March 30, 1965 E. W. KETTNICH ETAL 3,175,443

CHAD DISPOSAL SYSTEM HAVING FLUID CURRENT ACCELERATION MEANS

Filed June 22, 1962

2 Sheets-Sheet 1

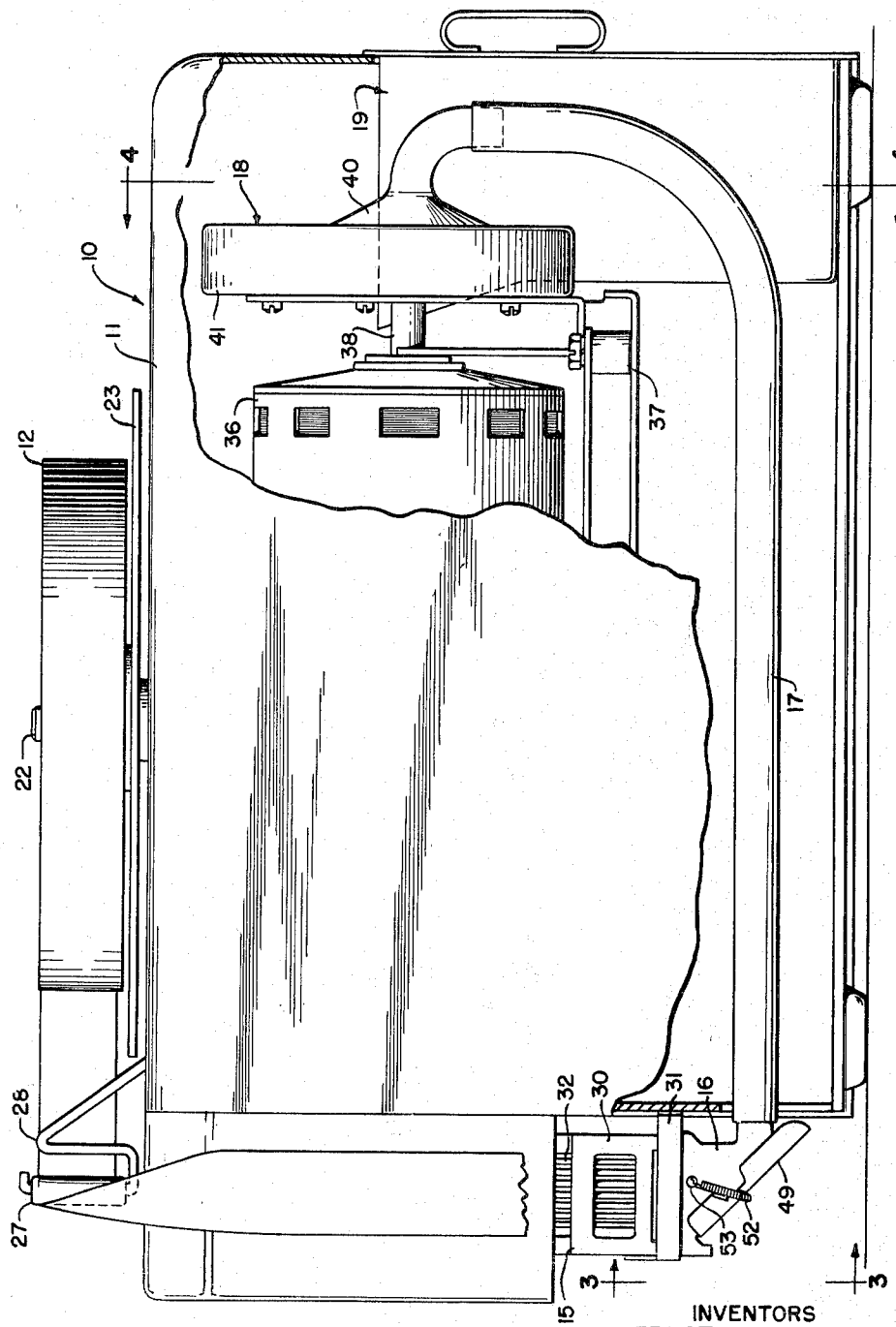


FIG. 1

INVENTORS
ERNST W. KETTNICH
NORMAN D. SARGENT

BY J J Hamill

ATTORNEY

March 30, 1965 E. W. KETTNICH ETAL 3,175,443

CHAD DISPOSAL SYSTEM HAVING FLUID CURRENT ACCELERATION MEANS

Filed June 22, 1962 2 Sheets-Sheet 2

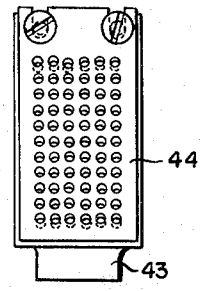


FIG. 5

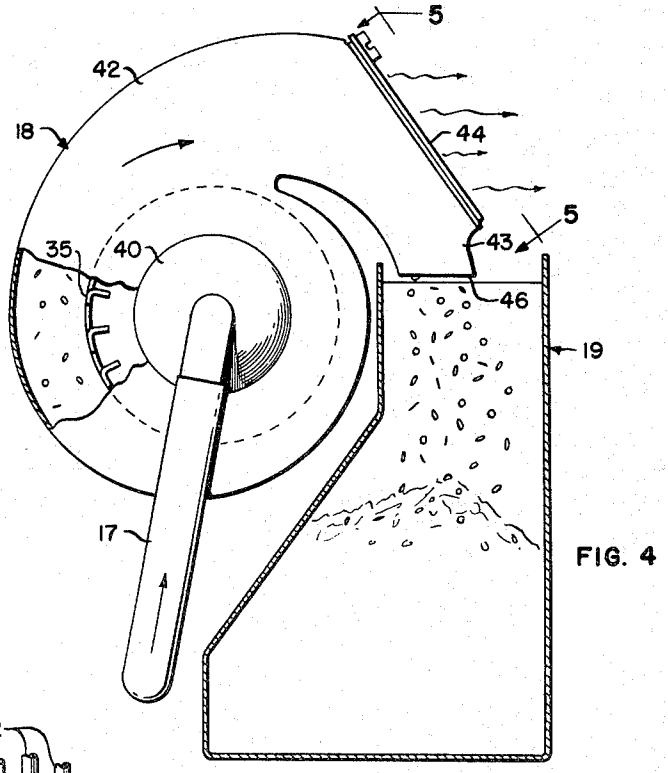


FIG. 4

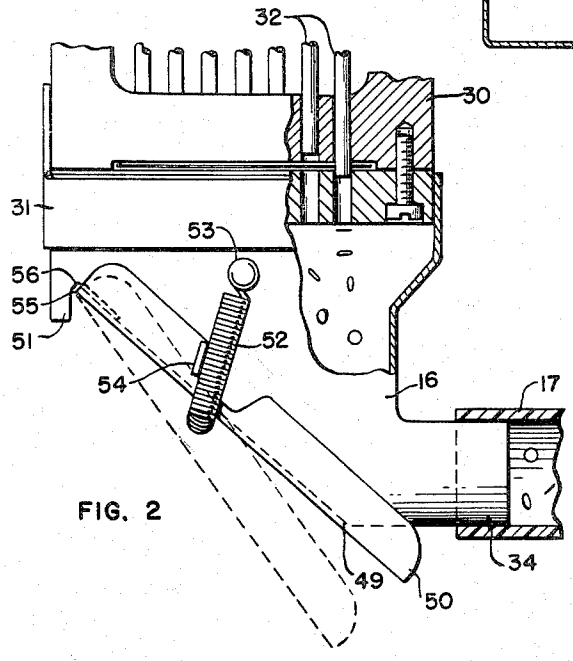


FIG. 2

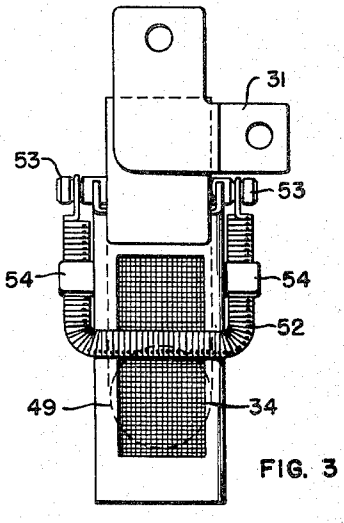


FIG. 3

INVENTORS
ERNST W. KETTNICH
NORMAN D. SARGENT

BY J. J. Hamill

ATTORNEY

United States Patent Office 3,175,443 Patented Mar. 30, 1965

3,175,443

CHAD DISPOSAL SYSTEM HAVING FLUID CURRENT ACCELERATION MEANS

Ernst W. Kettnich, Morton Grove, and Norman D. Sargent, Mount Prospect, Ill., assignors to Teletype Corporation, Skokie, Ill., a corporation of Delaware

Filed June 22, 1962, Ser. No. 204,408
5 Claims. (Cl. 83—100)

This invention relates to a chad disposal system for a perforator and more particularly to a forced air system for accelerating and moving chad away from the punches and die block to a remote location where the chad are decelerated and collected.

With the advent of high speed perforating mechanisms for recording media such as paper tape, the large amount of chad or chips resulting from the perforating of large reels of tape has necessitated larger collecting containers for the chad. The lower speed perforators employ chad collection containers that are fed by gravity through a chute and that are too small to receive and contain the chad which results from the operation of high speed punches. Accordingly, it is necessary in the high speed perforators to remove the chad from its place of origin and convey it to a convenient collection point where space is available for a large container therefor.

An object of the invention is to provide a new and improved chad disposal system for removing chad from their place of origin.

Another object of the invention is to provide a chad disposal system for a perforator wherein chad are accelerated (in their passage) from their point of origin and carried through a ducting means to a point of collection and are then decelerated prior to their entry into a collection container.

Still another object of the invention is to provide a chad disposal system wherein the chad are collected from their place of origin and accelerated through a ducting means by a moving stream of air to a collection point and wherein the chad and air stream are decelerated to prevent the blowing of chad out of a collection container therefor.

A further object of the invention is to provide a device in a chad disposal system that will warn the operator of an excess accumulation of chad within the chad system and that will release chad as it is being produced by further operations of the perforator.

Another object of the invention is to provide an emergency release for chad that is normally ineffective and that becomes effective to release chad from the perforator, to warn the operator of an excessive accumulation of chad and to prevent injury to the perforator if it continues punching while chad are bound within the chad disposal system.

In the present chad disposal system an air stream is created by a vacuum and is employed to convey the chad from their place of origin to their place of collection. According to the preferred embodiment of the invention a perforator receives paper tape from a reel mounted thereon and punches perforations in the tape to record intelligence. The punches push the chad or chips perforated from the tape through the die block to a chad receiving chute. A high velocity stream of air is generated by a fan and draws the chad from the receiving chute through a duct to an impeller housing for the fan.

The chad move through the duct work with this high velocity stream of air and are forced through the the impeller housing by the fan to a duct leading to a collection container. The duct work leading from the impeller to the collection container has an opening in one wall thereof covered by an adjustable screen or closure member for reducing the velocity of the stream of air carrying chad

to almost zero velocity as the stream of air and the chad carried thereby enter the collection container. Thus, the chad drop gently into the container rather than being blown into the container at high velocity. The air inlet opening in the wall of the chad receiving chute is covered by a pivotally mounted screen member that is biased into engagement with the receiving chute to retain chad within the chute while permitting air to enter through the screen. When excessive chad accumulates within the chad receiving chute and is not being removed therefrom the further production of chad will force the screened member to pivot and uncover the opening in the wall of the chute whereupon the accumulated chad is released and drops from the chad receiving chute to warn the operator of the failure of the chad removal system.

Other objects and advantages of the invention will become apparent from the following detail description when considered in conjunction with the drawings wherein:

FIG. 1 is a side elevational view of a perforator having a portion of its side cover removed to show the chad disposal system according to the preferred embodiment of the invention;

FIG. 2 is an enlarged fragmentary sectional view of the chad receiving chute and the screen cover member;

FIG. 3 is an enlarged front view of the chad receiving chute and cover member taken along the line 3—3 of FIG. 1 in the direction of the arrows;

FIG. 4 is a rear view taken substantially along the line 4—4 in the direction of the arrows of FIG. 1 showing the impeller housing and collection container for the chad, and

FIG. 5 is a view taken along the line 5—5 of FIG. 4 in the direction of the arrows showing the adjustable air outlet according to the preferred embodiment of the invention.

Referring now to the drawings and more particularly to FIG. 1, there is illustrated a conventional tape perforator **10** enclosed by a main cover **11** positioned above which is a roll of recording medium **12**. The leading end of the recording medium passes from the roll **12** to a punching station **15** where the recording medium is perforated to record intelligence and where the chad or chips punched from the tape are collected in a chad receiving chute **16** for conveyance through a duct **17** and through an impeller unit **18** to a collection container **19**.

More particularly, the roll **12** of recording medium is preferably paper tape and is carried on a spindle **22** extending outwardly of the main cover **11** of the tape perforator **10**. A stationary flange **23** guides the outer turns of tape and the leading end of the tape to a tape guide roller **27** carried on a taut-tape arm **28** pivotally mounted on the perforator **10**. The recording medium passes to the punching station **15** where it is guided between an upper punch block **30** and a lower die block **31**. The punch block **30** supports and guides reciprocable punch pins **32** which are selectively actuated to move downwardly through the punch block **30** and into the die block **31** thereby perforating the record medium guided between these blocks and producing chips of the recording medium which chips are defined by the collective term "chad."

When the perforator is operating at high speed the volume of chad produced would soon fill a large container and it is not normally feasible to provide a suitable container therefor to which the chad can be fed by gravity, particularly when the perforator is mounted in a cabinet containing other data handling equipment. Therefore, it is necessary to collect the chad as it accumulates in a chad receiving chute **16** and to provide a duct **17** and a positive means to move the chad from their place of origin to a remote place of collection. In the perforator of the present invention, the chad are moved from their

place of origin to their place of collection by high velocity stream of air originating through an air inlet 34 in the chad receiving chute 16. The chad are then moved through the duct 17 to the impeller unit 18 in which rotate a plurality of vanes 35 driven by a perforator motor 36. The motor 36 supplies the power for operating the perforator, as well as for driving the vanes 35 (FIG. 4). The impeller unit is mounted on a suitable bracket attached to a motor support frame 37. When the perforator is operating, the motor 36 will be running and rotating its drive shaft 38 and the vanes 35 which are secured to the drive shaft 38. The air and the chad enter the impeller housing 18 through a conically shaped connector 40 attached at the center of a rear wall 41 of the impeller housing 18.

After entering the impeller housing 18 the air and the airborne chad are preferably driven by the vanes 35 in a clockwise direction as viewed in FIG. 4 through an outlet portion 42 of the impeller housing 18. The portion 42 has an extension 43 for deflecting the chad downwardly into the collection container 19. An adjustable closure member 44 comprising a perforated sheet or screen member is mounted on the extension 43 and the air leaving the outlet portion 42 of the impeller housing 18 may pass through this screen member. The screen is of small enough mesh, however, to prevent the escape of any chad through its perforations. This screen or sheet 44, as may be seen most clearly in FIGS. 4 and 5, may be adjusted on the opening in the outlet portion 42 to control the amount of air passing through it. A major portion of the air being moved outwardly through the outlet 42 of the impeller housing 18 flows through the perforated sheet or screen 44 on the extension 43 and thus the volume and velocity of the air being deflected downwardly through a chad outlet 46 is greatly reduced from that volume and velocity which left the outlet portion 42 of the impeller housing 18. In actual practice the velocity of the air and chad has been so reduced that the chad drop downwardly almost exclusively under the force of gravity and hence are not positively blown about in the container which blowing would result in chad being blown upwardly over the outer wall of a chad container 19, particularly when the chad container 19 is relatively full of chad.

In practice, it has been found that, without the provision of the perforated sheet or screen closure member 44 to decelerate the chad and air, the chad entering the container 19 would be blown out even though a very tight cover is provided. By reducing the velocity of the chad entering the container 19 not only has it been possible to eliminate the cover therefor but also to eliminate the escape of chad from the container. Since the impeller unit 18 is within the cover 11 the air leaving the perforated closure member 44 also serves to cool the perforator's operating mechanisms.

As a safety feature, the chad chute 16 has an open side 49 having a releasable cover 50 that pivots to release an excessive accumulation of chad within the chad chute 16 thereby preventing injury to the punch pins 32, the punch block 30 and die block 31. An excessive accumulation of chad within the chad receiving chute 16 may be due to occurrences such as partial blocking of the duct 17 or by the complete filling of the container 19, the impeller housing 18, the duct 17 and the chad receiving chute 16 with chad. The open side 49 of the chad chute 16 extends at an oblique angle to the punch block 31 and to the chad duct 17, so that upon removal of the screened cover 50 access is available to the bottom of the punch block 30 and to the duct 17 attached to the chad receiving chute 16. This facilitates the clearing and removing of the chad from the die block 31 and chad duct 17 after they have been filled with chad.

The screened cover 50 has its upper end 55 positioned intermediate a downwardly extending lip 51 of the chad receiving chute 16 and an upper portion 56 of the side

walls of the chad receiving chute 16. The cover 50 is biased into engagement with the wall 49 by a garter spring 52 secured to pins 53 on opposite side walls of the chad receiving chute 16. The spring 52 encircles the screened cover 50 and engages outwardly turned ears 54 on the cover 50 and exerts an upwardly directed force on these ears. Thus, the spring 52 exerts not only a force urging the cover 50 against the walls of the open side 49 but also exerts a force on ears 54 urging the cover 50 upwardly to a position intermediate the upper end portion 56 and the lip 51 of chad chute 16.

Upon the excessive accumulation of chad within the chad receiving chute 16 due to the non-removal or insufficient rate of removal of chad therefrom through the duct 17, continued operation of the punch pins 32 and the production of more chad will force the chad collected within the chad receiving chute 16 to press downwardly on the cover 50 and to pivot the cover 50 about its upper end 55. The cover 50 will move to the dotted line position shown in FIG. 2 and the chad will fall downwardly from the chad chute 16 thereby attracting the operator's attention to the fact that the chad are no longer moving through the duct 17.

A complete understanding of the operation of the chad disposal system will be apparent from the following description of its operation. The record medium passes between punch block 30 and the die block 31 and is perforated to record intelligence during the selective actuation of the punch pins 32. The chad are forced by the punch pins 32 through the die block 31 into the chad receiving chute 16.

The vanes 35 enclosed in impeller housing 18 and driven by the perforator motor 36 produce a low pressure area within the impeller housing 18, attached duct 17, and chad receiving chute 16. Ambient air rushes through the perforated cover 50 on the open side 49 of the chad chute 16 and into the chad receiving chute 16. Since the volume and capacity of the chad chute 16 is larger than the capacity of the duct 17, the chad receiving chute 16 furnishes a large volume of slower moving air to the smaller cross-sectional area duct 17 wherein the velocity of the air increases, thus establishing a Venturi action. The chad move with the air through the chad duct 17 from the chad receiving chute 16 to the conically-shaped inlet connector 40 leading to the center of the impeller housing 18 from which the chad and air are driven by the vanes 35 to an outlet portion 42 of the impeller housing 18.

The high velocity air leaving the outlet portion 42 of the impeller housing 18 is permitted to move outwardly through the perforated closure member 44 on extension 43 of impeller housing 18. The chad are deflected downwardly by the closure member 44 and fall into the chad collection container 19. The velocity of the airborne chad is reduced with the velocity of the air and as the chad leave the chad outlet 46 on the impeller extension 43, their velocities are substantially reduced to only that afforded by gravity.

To prevent the breaking of the punch pins 32 and/or injury to the punch block 30 and die block 31 due to an excessive accumulation of chad within the chad receiving chute 16, the screened cover 50 is permitted to pivotally move about its upper end 55 when there is an accumulation of chad in the chad receiving chute 16 and a downward pressure exerted on the accumulated chad by the production of still more chad. The screened cover 50 moves to its dotted line position shown in FIG. 2. The chad leaving the cover 50 drop outwardly of the cover of the perforator and attracts the operator's attention to the condition of the blocked chad chute 16.

From the foregoing it should be apparent that the present chad disposal system provides a novel and efficient manner for the accelerating and removing of chad from their place of origin, and transporting them at high velocity adjacent to their place of collection where the

chad are decelerated and dropped into a chad container at low velocity. It also should be apparent that the chad disposal system features means to prevent injury to the perforating mechanism due to the failure of the air stream to move the chad from the place of origin and to notify the operator of the failure of the chad to move through the system to their point of collection.

Although only one embodiment of the invention is shown in the drawings and described in the foregoing specification it will be understood that the invention is not limited to the specific embodiment described, but is capable of modification and rearrangement and substitution of parts and elements without departing from the spirit of the invention.

What is claimed is:

1. In a tape perforator wherein when punches are operated through a die block to perforate a tape and as a result produce chad as a by-product of a punching operation, a chad removal system comprising receiving means interconnected with said die block into which the chad fall under the action of gravity, duct means connected to said receiving means for conveying said chad from the receiving means to a remote collection position, air moving means connected to said duct means for increasing the velocity of the air inside the duct means to move the chad from said receiving means, said receiving means, duct means and air moving means being positioned to direct an air current in a direction transverse to the normal direction of the fall of the chad whereby the chad are moved from the receiving means into the duct means, chad collecting means connected to said duct means to receive and collect the chad, and an air pressure dissipating means connected to said duct means adjacent to the collecting means to reduce the velocity of the air and the chad carried thereby prior to their entry into the chad collecting means.

2. In a tape perforator having punches perforating a record medium and forcing the resulting chad through a die block as they are punched, a chad removal system comprising chad receiving means connecting with said die block to receive the chad which fall from said die block under the action of gravity, an air inlet in said receiving means, a duct means connected to said receiving means to convey air and chad to a remote position, said air inlet and said duct means being designed to direct air through the receiving means in a direction transverse to the direction of fall of the chad, air moving means connected to said duct means to increase the velocity of the air inside the duct means and the receiving means to move the air and chad through the receiving means and the duct means to a remote position, a chad receptacle for receiving said chad from said duct means, an air velocity reducing means associated with said duct means to reduce the velocity of the air and chad leaving said duct means and entering said collection means, and an emergency release means for releasing an excessive accumulation of said chad caused by the failure of the chad to move through the duct means.

3. Apparatus according to claim 2 wherein said emergency release means is a tiltable screen member which is spring urged to cover the air inlet to the receiving means.

4. In a perforator having means for perforating a recording medium, a chad disposal system comprising a chad receiving means for receiving said chad as they fall under the action of gravity after they are punched from the record medium, an air entry in said chad receiving means, duct means attached to said receiving means and having a smaller cross-sectional area than the area of said receiving means, air driving means for drawing air from said air entry through said receiving means and said duct means thereby creating a Venturi action for accelerating the chad and air from the large cross-sectional area of the receiving means through the smaller cross-sectional area of the duct means, said air entry and said duct means being positioned to direct the flow of air in the receiving means in a direction transverse to the normal direction of fall of the chad, and a chad collecting means at the collection position for receiving said chad from said ducting means.

5. A chad disposal system for a perforating mechanism comprising a chad chute for receiving the chad from said perforating mechanism, duct means connected to said chad chute for conveying chad from said chad chute to a remote position, said chad chute having an air entry opening therein, means for moving a stream of air through said air opening in said chad chute and through said duct means to a remote place of collection, a perforated member normally covering said air opening to prevent the egress of chad therefrom while permitting the ingress of air therethrough, and a means for urging said perforated member into covering engagement with said air inlet opening in said chad chute, said urging means permitting the movement of the perforated member from said air entry opening when said chad chute is full of chad and further chad is being produced faster than it is being conveyed away from said chad chute.

References Cited by the Examiner

UNITED STATES PATENTS

755,701	3/04	Rollins	19—205 X
1,969,770	8/36	Taylor	83—100 X
2,065,327	12/36	Grant et al.	83—100 X
2,968,982	1/61	Causino	83—100 X
3,028,743	4/62	Braun	83—100 X
3,041,905	7/62	Gabriel	83—100

FOREIGN PATENTS

507,596	12/54	Italy.

ANDREW R. JUHASZ, *Primary Examiner.*

WILLIAM W. DYER, JR., *Examiner.*