Dec. 6, 1966 W. H. HERMAN 3,289,898

METERING AND DISPENSING DEVICE FOR VISCOUS LIQUIDS

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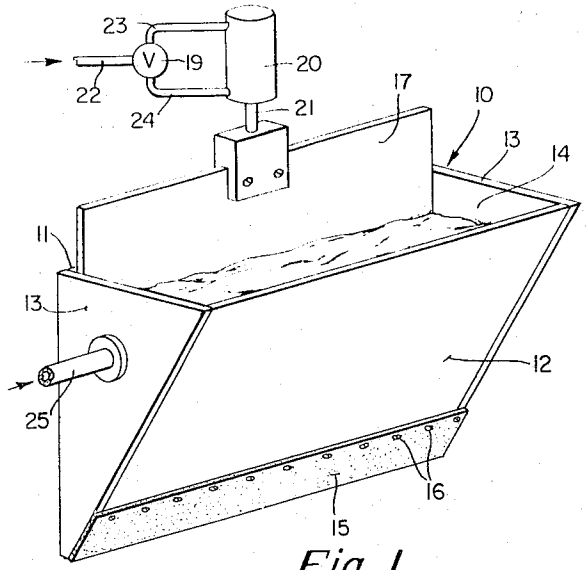


Fig. 1

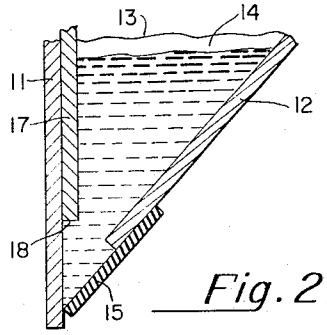


Fig. 2

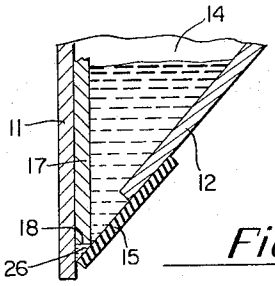
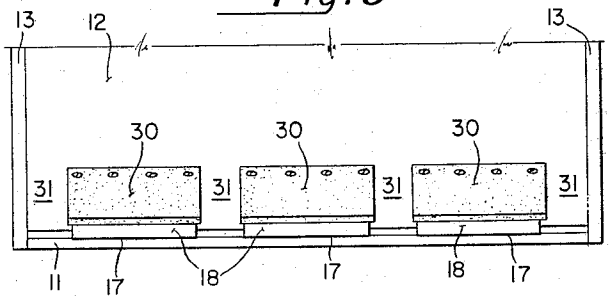


Fig. 3

Fig. 5



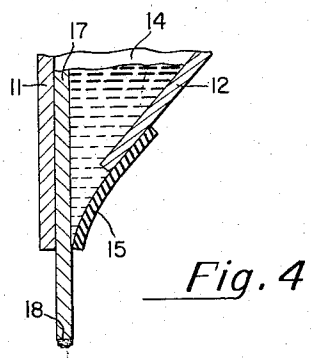


Fig. 4

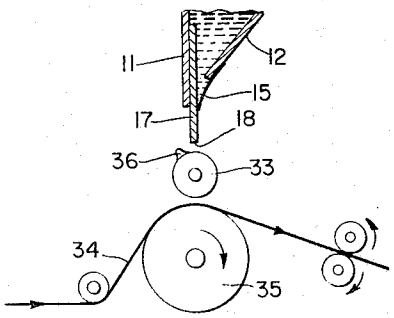


Fig. 6

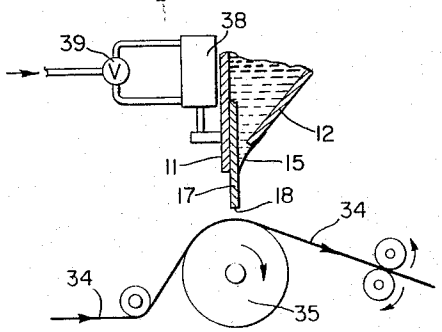


Fig. 7

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METERING AND DISPENSING DEVICE FOR VISCOUS LIQUIDS

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8 Claims. (Cl. 222—263)

This invention relates to a liquid metering and dispensing device and, more particularly, to a new and improved device for separating predetermined or metered amounts of relatively viscous liquids from a supply reservoir and for transferring them to a remote point for application to a surface.

In the past, there has been a problem in many industries of applying measured amounts of relatively viscous liquids to a surface. For example, this function is a critical part of many processes in the fiberboard container making and packaging art where a liquid such as glue is to be applied to a surface in a measured amount and at a predetermined time and area. It is often desirable to regularly dispense and apply measured amounts of other liquids, such as lubricants or relatively viscous oils, to a surface.

For purposes of this invention, the term "viscous liquid" has been used to designate, and is intended to encompass, all highly viscous liquids including glues, cements, adhesives, mixtures of glutinous substances, lubricants, heavy oils, etc. In other words, as will become evident from the following description, the apparatus of the invention can be employed to dispense predetermined amounts of any relatively viscous liquid and to transfer such amounts to a remote position. The viscosity of the liquids used can vary depending on the speed of operation of the apparatus as employed. They should generally be more viscous than water and should demonstrate some temporary tendency to resist flow or change in shape or arrangement.

Different devices have been conceived which employ a variety of means to separate measured amounts of viscous liquids such as glue from a supply reservoir and apply them to a surface. For example, one method employed has been that of separating a measured amount of glue from a supply and impinging it against a surface. One means for doing this operates as a glue gun and involves the application of a blast of compressed air to an amount of glue disposed within a feedout tube from a glue reservoir.

Although some control can be achieved in this method, it is desired in most cases to more accurately determine the amount of a viscous liquid applied. It is also desired to more accurately control the area of application of the measured amount of viscous liquid. This becomes important and difficult to accomplish with prior art devices, especially where the surface to which the viscous liquid is to be applied is that of a rapidly moving web and where precise timing becomes a significant factor. Operation of prior art devices presents even greater problems as the speed of manufacturing equipment increases and the period of time for measuring amounts of a viscous liquid and transferring them to a surface is decreased.

A particular area in which devices such as the above have been employed and in which the above problems have become important is that of the paper industry with regard to transferring adhesive to a moving web of paper coming from a parent roll of paper or from a paper manufacturing machine for the purpose of attaching the tail end of a predetermined length of paper to the roll upon which the predetermined length has been wound, which process is often referred to as tail tying. In this instance, it has been found advantageous to apply adhesive or glue in a continuous or intermittent line transversely

across a rapidly moving paper web adjacent to or with reference to the transverse line where the paper web is to be severed. Severance normally occurs upon the completion of winding of one small product roll from a large parent roll and prior to the commencement of the winding of a successive small product roll.

Most winding operations are now performed at a very high rate of speed, that is, where the velocity of the paper web is 1200 feet per minute and higher, and on a so-called continuous basis. Some of the previous methods employed to apply adhesive to the moving web in tail tying processes involved glue guns and moving brushes. These are no longer satisfactory or reliable for high speed winding and new means have become necessary to increase the speed of application and to improve the accuracy of the amount of adhesive applied as well as the area within which it is applied.

If excessive adhesive is applied to a roll for such a purpose, some of it tends to be thrown off the rapidly rotating wound product roll due to centrifugal force. In addition, the excessive adhesive tends to permeate several layers of the paper product on the wound roll and creates difficulty to a user in locating a loose end and starting the roll to unwind for use. Similar problems are caused by application of an adhesive to overlie large areas of the wound roll. If insufficient adhesive is applied, the tail end of the web will be loose or come loose during subsequent packaging, resulting in fouling of the wrapping machinery and an unsightly appearance of the product. Similar problems result from inaccurate placement of the measured amount of adhesive.

In view of the aforementioned difficulties and shortcomings of the prior art viscous liquid metering and dispensing devices, it is a principal objective of the present invention to provide a viscous liquid metering and dispensing device which is capable of accurately separating metered amounts of a viscous liquid from a supply reservoir and transferring these measured amounts to a remote point for application to the surface of an article such as a rapidly moving web.

It is an additional object of the invention to provide a viscous liquid metering and dispensing device adapted to apply the liquid across a relatively wide, rapidly moving paper web in a predetermined pattern of continuous or intermittent areas.

The invention provides a housing having a front wall, a converging wall and spaced side walls and defining a chamber for containing a supply of a viscous liquid such as adhesive or glue. The converging wall lies in one plane and is arranged to intersect the front wall lying in another plane at an angle of less than 90° to the plane of the converging wall so as to establish a line of intersection. The converging wall has a flexible gate portion adjoining the front wall and disposed in sealing engagement therewith when in a closed position but movable out of contact with the front wall upon application of force in order to permit separating of a predetermined amount of viscous liquid from the chamber. A tongue member is disposed within the chamber and along the front wall. The surface of the bottom edge of the tongue member is substantially parallel to the line of intersection between the front wall and the converging wall and extends between the spaced side walls. At least a portion of this surface is in a plane angularly disposed to both the plane of the front wall and the plane of the converging wall. The tongue member is arranged for movement adjacent the front wall so that the bottom edge surface is reciprocably movable from a first position wherein the surface is disposed within the chamber, spaced from, and out of contact with, the converging wall, through a second position wherein the boundaries of the surface are

in contact with the front wall and the converging wall thereby defining a cavity with the side walls which contain a metered amount of viscous liquid, to a third position wherein the surface is disposed outside of the chamber upon deflection of the flexible gate portion and carries thereupon the metered amount of viscous liquid. Actuation means are operably connected to the tongue member to provide a means for reciprocably advancing and withdrawing the tongue member toward and away from the line of intersection of the front wall and the converging wall.

In some embodiments, where it is desired to apply a viscous liquid in an intermittent line, the tongue member may have a plurality of slots cut upwardly into the bottom edge surface for a distance greater than the length of the travel path of the tongue member during its reciprocal movement. The width of such slots is equal to the desired spacing between areas of viscous liquid application desired across a surface. This results in a plurality of bottom edge surfaces being formed on the remaining extensions of the tongue member. The flexible portion of the converging wall is also divided into a plurality of fixed portions and flexible portions arranged in corresponding positions across the housing, resulting, in essence, in the formation of a plurality of devices, as described above, for separating amounts of viscous liquid from a single source or supply within a housing.

In order to apply the metered amounts of viscous liquid to a surface such as a moving web, the entire viscous liquid metering and dispensing device may be advanced by an actuation means so that the bottom edge surface of the tongue member contacts with a moving web at the desired moment. In this manner, the measured amount of viscous liquid is transferred and the web receives an application of a metered amount of viscous liquid on the desired portions or areas. Another method of transferring the metered amounts of viscous liquid involves an associated transfer means such as a transfer bar which may be conveniently carried upon the surface of a rotatably mounted cylinder. Once the desired amount of viscous liquid is separated from the parent supply within the chamber and exposed upon the bottom edge surface of the tongue member outside of the housing, the transfer bar is advanced by rotation of its carrying cylinder into interference with the bottom edge surface so as to remove the predetermined metered amount of viscous liquid from the surface and carry it upon the transfer bar. Upon further rotation of the carrying cylinder at the desired time, the transfer bar is arranged to contact a surface such as that of a moving web so as to transfer the viscous liquid to the web at the desired point.

Additional objects and advantages of the invention will become apparent from the following detailed description thereof, read in conjunction with the accompanying drawings, in which

FIGURE 1 is a perspective view of a viscous liquid metering and dispensing device of the invention,

FIGURES 2, 3 and 4 are partial sectional views taken along line 2—2 of FIGURE 1, and progressively illustrate the manner of operation of the device of FIGURE 1,

FIGURE 5 is a bottom view of a different embodiment of the device shown in FIGURE 1, arranged to transfer predetermined amounts of viscous liquid in an intermittent line,

FIGURE 6 is a diagrammatic sectional view of a metering and dispensing device and associated transfer means for transferring a measured amount of viscous liquid to a moving web, and

FIGURE 7 is a diagrammatic sectional view of a metering and dispensing device movable by an associated actuation means into contact with a moving web.

Referring now to FIGURES 1 through 4 of the drawings, there is shown a housing indicated generally by reference numeral **10**, which includes a front wall **11** and a converging wall **12**, the plane of which is arranged to

intersect the plane of front wall **11** at an angle of less than 90°. Two spaced side walls **13** connect with front wall **11** and converging wall **12** to define a chamber **14**, within which adhesive is retained. Converging wall **12** has a flexible portion **15** extending along and comprising its side portion which is disposed adjacent side wall **11** and in contact therewith when in the undistorted or relaxed and closed position. Strip **15** may be comprised of any type of flexible resilient material such as rubber which may be bent to one side or another out of the plane of converging wall **12** upon the application of force. Strip **15** may be sealingly attached to converging wall **12** as by a series of bolts **16**.

A tongue member **17** is disposed within the chamber **14** defined by the housing **10** and is mounted for reciprocation in a plane parallel and adjacent to the plane of front wall **11** so that its bottom surface **18** will be advanced toward and away from the line of intersection of the plane of front wall **11** with the plane of converging wall **12**. The bottom edge surface **18** is in a plane parallel to the line of intersection described above. In addition, the plane of bottom edge surface **18** is angularly disposed to the plane of front wall **11** and the plane of converging wall **12**. Bottom edge surface **18** terminates directly at a line of contact with front wall **11**.

The action of tongue member **17** is controlled by a valve **19** which governs the operation of a double action air cylinder **20**. The piston **21** of air cylinder **20** is operably connected to the end of tongue member **17** opposite bottom edge surface **18**. Valve **19** connects air line **22** to air cylinder **20** through feed lines **23** and **24**, alternatively. In other embodiments, the operation of valve **19** may be performed by hand or may be controlled by connecting it with the operation of other equipment such as a web handling machine or a continuous winding machine for rolled paper products in a manner which is well known or understood in the art and employed with like equipment. Obviously, other types of actuation means could be employed.

In some instances, it is desired to dispense, with a device of this type, metered amounts of an adhesive which is relatively fast-drying or which contains relatively volatile ingredients and, therefore, is susceptible to damage or deterioration upon prolonged exposure to air. It is also desired in some instances to continuously, circulate glue through a heating means in order to maintain it at the desired viscosity for metering and application. As shown in FIGURE 1, a viscous liquid such as glue may be circulated through the chamber **14** within housing means **10** by means of feeding it into chamber **14** through one or more inlets **25** on housing means **10** and withdrawing it from chamber **14** through one or more outlets (not shown) into opposite end on housing means **10**. In this manner, a heater (not shown) and/or a pump (not shown) may precede inlet **25** and be arranged to circulate glue from a remote supply reservoir (not shown) through the housing means **10** in a continuous manner thereby insuring at all times a fresh supply of adhesive having the desired properties. The housing means **10** may be fitted with a lid (not shown) which sealingly covers the top portion thereof and is in frictional contact with the moving tongue member **17**.

FIGURES 2, 3 and 4 progressively illustrate the manner in which the viscous liquid metering and dispensing device of FIGURE 1 operates to dispense a predetermined amount of viscous liquid. In the light of the above-described structure, it can be seen that when the double action air cylinder **20** is actuated to reciprocably move tongue member **17** along the plane adjacent to front wall **11**, the bottom edge surface **18** will be reciprocably moved from a first position within the chamber **14** spaced from and out of contact with the converging wall **12**, as shown in FIGURE 2, through a second position wherein one edge bounding the surface **18** is in contact with converging wall **12** and, more specifically, the

flexible portion **15** extending along and comprising the one side thereof, as shown in FIGURE 3. In this position, a reservoir or cavity **26** is defined by outline of the front wall **11**, the converging wall **12**, side walls **13**, and the bottom edge surface **18** such that a metered amount of viscous liquid is separated and contained therein having a predetermined volume.

As operative movement of tongue member **17** continues prior to completion of one half of a cycle and a corresponding reciprocation, bottom edge surface **18** is moved to a third position wherein it is disposed outside of chamber **14** after the edge contacting the flexible portion **15** has exerted sufficient pressure upon the flexible portion to bend and deflect it downwardly and out of sealing contact with front wall **11**, as shown in FIGURE 4. In this position, the bottom edge surface **18** contains a predetermined metered amount of viscous liquid which is basically that portion of the viscous liquid contained within the supply reservoir or cavity **26** which was separated and defined by the portions of the front wall **11**, the bottom edge surface **18**, the side walls **13**, and the converging wall **12**.

An advantageous feature of the invention is that the amount of viscous liquid separated in the manner described above can be closely controlled and easily controlled in an accurate manner. The principal manner of varying the amount resides in varying the thickness of tongue member **17** which results in a larger cross-sectional area for cavity **26**. Alternatively, and perhaps even more expeditiously, the angle of the bottom edge surface **18** may be varied relative to front wall **11** and converging wall **12** to change the volume of a resulting cavity **26** formed during operation.

FIGURE 5 illustrates a modified form of the invention and is a bottom view of the device shown in FIGURE 1. In this embodiment, converging wall **12** has a plurality of flexible portions **30** positioned in spaced relation to each other and separated by a plurality of inflexible integral portions **31** of converging wall **12** which intersect and contact front wall **11** to form a seal. Tongue member **17** has a plurality of spaced slots cut upwardly through the bottom edge surface **18** and corresponding to the integral portions **31**. This results in the formation of a plurality of separate tongue members **17** of narrow width which are passed outward of chamber **14** upon movement of piston **21** through the joint between the flexible portions **30** and front wall **11**.

In operation, the bottom edge surface **18** of each tongue member **17** carries a predetermined amount of viscous liquid out from the supply chamber **14**. The application of this viscous liquid to a surface results in an intermittent treated line.

From the above, it can be seen that the apparatus described in several embodiments accomplishes separation of a metered amount of viscous liquid from a supply of viscous liquid contained within a supply reservoir and transfers it to a remote position for application or use.

FIGURES 6 and 7 illustrate two methods for handling the metered amount of viscous liquid after its separation from the parent supply in order that it may be transferred to the surface of a work piece, such as glue to one surface of a moving paper web. FIGURE 6 contemplates employing with the viscous liquid metering and dispensing device a separate transfer means which in the embodiment shown comprises a rotatably mounted cylinder **33** positioned between the bottom edge surface **18** of a tongue member **17** of a metering device and the surface of a moving paper web **34** which represents the surface of a work piece to which viscous liquid is to be applied. Web **34** is supported in partial wrapping engagement with the surface of a rotatably mounted supported roll **35**. Cylinder **33** has a protuberance **36** extending outwardly from its surface which protuberance extends longitudinally from one end of roll **33** to the other. The relationship of transfer roll **33** is such that, upon rotation, protuberance **36** is moved past a position of interference with the outwardly extending bottom surface **18** of tongue member **17** of the metering and dispensing device. Upon contact, the protuberance serves as a transfer bar and wipes the metered amount of viscous liquid from the bottom edge surface **18**. Upon further rotation, the transfer bar or protuberance **36** contacts the preselected portion of the surface of moving web **34** and applies or transfers a metered amount of viscous liquid to the web. It can be seen that the movement and timing of contact of the web by transfer bar **36** may be controlled in a manner whereby it bears some relationship to movement of the web or another work piece, as is understood in the art.

FIGURE 7 illustrates another embodiment of apparatus involving the metering and dispensing device shown in FIGURE 1 for transferring the measured amount of viscous liquid contained on bottom edge surface **18** to a desired surface. As shown in FIGURE 7, an actuation means such as double action air cylinder **38** is attached to front wall **11** of the housing **10** of a metering and dispensing device and is arranged to advance and withdraw the entire metering and dispensing device to a position where the bottom edge surface **18** of an outwardly extending tongue member **17** containing a metered amount of viscous liquid thereupon would contact a desired surface such as the surface of a moving paper web **34** at a predetermined time. In a manner similar to that employed in FIGURE 6, a moving paper web **34** could be supported in partial wrapping engagement with a rotatably mounted support roll **35**. A valve **39** is arranged to control the operation of double action air cylinder **38** by means of air from line **40** fed through line **41** or line **42**. Air cylinder **38** would advance and withdraw the bottom edge surface **18** into contact with the surface of the moving web **34** at a predetermined time thereby accomplishing viscous liquid transfer.

What is claimed is:

1. A viscous liquid metering and dispensing device which comprises a housing having a front wall and a converging wall and defining a chamber for containing a supply of viscous liquid, said converging wall being arranged to intersect said front wall along a line of intersection of the plane of said converging wall with the plane of said front wall and at an angle of less than 90°, said converging wall having a gate portion adjoining said front wall and disposed in sealing engagement therewith when in a closed position but movable out of contact with said front wall; a tongue member disposed within said chamber and along said front wall, said tongue member having a bottom edge surface substantially parallel to said line of intersection, at least a portion of which surface is in a plane angularly disposed to both the plane of said front wall and the plane of said converging wall, said tongue member being arranged for movement adjacent said front wall so that said bottom edge surface is reciprocally movable from a first position wherein said surface is disposed within said chamber and spaced from and out of contact with said converging wall, through a second position wherein the boundaries of said surface are in contact with said front wall and said converging wall thereby defining a cavity which contains a metered amount of viscous liquid, to a third position wherein said surface is disposed outside of said chamber upon deflection of said gate portion and carries thereupon said metered amount of viscous liquid; and actuation means operably connected to said tongue member.

2. A viscous liquid metering and dispensing device according to claim **1**, wherein said housing includes an inlet and an outlet and means to circulate viscous liquid through said chamber.

3. A viscous liquid metering and dispensing device according to claim **1**, wherein said tongue member is operably connected through said actuation means to an auto-

matic web handling machine for movement into and out of said cavity at predetermined intervals.

4. A viscous liquid metering and dispensing device according to claim 1, wherein at least a portion of said bottom edge surface is in a plane perpendicular to said front wall.

5. A viscous liquid metering and dispensing device according to claim 1, wherein said bottom edge surface comprises a plurality of spaced-apart areas, and said front wall has a plurality of gate portions formed therein and arranged in sealing engagement with said tongue member in alignment with said spaced-apart areas.

6. A viscous liquid metering and dispensing device according to claim 1, including viscous liquid transfer means cooperable with said movable tongue member and adapted to remove said metered amount of viscous liquid from said bottom edge surface when said surface is disposed outside of said chamber and to transfer it to a remote position.

7. A viscous liquid metering and dispensing device according to claim 6, wherein said viscous liquid transfer means comprises a resilient transfer bar mounted for movement into interference and wiping engagement with said bottom edge surface and to a position remote from said bottom edge surface.

8. A viscous liquid metering and dispensing device according to claim 1, including housing actuation means operably connected to said housing and adapted to reciprocably advance and withdraw said housing and correspondingly said bottom edge surface toward and away from a remote position.

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