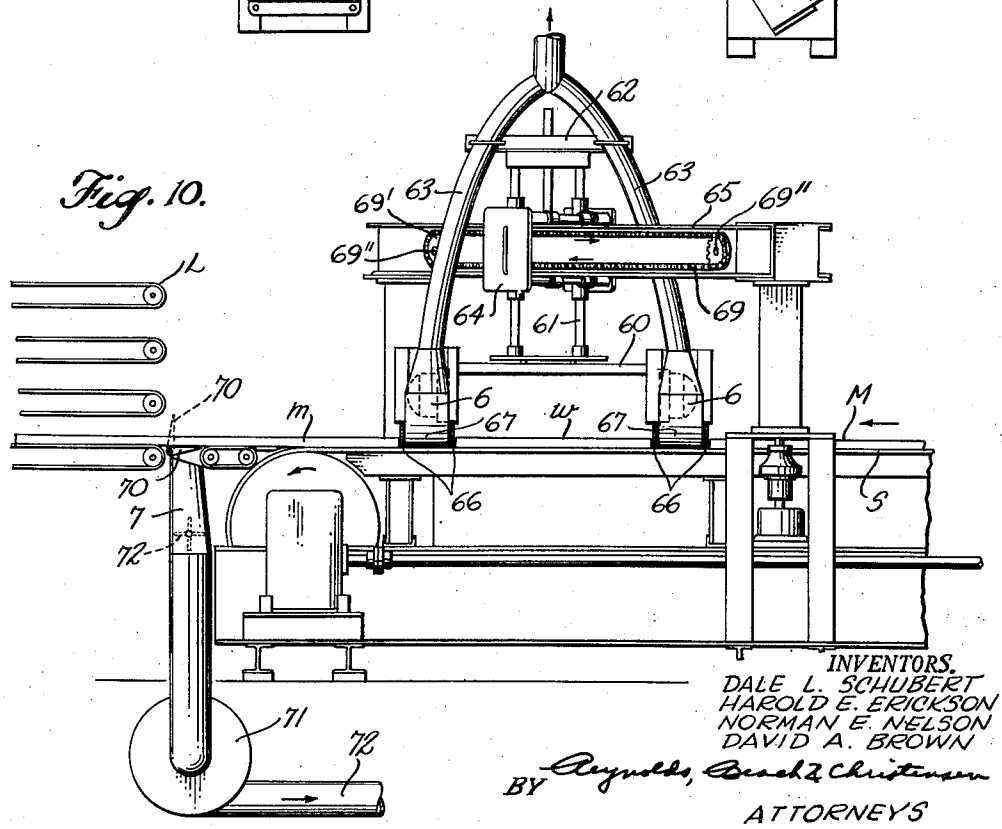


Fig. 10.



INVENTORS.
DALE L. SCHUBERT
HAROLD E. ERICKSON
NORMAN E. NELSON
DAVID A. BROWN

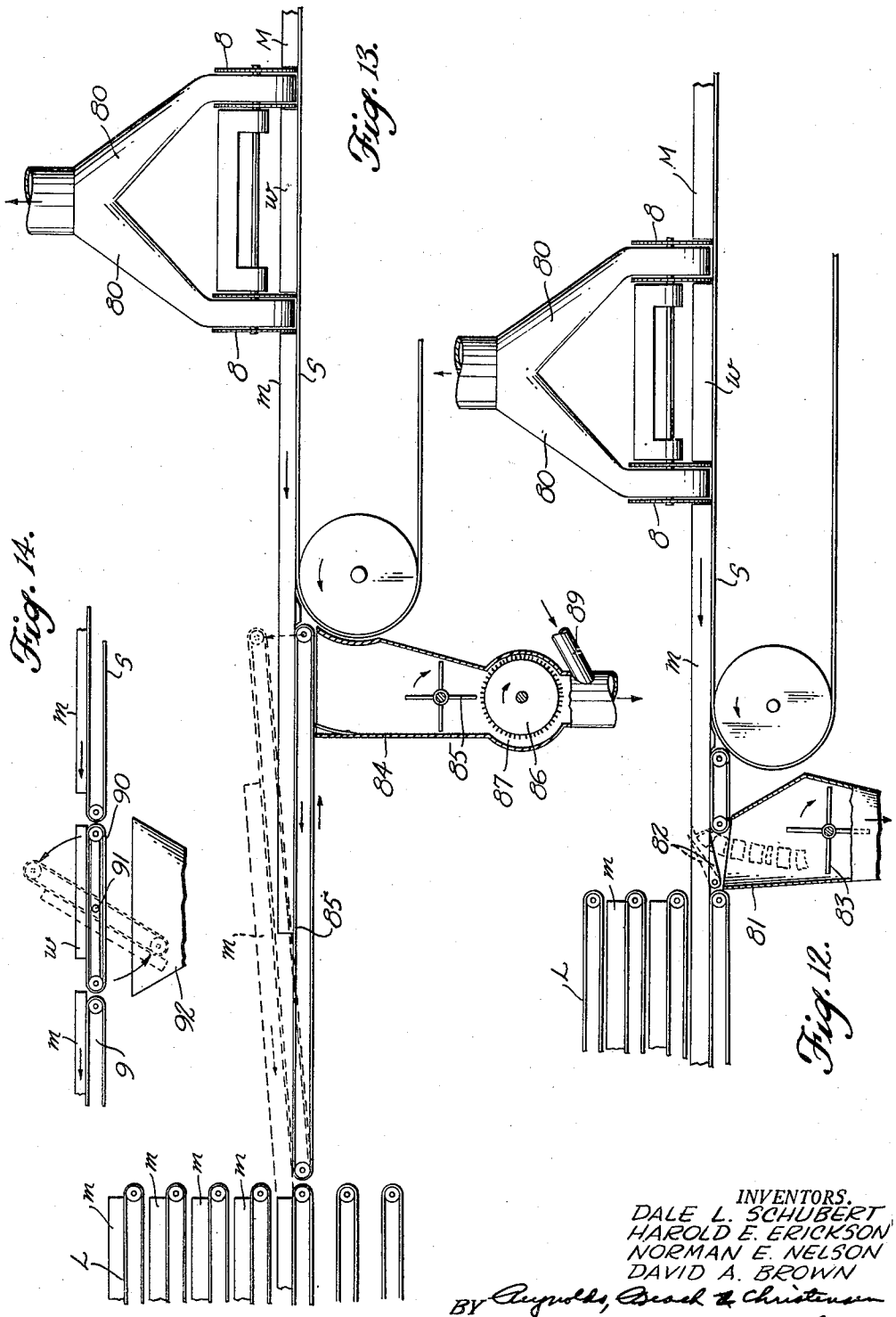
BY Reynolds, Beach & Christensen

ATTORNEYS

Feb. 25, 1958 D. L. SCHUBERT ET AL 2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Filed Aug. 23, 1952 6 Sheets-Sheet 5



INVENTORS.
DALE L. SCHUBERT
HAROLD E. ERICKSON
NORMAN E. NELSON
DAVID A. BROWN
BY Reynolds, Beach & Christensen
ATTORNEYS

Feb. 25, 1958 D. L. SCHUBERT ET AL 2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Filed Aug. 23, 1952 6 Sheets-Sheet 6

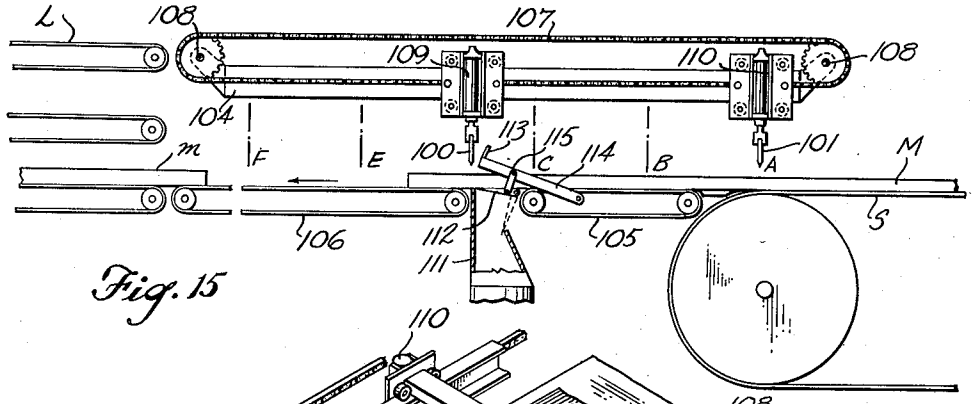


Fig. 15

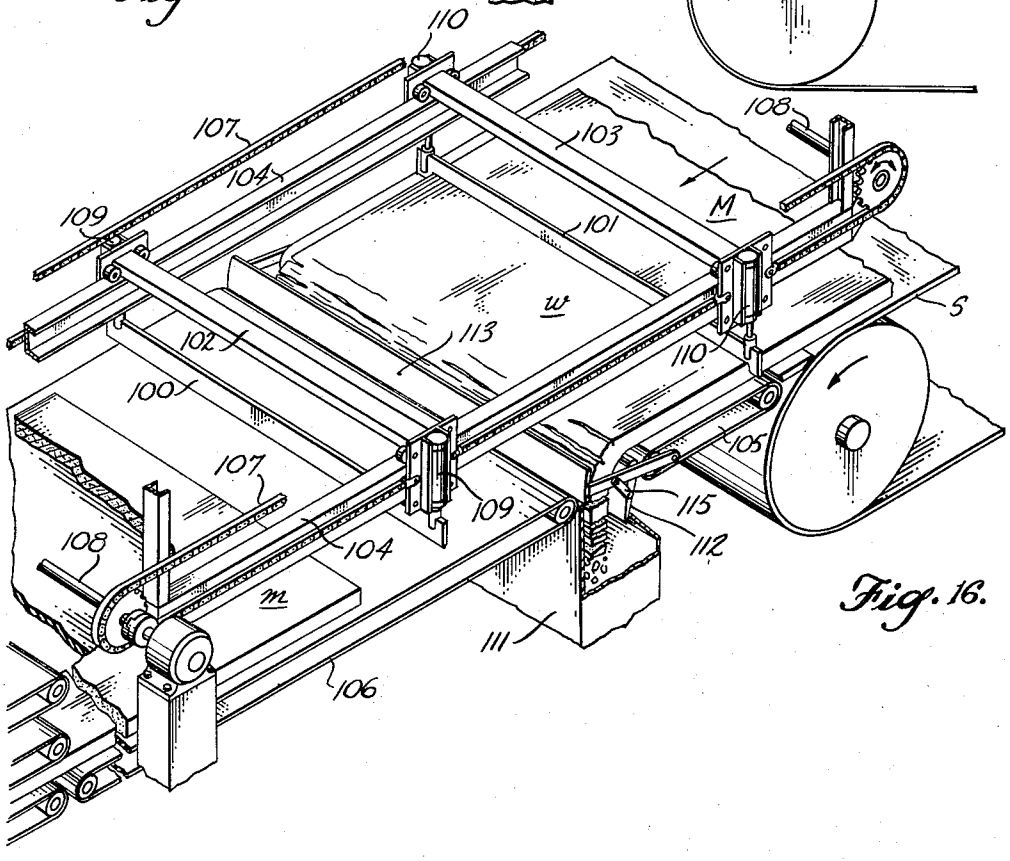


Fig. 16.

INVENTORS.
DALE L. SCHUBERT
HAROLD E. ERICKSON
NORMAN E. NELSON
DAVID A. BROWN

BY Reynolds, Bard & Christensen
ATTORNEYS

United States Patent Office 2,824,610 Patented Feb. 25, 1958

2,824,610

MAT SEGREGATING MECHANISM AND METHODS

Dale L. Schubert, Tacoma, Harold E. Erickson, Auburn, Norman E. Nelson, near Tacoma, and David A. Brown, Tacoma, Wash.; said Erickson, said Nelson, and said Brown assignors to said Schubert

Application August 23, 1952, Serial No. 305,962

6 Claims. (Cl. 164—76)

The present invention relates to mechanism for segregating a continuous mat sheet into individual and separated mat units. This mechanism effects such segregation by the method of removing a section of mat of substantial length from between edges severed by the mechanism which form the adjacent ends of two adjacent mat units.

In the manufacture of fiberboard from woody fiber material and similar products it is customary to form a mat of the desired thickness of fiber in a continuous length. Such mat may be formed from wet fiber material as with a Fourdrinier mat forming machine, or from relatively dry fiber. The fiber utilized may be from waste wood, cornstalks, bagasse or other material suitable as a fiber source. The present invention is not concerned with the particular manner in which the mat is produced or the type of fiber used, but has particular application to such a fiber mat which is formed as a continuous sheet.

In the manufacture of fiberboard, whether soft board of the insulating type or hardboard having a density approaching or exceeding unity, the customary procedure is to press a fiber mat in a press which usually is heated. The present invention is especially intended for use where this pressing operation is performed in a multiplaten press which may have from ten to twenty openings, for example. Economy of plant operation is promoted if mat units to be pressed can be accumulated in stacked relationship spaced apart vertically distances corresponding to the distances between the mat supporting surfaces of the press when it is opened, so that a complete press load of sheets may be charged simultaneously into the press. Time is saved in the pressing operation if the mat units can be accumulated in this fashion during a pressing cycle, although the invention would also be useful in a process where fiber mat units are moved sequentially into the several openings of the press directly.

Whether the mat units are supplied to shelves of a press loader or directly onto platens of a press, some time lag at least occurs between registry of a supply conveyer carrying the mat units with successive shelves of a press loader or platens of a press. If a mat of fiber material is formed continuously by an automatic machine at a given speed, the problem therefore arises of separating the continuous mat into units and of manipulating successive units to feed onto different loader shelves or press platens without adjacent ends of adjacent mats being damaged or interfering with each other.

The object of the present method of segregating the mat into mat units is to provide sufficient space between adjacent ends of adjacent mat units to enable the supply conveyor and successive loader shelves or press platens to be brought into registry while the supply conveyor is moving through a distance not exceeding the spacing between such mat ends. It therefore becomes possible to feed the mat units into successive spaces at the same rate that the mat is formed without any interference between adjacent mat units. It is evident that the method should be sufficiently flexible, taking into consideration the

speed of the supply conveyor and the time required to effect registry between the supply conveyor and successive mat unit receiving spaces, so as to provide a space between adjacent ends of adjacent mat units adequate to prevent interference between successive mats, while at the same time not making the spacing between mat units appreciably greater than necessary to accomplish this purpose, so as to waste time in the operation of loading the press loader or the press.

Specifically, it is an object of the present method to remove an appreciable quantity of mat material between adjacent units of mat, and to return the fibrous material thus removed to the mat forming equipment for re-use.

An object of the mat segregating mechanism according to the present invention is to remove the desired amount of fibrous material between adjacent ends of adjacent mat units quickly and cleanly, and simultaneously neatly form the ends of the mat units. In removing such fibrous material it is an object to disintegrate it substantially into fiber particles again, or at least into pieces sufficiently small as to be utilized by the mat forming machine, preferably without requiring any appreciable reprocessing.

A further object is to provide mechanism effective for removing and disintegrating mat material which is of simple but rugged construction, and which can be associated with a conveyor between the mat forming machine and the press or press loader not greatly exceeding the length of one mat unit, so as not to require appreciable additional working space in a fiberboard manufacturing plant.

The mechanism can take any of several different forms so as to be most suitable for handling various types of fiber and mat compositions.

The mechanism broadly includes two mat edge forming elements arranged in relation spaced corresponding to the spacing desired between the adjacent ends of adjacent mats, and the mat section between such edge forming elements is disintegrated either at the time the mat unit end edges are formed, or the section of mat between such ends is removed and disintegrated subsequent to formation of such edges, but prior to delivery of the mat units to the press loader or press.

Advantages of the several types of mechanism illustrated in the drawings will be discussed in the following detailed description.

Figure 1 is a somewhat diagrammatic side elevation view of mat segregating mechanism according to the present invention with parts broken away.

Figure 2 is an elevation view of a portion of the segregating mechanism viewed transversely of the direction of mat movement, and Figure 3 is a plan view of such mechanism, parts being broken away in both views. Figure 4 is an elevation view of the same mechanism viewed parallel to the direction of mat movement, with parts of the mechanism broken away.

Figure 5 is a plan view of part of the mat segregating mechanism corresponding to that shown in Figures 2, 3 and 4, but of a somewhat modified type, and Figure 6 is a vertical sectional view through the mechanism of Figure 5, taken on line 6—6 of that figure.

Figures 7, 8 and 9 are side elevation views looking parallel to the direction of mat movement of three further modified types of mat segregating mechanism with parts broken away in each instance.

Figure 10 is an elevation view looking transversely of the direction of movement of the mat, and Figure 11 is a plan view, of a different type of mat segregating mechanism, and Figure 12 shows in elevation similar to Figure 10 and somewhat diagrammatically a somewhat modified mechanism of the same general type.

Figure 13 is a side elevation view looking transversely

of the direction of mat travel of still another form of mat segregating mechanism, parts being broken away. Figure 14 is a fragmentary diagrammatic side elevation view of a slightly different mechanism of the same general type.

Figure 15 is a side elevation view looking transversely of the direction of mat movement of another type of mat segregating mechanism shown rather diagrammatically and with parts broken away. Figure 16 is a top perspective view of such mechanism, also with parts broken away.

As has been mentioned previously, it is assumed that an endless fiber mat M of appropriate thickness is produced by any suitable mat making machine. This mat is usually more than one inch in thickness and may be several inches in thickness. While it will be assumed further that except for its endless character the mat is ready for consolidation into fibreboard form, the method and mechanism of the present invention may be utilized for segregating the endless mat into units of a size suitable for pressing, yet not ready for pressing. Thus, for example, even after such segregation the individual mat units may be subjected to a prepressing operation, a surface evening operation, or some other operation before pressing. It will be understood, therefore, that while in the following discussion the mat units are portrayed as being assembled for pressing immediately after segregation by the present method and mechanism, such sequence is not at all mandatory.

Furthermore, it has been pointed out above that fiber mat units may be conveyed one by one to successive press spaces or openings, but that time is saved if some suitable type of magazine loader is utilized in which the number of mat units required for a complete loading of the press can be accumulated one by one during a pressing cycle, and then all of the mat units can be moved into the press simultaneously. In Figure 1 a representative type of loader L is illustrated including superposed shelves, each of which may be provided with a belt movable to transfer the mat unit from its shelf onto the corresponding platen of the press. The mechanism for effecting sequential registration between the mat unit supply conveyor and the successive openings or shelves of the loader is not a part of the present invention and any mechanism suitable for this purpose may be employed. The important feature of this invention is that sufficient lag be provided between successive mat units without stopping the supply conveyor so that the loader shelf locating mechanism will have time following complete disposition of one unit in a loader opening to shift the next loader opening into registry with the supply conveyor in time for it to receive the leading end of the next mat unit.

The supply conveyor S carries the endless mat M from the mat forming machine, and the segregating operation of the present mechanism is performed on such conveyor, so that the mat units *m* of a length to be accommodated in the press are delivered by this same conveyor to the press loader L. While such press loader is shown as being movable vertically relative to the supply conveyor, a tilting conveyor section could be interposed between the supply conveyor and the loader to shift from one loader space to the other without the loader being moved vertically.

Whichever type of mechanism for registering the supply conveyor with successive spaces of the loader is employed, proper spacing between the mat sections *m* is afforded by actually removing the intervening section of mat. This enables the mat to be moved at uniform speed from the forming machine to the loader instead of, as in the past, attempting to accelerate the movement of a mat unit *m* after it is severed from the endless mat M in an attempt to provide adequate spacing between adjacent ends of adjacent mat units.

In the type of segregating mechanism shown in Figures 1 to 4, inclusive, the section of waste mat *w* is removed completely at the same time that the edges are formed on the trailing end of one press length mat unit and the leading edge of the next press length mat unit. Such removal is accomplised by the mat disintegrating head 1 which, in a single pass transversely of the direction of movement of the supply conveyor S, cuts out a swath of mat *w* equal in length to the spacing required between the adjacent ends of adjacent press length mat sections *m* to afford the desired dwell between complete reception of a mat unit *m* in one space of the loader L and initiation of movement of the next mat unit into the succeeding space.

Details of the mat disintegrating head are shown in Figures 2, 3 and 4 as including cutting disks 10 mounted adjacent to opposite ends of a rotary shaft 11 driven by the motor 12 through the countershaft 13. The peripheries of the cutting disks 10 may be suitably serrated to cut through the fiber mat easily with the least possible disturbance, but such a mat is usually rather loosely packed even if it has been prepressed, so that it is not necessary that such cutting disks actually be saws. The design of their peripheries may be selected in accordance with the character of the mat to be cut so as to leave a clean, smooth edge on each end of the mat unit *m*.

On the shaft 11 between the cutting disks 10 is mounted a sleeve 14 in which are anchored the inner ends of a plurality of mat disintegrating fingers 15. These fingers may be arranged in rows lengthwise of the sleeve, four such rows being shown, and the fingers pass through notches or slots 16′ as the sleeve rotates. The shaft 11 and sleeve 14 may be rotated at the same speed, in which case the sleeve could be secured directly to the shaft, but preferably the disintegrating rotor is turned slower than the cutting disks. Consequently the sleeve 14 is rotative on shaft 11 and is driven from the countershaft 13 by a separate drive belt and pulley arrangement as shown at the left of Figure 2.

The shaft 11 will be rotated by the motor 12 as the disintegrating head 1 is moved across the path of travel of the mat, and the fiber material disintegrated by the fingers 15 will be swept by them into the nozzle end 16 of a suction duct 2. Suction is produced in such duct by a blower 20 which delivers the airborne disintegrated fiber from the mat through a discharge pipe 21 into an accumulating cyclone 22. From this cyclone the fiber material falls into a hopper 23 from which it is withdrawn as needed by a picking roll 24, and conveyed by a further blower duct 25 to be mixed with other fiber material being supplied to the mat making machine. The fiber material from the waste section *w* is thus all recovered and utilized in the mat making operation.

It has been pointed out previously that a principal advantage of the present invention is that the mat may be formed endlessly at a constant speed by the mat making machine and delivered at that same speed to the press loader L, and preferably the mat making speed and speed of the supply conveyor S will be coordinated with the number of press openings and the time required for the pressing cycle, so that there need be no interruption whatever in the mat forming process. It will be evident, therefore, that it would be undesirable to interrupt the movement of the supply conveyor S to facilitate the mat segregating operation. Consequently the movement of the mat disintegrating head 1 must be coordinated with the travel of the supply conveyor S so that the resultant movement of the disintegrating head will be perpendicular to the length of the mat. It will be evident, therefore, that the movement of the disintegrating head transversely of the direction of travel of the supply conveyor must have a substantial component of movement in the direction of such conveyor travel. The disintegrating head is therefore shifted along a track 3 inclined relative to the supply conveyor S, and the speed of movement of the disintegrating head along such track must be such that its component of movement in the direction of mat travel

during the disintegrating operation will be exactly equal to the speed of supply conveyor S.

The disintegrating head is supported for movement along track 3 by a carriage 30 having antifriction bearing rollers 31 engageable with the upper and lower edges of each of the tracks and located at opposite ends of the carriage to prevent it from tilting. The carriage is driven along the track by chains 32 shown in Figure 2, extending alongside the track, and the drive mechanism for these chains is suitably integrated with the drive for supply conveyor S so as to preserve positively the desired speed ratio between the conveyor speed and the disintegrating head speed to keep the component of the latter lengthwise of the conveyor equal to the conveyor speed during disintegrating movement of the head as previously discussed. Preferably the tracks 3 are of channel shape as shown best in Figure 2, and the drive chains 32 conveniently may be received within such channels.

The motor 12 and countershaft 13 are carried directly by the carriage 30, but it will be evident that the disintegrating head of the type shown cannot operate in both directions to cut a swath through the mat, because when the head is moving opposite to the direction of the arrow in Figure 3 its component lengthwise of the travel of conveyor S would be bucking movement of such conveyor, and consequently would not cut a swath perpendicular to the length of the mat. For that reason it is necessary for the disintegrating head to be raised during return movement of the carriage 30 along the track 3, preparatory to a further mat segregating operation. The shaft 11 is therefore supported swingably in mounting brackets 17 which preferably are pivoted to swing about the axis of countershaft 13 so that the driving connection between this shaft and the shaft 11 and sleeve 14 need not be interrupted.

During the mat disintegrating movement of the disintegrator head 1 across the supply conveyor, it is important that the elevation of the cutting disks 10 and the disintegrator fingers 15 relative to the conveyor belt be maintained accurately, so that the mat will be completely severed and the sections *w* removed without the cutting disks or disintegrating fingers coming into contact with the belt. The simplest way of insuring this result is to support the swinging end of the head on rollers 18, which travel on the surface of the conveyor belt S. These rollers or wheels should support the cutting disks so that they just clear the belt surface, and the ends of the disintegrator fingers may clear the belt by approximately a quarter of an inch.

When the disintegrating head has completed one segregating operation and has reached the position shown in Figures 3 and 4, it will be swung upwardly about the axis of shaft 13 by hoisting cables 33 extending over guide pulleys 34 and around guide pulleys 35 on the carriage 30, and anchored to the plunger 36 of a hydraulic or air cylinder 37 also mounted on carriage 30. Operating fluid admitted to this cylinder will retract the plunger 36 to swing the disintegrating head 1 upward into the broken-line position of Figure 4 where the rollers 18 will clear the upper surface of the mat M during return movement of the carriage 30 along tracks 3. A sliding connection between suction nozzle 16 and conduit 2 will enable the disintegrating head to be swung in this fashion, and the duct 2 itself will be made of sufficiently flexible material or be provided with flexible joints such as to enable the carriage to be moved back and forth along the track without disconnecting such duct.

It will be evident that automatic control mechanism may be provided which will coordinate operation of the disintegrating head with travel of the conveyor S so that, at the proper time to segregate a mat unit *m* of the desired length, the carriage 30 will be driven along track 3 with the disintegrating head in the lowered position to cut out the swath of mat. When the carriage has reached the end of its mat removing travel, a limit switch can effect reversal of the carriage drive, and at the same time actuate the fluid cylinder 37 to raise the disintegrating head into retracted position. When the carriage has reached the other end of its track ready for another segregating operation, a limit switch may interrupt the return movement. When the proper time interval has elapsed the control mechanism may effect shifting of the plunger 36 in the opposite direction to lower the disintegrator head and simultaneously initiate travel of the carriage 30 along track 3 in the direction indicated by the arrow in Figure 3.

The mechanism shown in Figures 5 and 6 includes components generally similar to the mechanism shown in Figures 1 to 4, inclusive, discussed above, but the track supporting and guiding mechanism has been omitted from the illustrations of Figures 5 to 9, inclusive, although it will be understood that such mechanism generally like that shown in Figures 2 to 4, inclusive, would be provided in each instance. The principal difference between the segregator head 4 of Figures 5 and 6 and the head 1 of Figures 2, 3 and 4, is that while the cutting disks and disintegrating fingers in the previous type rotated about the same axis, this is not the case in the disintegrating head 4 of Figures 5 and 6. In this latter instance the cutting disks 40 are mounted on a shaft 41, whereas the disintegrating fingers 42 are mounted on the separate shaft 43. Again, however, these shafts are both driven by the motor 44. In this instance the drive from the motor shaft is direct, as shown in Figure 5, rather than through a countershaft because the motor is incorporated as an integral part of the head instead of being mounted on the carriage above. The entire head supporting mechanism 38 will therefore be lifted bodily to raise the head from disintegrating position during the return stroke of the carriage.

The suction nozzle 45 has in it slots 45' through which the disintegrating fingers move to confine the fiber as much as possible, and the shaft 43, of course, rotates in a direction such that the fingers rake the fiber into the suction nozzle. The relative speed of rotation of cutting disks 40 and fingers 42 may, in design, be controlled by selecting the proper pulley and sprocket sizes on the respective drives. Where the disks and fingers are mounted on separate shafts as explained, the shaft 43 must be located and the length of fingers 42 must be such that the entire disintegrating finger assembly will rotate in the space beneath the cutting disk shaft 41 as shown best in Figure 6.

Since in a disintegrating head of this type the support would probably not mount the head pivotally, it may be desirable for the head to be supportable entirely upon the supply conveyor belt. For that purpose rollers or wheels 46, 47 and 48 may be provided, disposed in triangular arrangement to afford stability of support to the head. The direction of head movement will, of course, still be guided from the track, and if desired the track may afford more or less support to the head through the frame 38.

In the disintegrating heads of Figures 7, 8 and 9, which are shown in rather diagrammatic fashion, no disintegrating fingers are provided. In each instance, however, cutting disks 5, driven directly by a motor 50, are provided, which correspond to the cutting disks 40 in the disintegrating head of Figures 5 and 6. In each of these instances the motor and disk supporting shaft 51 are suitably mounted on a frame which can be elevated at the completion of a disintegrating stroke to transport the cutterhead back to the other side of the supply conveyor, ready for the next mat segregating operation. As in the form of disintegrating head illustrated in Figures 5 and 6, it is probable that the heads of these types will not be swingably supported, so that again a triangular arrangement of supporting rollers including the roller 52 will be provided to ride on the belt of conveyor S

and support the head on such belt. In addition, each of the heads will incorporate the suction pipe **53** to remove the fibrous disintegrated mat material.

To this point the three disintegrating heads of Figures 7, 8 and 9 are sufficiently similar to each other and to the head **4** of Figures 5 and 6 that no further details need be described. The differences between these disintegrating heads and the head shown in Figures 5 and 6 lie primarily in the mechanism for disintegrating the fibrous material of the mat between the cutting disks **5**, which define the extreme edges of the swath of mat to be removed. None of the disintegrating heads of Figures 7, 8 and 9 incorporates rotary disintegrating fingers as do the heads **1** of Figures 2, 3 and 4, and **4** of Figures 5 and 6.

In Figure 7 the disintegrating mechanism is in the form of a chopping rake or plate **54**, which is carried by pivots **55** on spaced wheels **56** and by pivots **57** on spaced wheels **58**. These pivots are located preferably equidistantly from the rotative axes of the respective wheels, although if desired the pivot **57** may be disposed somewhat closer to the axis of wheel **58** than pivot **55** is located relative to the axis of wheel **56**. If the pivot spacings are equal and the wheels **56** and **58** are driven in synchronism from the motor **50**, the chopping rake or plate will always be disposed vertically. When wheels **56** and **58** rotate in the directions indicated by the arrows, the rake or plate will be lowered to chop through the mat and then will be translated toward the suction pipe **53** to break a section of the mat away and rake or scoop it into the suction pipe.

If pivots **57** are located closer to the rotative axis of wheels **58** than the spacing between pivots **57** and the axis of wheels **56**, the chopping rake or plate **54** will swing about pivots **55** as well as being moved vertically. In this instance also wheels **56** and **58** should always rotate in synchronism such that the angular or rotative positions of pivots **55** and **57** are always the same. The effect of the smaller spacing between the upper pivots **57** and the rotative axis of wheels **58** will be to swing the chopping rake or plate so that its lower end will reach forward into the mat M as the rake or plate descends and then the rake or plate will straighten to be disposed exactly vertically when it has moved downward into its lowermost position. As the wheels continue to turn, the rake or plate will be swung in the opposite direction so that its lower end will kick the mat section broken off into the suction pipe **53**.

In the disintegrating head shown in Figure 8 no moving mechanical disintegrating member is provided. Instead a pipe **59** is suitably supported in a position extending between the cutting disks **5**, one side of which is perforated so that when air is supplied to this pipe it will be ejected from such perforations in a direction downward and toward the suction pipe **53**. The air blast from these apertures will serve the dual purpose of breaking apart the structure of the mat section to be removed and of supplying air for flow into the nozzle of the suction pipe **53**. Because of the cooperative action of the air jets and the suction nozzle, there will be little tendency for the air to be deflected from the belt of the supply conveyor S in directions other than into the suction nozzle, so that there will be no appreciable tendency for a cloud of dust to be raised.

In the disintegrating head of Figure 9 is mounted pivotally a scraper or scooping fork **53'** which projects downwardly and forwardly from the nozzle of the suction pipe. This scraper in its downwardly swung position should be disposed with its lower edge touching or very nearly touching the belt of the supply conveyor to slide under the mat and separate it from the conveyor belt. The scraper may be oscillated rapidly through a small angle about its supporting shaft to break the mat, so that the air flowing over it into the suction pipe **53** will have a better opportunity to act on the fiber for disintegrating it and sweeping the particles into the suction pipe.

While in the types of mat segregating mechanism described above the entire swath of mat material between adjacent edges of the adjacent press length mat units has been disintegrated in conjunction with formation of the mat unit ends, this process requires the disposal of a large amount of mat material necessitating considerable suction and a reasonably slow movement of the disintegrating head across the mat. Particularly where the mat travels at rather a high speed, therefore, and also to conserve space, it may be preferable not to disintegrate the entire waste portion of the mat between press length mat units at the time such mat units are segregated. Mechanism to accomplish this purpose is shown in Figures 11 to 16, inclusive. Such mechanism is particularly well adapted to the production of relatively thin fiberboard, which requires a correspondingly thin mat for its formation, because such mat, utilizing less material, can be produced at a faster rate than thicker mats.

In Figures 10 and 11 twin disintegrating heads **6** are spaced apart by a spreader bar **60** which is supported on the lower ends of upright struts **61**. The upper ends of these struts carry a second spreader bar **62** to the opposite ends of which are clamped suction pipes **63** extending upward from the twin disintegrating heads **6**. The two spreader bars **60** and **62**, the struts **61**, and the suction pipes **63** thus constitute a frame supported by the carriage **64**.

The carriage **64** includes rollers embracing the twin rails **65** of a track extending transversely across the mat carrying supply conveyor S. As will be evident from a comparison of Figures 3 and 11, the component of movement of the carriage **64** in the direction of travel of the conveyor S is much less for the mechanism of Figure 11 than for that of Figure 3, because of the higher speed of travel of which the heads **6** are capable since much less mat material is removed by the twin disintegrating heads **6** of the mechanism shown in Figures 10 and 11 than by the disintegrating heads previously described, as has been mentioned above. While the widths of the swaths cut by the twin disintegrating heads **6** may be any convenient width, such width should be sufficient to afford a reasonable time lag between the trailing end of a press length mat unit *m* and the leading edge of the waste mat section *w*. Such disintegrating heads may incorporate two spaced cutting disks and simply an intervening suction nozzle carried by the suction pipe **63**, because of the relatively close proximity of the cutting disks, but if desired any suitable mechanical disintegrating mechanism or air blast, as discussed heretofore, may be utilized. The cutting disks are driven by motors **68** supported from the ends of the spreader bar **60**.

When the twin disintegrator heads have completed a cut traveling in the direction of the arrow in Figure 11, it is necessary for the head supporting frame to be elevated sufficiently so that the cutters clear the mat during return movement of the carriage **64** to the opposite side of the conveyor S. This may be accomplished simply by sliding the struts **61** vertically in guide tubes carried by the carriage. Within the channels of the rails **65** may be supported chains **69** extending about sprockets **69'** carried by shafts **69''**, which serve the dual purpose of reciprocating the carriage **64** along the track and of shifting the disintegrator head supporting frame vertically. Thus each of the chains **69** may have a lug secured to one of the struts **61**, which during the mat segregating stroke will be moved along the lower stretch of its chain to reciprocate the carriage and support the head carrying struts at a predetermined spacing from the belt S as shown in Figure 10. When these lugs reach the sprockets at the cut completing end of the track, the lugs will ride around the sprockets simultaneously sliding the struts **61** upward to raise the disintegrating heads and

initiating return movement of the carriage 64 to the right end of the track as seen in Figure 10. During such movement the lugs will be carried by the upper stretches of the chains 69 so as to maintain the struts 61, and consequently the disintegrator heads, in raised position to pass above the mat M. Upon reaching the sprockets at the opposite end of the track the lugs will be moved down to lower the heads preparatory to initiation of the next mat segregating operation.

The waste portion *w* must be removed from the supply conveyor S before it reaches the press loader L. This is accomplished by providing a disposal duct 7 between the disintegrating head mechanism described and the loader L, access to which is controlled by a hinged deflector plate or baffle 70. When this plate is in the closed position shown in solid lines in Figures 10 and 11, it bridges the gap between the supply conveyor and the loader, so that the mat units *m* pass across such plate onto a loader shelf. When the trailing edge of such a unit has passed across this plate, however, it may be swung upwardly either manually or automatically into the broken-line position shown in Figure 10 during the lag between passage of the trailing edge of a press length mat unit and the leading edge of a waste mat section *w*. A blower 71 will produce a suction to draw the waste section downward as it passes unsupported over the mouth of the disposal duct. Successive strips of the mat section will therefore be broken off and dropped into the duct 7, and in this duct may be provided a disintegrating rotor including disintegrating fingers 72 or paddles which will break up these strips as they pass to the blower 71. From such blower the fiber particles airborne will be carried back to the mat forming machine for re-use.

When the waste section *w* has all dropped into the disposal duct 7, the deflector plate or baffle 70 will be swung downward again into full line position bridging the disposal duct. It will be evident that upward swinging of the deflector plate may be effected by electric eye control, for example, so that as soon as a mat unit *m* passes the baffle plate will be swung upward. The blower 71 and disintegrator rotor 72 may be rotated continuously. or they may be energized intermittently by or in synchronism with opening of the deflector plate and de-energized by or in synchronism with downward swinging of the deflector plate. Such downward swinging may also be effected by photoelectric control or suitable feeler switch control, or time switch control operated by or in synchronism with the supply conveyor S may be utilized.

The mat segregating mechanism shown in Figure 12 is much the same as that described in connection with Figures 10 and 11, except that the twin disintegrating heads 8 and suction ducts 80 are not shown as supported by vertically reciprocating struts. Other provision may be made for supporting and traversing the disintegrator heads across the fiber mat M than the structure shown in Figures 10 and 11, while utilizing the same general type of mechanism for disposing of the waste mat section *w* between the swaths cut out by the disintegrator heads.

In Figure 12 the opening to the disposal duct 81 is shown as maximum, being substantially equal to the width of the swath cut by each of the disintegrator heads 8. With an opening of this width it is not necessary for the baffle or deflector plate 82 to open vertically, but can swing upward just enough to open a slot sufficiently wide to receive the full thickness of the mat. The leading edge of the waste section *w* will then be pushed against the inclined baffle which acts as a deflector turning the mat downward into the disposal duct and assisting in breaking off strips of the mat.

In this modification the disintegrator rotor 83 is shown in a wider portion of the disposal duct and incorporates disintegrating fingers rotating at rather high speed in the direction of the arrow, so that the falling mat strips will be struck by upwardly moving fingers at least once and probably several times to disintegrate the material and disperse the fibers thoroughly. As before, the fibers then are returned to the mat forming machine for re-use.

In the mat segregating mechanism shown in Figure 13, the segregating mechanism which traverses the endless mat is of the same type as shown in Figure 12, including the twin disintegrating heads 8 and the suction ducts 80. The difference in this mechanism generally resides in the arrangement for disposing of the waste mat section *w*. In this instance a disposal duct 84 having a very wide mouth is disposed adjacent to the end of supply conveyor S, which normally is covered by a portion of a tiltable transfer conveyor 85. When a press length mat unit *m* has been moved far enough so that its trailing end is carried by the conveyor 85, the right end of this conveyor as seen in Figure 13 is swung upwardly sufficiently to open a gap between the conveyor S and the adjacent end of the transfer conveyor affording access to the open upper end of the disposal duct. Transfer conveyor 85 will be long enough so that the mat unit *m* carried by it in tilted position will not be bent enough to injure the mat. If the leading edge of the waste mat section *w* comes into contact with the lower stretch of the transfer belt 85, such belt stretch, running counter to the direction of movement of the waste mat section, will oppose the movement of such leading edge and deflect it downward into the disposal duct.

As the mat material drops through the disposal duct 84, it will be struck by the fingers of the disintegrating rotor 85, which is similar to the rotor 83 described in connection with Figure 12. After passing beyond such rotor, the fibrous material will be further disintegrated by a picking roll 86 spaced from the wall of the disposal duct sufficiently to leave a narrow passage 87 through which the fibrous material will be drawn by suction in the duct 88. Air may be supplied to this suction duct by a blower pipe 89, which airflow, in conjunction with the air admitted through the disposal duct 84, will carry the disintegrated fiber material back to the mat forming machine as previously discussed.

It will be evident that as soon as the waste mat section *w* has been removed from the supply conveyor S the tilting transfer conveyor 85 will be swung downward again into the full line position shown in Figure 13, so that the next press length mat section *m* will be carried to the loader L by it. At that time the trailing portion of one mat unit will be carried by one end of the transfer conveyor, and the leading edge of the next mat section will be carried by the other end of the transfer conveyor. Shifting of the loader L will be effected at the time a mat unit has just been moved into the loader, as shown in full lines in Figure 13, to elevate such loader for bringing the next opening into registry with the transfer conveyor 85 while the leading end of the mat unit *m* shown partially on it progresses to the loader.

In Figure 14 a somewhat different disposal arrangement for the waste mat section *w* is illustrated. In this mechanism a short conveyor 9 is interposed between a tilting conveyor section 90 and the press loader. Such tilting conveyor section is adjacent to the end of the supply conveyor S and carries the mat sections *m* from such supply conveyor to the conveyor 9. The tilting conveyor is somewhat longer than the waste mat section *w* and is mounted for tilting on a pivot 91 between its ends and shown in Figure 14 as located centrally of the conveyor section 90. When the waste section *w* has moved completely onto this conveyor section, it may simply be rotated 180° about its central pivot, simultaneously flopping the waste mat section into the disposal hopper 92 and presenting as the upper side of the conveyor section 90 the side which previously was on the bottom. The conveyor then continues to operate in this position until the next waste mat section *w* is carried fully by it, whereupon this conveyor section again is rotated through 180° about pivot 91. Such position reversal of the conveyor sec-

tion may be accomplished by a chain driven sprocket concentric with the pivot **91**, by a gear drive arrangement, by a ratchet arrangement, or in some other way.

Alternatively, the pivots may be located considerably closer to the feed end than to the discharge end of conveyor section **90**. With such construction when the trailing end of the mat section *m* has passed beyond the discharge end of the tilting conveyor section **90**, such section will be tilted about its pivot by suitable tilting mechanism not shown, such as a hydraulic piston and plunger, to move the conveyor section into a steeply downwardly inclined position in which the waste mat section *w* will slide abruptly into the disposal hopper **92**, whereupon the conveyor section may be tilted back into horizontal position again before the leading edge of the next press length mat section *m* reaches the feed end of the tilting conveyor section.

This type of disposal arrangement for the waste mat section would, of course, incorporate suitable disintegrating mechanism such as a rotor carrying disintegrating fingers, picking mechanism or equipment accomplishing an equivalent disintegrating action for preparing the fibrous mat material to be used again.

While all the mat segregating devices thus far described have incorporated at least one fiber mat disintegrating head, the mat segregating mechanism shown in Figures 15 and 16 employs spaced cutting or divider bars **100** to segregate the endless mat M into press length mat units *m* and waste mat sections *w*. These cutting or divider bars do not remove a swath of mat fiber material, nor are they moved transversely across the endless mat as are the disintegrating heads previously described.

The two cutting bars **100** and **101** are mounted in spaced relationship on carriages **102** and **103**, respectively. Each of these carriages includes a cross bar and roller-supported mountings carrying opposite ends of such bars, which rollers run on tracks **104** extending above and parallel to opposite sides of the supply conveyor S and the two transition conveyors **105** and **106**. The carriages **102** and **103** are interconnected and driven by chains **107** carried by sprockets on axles **108** and extending alongside the tracks **104**.

The divider bar **100** is supported directly from carriage **102** by the plungers of air or hydraulic cylinders **109**, and the divider bar **101** is supported from carriage **103** by air or hydraulic cylinders **119**. Retraction of these cylinders will raise the bars above the level of the conveyors S, **105** and **106** sufficiently so as not to contact the mat M carried by such conveyors, but downward projection of the piston rods from the cylinders will shift the divider bars **100** and **101** downward to dispose their lower edges in close proximity to the upper surfaces of such belts. Between transition belt **105** and **106** and approximately midway between the chain-carrying axles **108** is located a disposal duct **111**, normally closed by a trap door plate **112**. This plate is pivoted to swing from a position coplanar with conveyors **105** and **106** into a position inclined downwardly and forwardly in the direction of travel of the fiber mat M. A cut-off blade **113** is supported by arms **114** at its opposite ends to swing in upright position from a location above the fiber mat M downward through the mat into engagement with and substantially coplanar with the forward side of the disposal duct **111** in the direction of travel of the mat M. Swinging of cut-off blade **113** is synchronized with movement of the trap door plate **112** by links **115**, which draw the blade **113** downward through the fiber mat into engagement with the disposal duct edge when the trap door plate **112** swings downward into open position. Conversely, as the trap door plate is swung upward, the links **14** are swung correspondingly to elevate the cut-off blade **113** above the mat.

The divider bar **100** moves in a zone between the disposal duct **111** and the sprocket shaft **108** at the left of Figure 15, whereas the divider bar **101** moves between the sprocket shaft **108** at the right of Figure 15 and the disposal duct **111**. For the purpose of discussing the operation of this mat segregating mechanism, the extreme right position of divider bar **101** has been labeled A in Figure 15, an intermediate control position has been labeled B, and the extreme position of travel of such bar to the left is labeled C. Similarly the extreme right position of divider bar **100** has been labeled D, an intermediate control position, E, and the extreme left position of this divider bar is labeled F.

In dividing the endless mat M into press length units either manually or by suitable measuring mechanism, the trailing edge of such a unit may be considered as passing into registry with the forward side of the disposal duct **111**. At that instant the divider bar actuating cylinders **109** are operated to lower the dividing bar **100** to dispose its lower edge substantially in the plane of the conveyor **106** when the chain is disposed to position the bar substantially coplanar with the forward side of the disposal duct **111**. Simultaneously the trap door plate **112** is swung downward, which serves to depress cut-off blade **113** through the fiber mat close alongside the divider bar **100**. In addition, at the same time drive of chain **107** is initiated to shift the carriage **102** toward the left as seen in Figures 15 and 16 at a speed equal to that of conveyors S, **105** and **106**. A blower may operate continuously to produce a downward suction in disposal duct **111**, but if it is not driven continuously it would also be energized at the same time to produce such a suction.

The result of this operation is that the divider bar **100** defines the trailing end of a press length mat unit *m*, and the cut-off blade **113** defines the leading edge of a waste mat section *w*. As travel of the several conveyors to the left continues, the cut-off blade **113** in its lowered position constitutes a baffle or deflection plate which turns the waste mat section *w* progressively downward into the disposal duct as shown in Figure 16. In this duct suitable disintegrating mechanism as described above may be provided to disperse the fiber material to render it suitable for further use in forming a fiber mat.

In the portion of the operation thus far described divider bar **101** may remain in its raised position so that the trailing edge of the waste mat section *w* has not yet been defined. Assuming that by this time divider bar **100** will have reached position E in Figure 15 and divider bar **101** will have reached position B in Figure 15, the trailing edge of the press length mat unit *m* will have passed safely out of a position in which the suction in disposal duct **111** could have any possible adverse effect upon it. At this point, therefore, cylinders **109** may be energized to raise divider bar **100** which may thereafter remain in the raised position until the beginning of a further segregation operation. Movement of chain **107** may be halted to hold the carriages **102** and **103** in positions corresponding to E and B, respectively, in Figure 15.

Movement of the mat M may proceed with the cut-off blade **113** and trap door plate **112** in their lowered positions, thus disposing of mat stock until the leading edge of the next press length mat unit reaches location B. At that moment cylinders **110** will be energized to lower divider bar **101** so that its lower edge is disposed adjacent to the upper surface of transition conveyor **105**. Simultaneously with such divider bar movement drive of chain **107** is resumed to the left at a speed corresponding to the speed of conveyors S, **105** and **106**, so that bar **101** will define the leading end of such next press length mat unit and protect the material in it from the suction produced in the disposal duct **111**. When this bar reaches position C, the trailing portion of the waste mat section *w* will have been pulled by gravity and suction down into the disposal duct, and thereupon trap door plate **112** and cut-off blade **113** will be raised into the solid line positions shown in Figure 15, while at the same time cylinders **110** will be actuated to lift the cutting bar **101** and chain **107** will stop. Immediately the direction of movement

of chain **107** may be reversed to move divider bar **100** from position F back to position D, and divider bar **101** from position C back to position A, as shown in Figure 15. Such return movement of carriages **102** and **103** may be effected at a speed much more rapid than the speed of the chain in the opposite direction if desired.

The various operations of cylinder energization, trap door and cut-off blade movement, and chain drive may be effected by suitable timing and electric eye control, which will accomplish actuation of the various components in the sequence and relationship described. The chain **107** may be driven by a reversible motor or from a power source rotating in a single direction with reversing clutch, and, if desired, change-speed mechanism interposed between the power unit and the chain drive.

We claim as our invention:

1. Mechanism for segregating a fiber mat into units spaced apart a substantial distance, comprising a disintegrating head including rotary cutting disks spaced apart a substantial distance and operable to sever from the fiber mat a swath of mat material between said rotary cutting disks of a width substantially equal to the spacing between said rotary cutting disks, suction means operable to remove the fibrous mat material of such swath from between said cutting disks, a rotor extending between said cutting disks and including a hollow sleeve concentric with the rotative axis of said cutting disks and carrying disintegrating fingers engageable with the mat material of such swath between and severad by said cutting disks from the fiber mat and operable to break it up to facilitate its removal by said suction means, a shaft extending through said sleeve and carrying said cutting disks on opposite ends thereof, and power means operable to rotate said cutting disks and said rotor, and means operable to support and guide said disintegrating head for movement transversely of the length of the mat to remove such swath of mat material.

2. The mechanism defined in claim 1, and separate drive means connecting the power means to the hollow rotor sleeve and to the cutter disk carrying shaft, and operable to rotate the hollow rotor sleeve at a lower speed than the cutter disk carrying shaft.

3. The method of segregating a mat of loose fibrous material of indeterminate length into individual units having adjacent ends of adjacent units spaced apart a substantial distance, which comprises advancing a mat of indeterminate length continuously lengthwise at uniform speed, and during such advance of the mat cutting the mat crosswise of the direction of such advance at spaced locations and thus severing each end of a waste section of mat material from adjacent individual mat units, simultaneously with such cutting, sucking particles of such waste mat section from between the locations of the mat being cut, and thereby removing the material of such waste mat section, and protecting the ends of such adjacent individual mat units being severed from disturbance by such removing of waste mat material.

4. Mechanism for segregating a mat of loose fiber material into units spaced apart a substantial distance, comprising a travelling disintegrating head including cutting elements spaced apart a substantial distance and operable to sever from the fiber mat a swath of mat material between said cutting elements of a width substantially equal to the spacing between said cutting elements and rotary disintegrating means located between and in alignment with said cutting elements transversely of the direction of travel of said disintegrating head and operable to disintegrate the fibrous mat material of such swath between said cutting elements while said cutting elements protect the mat material at the opposite sides of said cutting elements from disturbance by said rotary disintegrating means, and means operable to support and guide said disintegrating head for movement transversely of the length of the mat to remove such swath of mat material.

5. Mechanism for segregating a mat of loose fiber material into units spaced apart a substantial distance, comprising a disintegrating head including cutting elements spaced apart a substantial distance and operable to sever from the fiber mat a swath of mat material between said cutting elements of a width substantially equal to the spacing between said cutting elements and suction duct means including a nozzle having its opening located substantially between said cutting elements and directed toward the space between said cutting elements to remove the fibrous mat material of such swath from between said cutting elements while said cutting elements protect the mat material at the opposite sides of said cutting elements from disturbance by suction from said nozzle opening, and means operable to support and guide said disintegrating head for movement transversely of the length of the mat to remove such swath of mat material.

6. Mechanism for segregating a mat of loose fiber material into units spaced apart a substantial distance, comprising a travelling disintegrating head including cutting elements spaced apart a substantial distance and operable to sever from the fiber mat a swath of mat material between said cutting elements of a width substantially equal to the spacing between said cutting elements, suction duct means including a nozzle having its opening located substantially between said cutting elements and directed toward the space between said cutting elements to remove the fibrous mat material of such swath from between said cutting elements and disintegrating means located between and in alignment with said cutting elements transversely of the direction of travel of said disintegrating head and operable to disintegrate the mat material of such swath between said cutting elements from the fiber mat to facilitate its removal by said suction duct means while said cutting elements protect the mat material at the opposite sides of said cutting elements from disturbance by suction from said suction nozzle opening and by said disintegrating means, and means operable to support and guide said disintegrating head for movement transversely of the length of the mat to remove such swath of mat material.

References Cited in the file of this patent

UNITED STATES PATENTS

93,493	Stadler et al.	Aug. 10, 1869
516,709	Robinson et al.	Mar. 20, 1894
674,425	Nilson	May 21, 1901
976,329	Witten	Nov. 22, 1910
1,732,781	Tiffany	Oct. 22, 1929
1,844,279	Gossard	Feb. 9, 1932
1,854,481	Mudd	Apr. 19, 1932
1,987,409	Moore	Jan. 8, 1935
2,023,455	Warren	Dec. 10, 1935
2,149,025	Marion et al.	Feb. 25, 1939
2,323,105	Welch	June 29, 1943
2,538,643	Gregory	Jan. 16, 1951
2,605,841	Overman	Aug. 5, 1952
2,609,874	Pedron	Sept. 9, 1952
2,610,688	Overman	Sept. 16, 1952