April 30, 1968 W. ANGST 3,380,873

ADHESIVE TAPE APPLICATOR

Filed Aug. 9, 1965 2 Sheets-Sheet 1

Fig.1

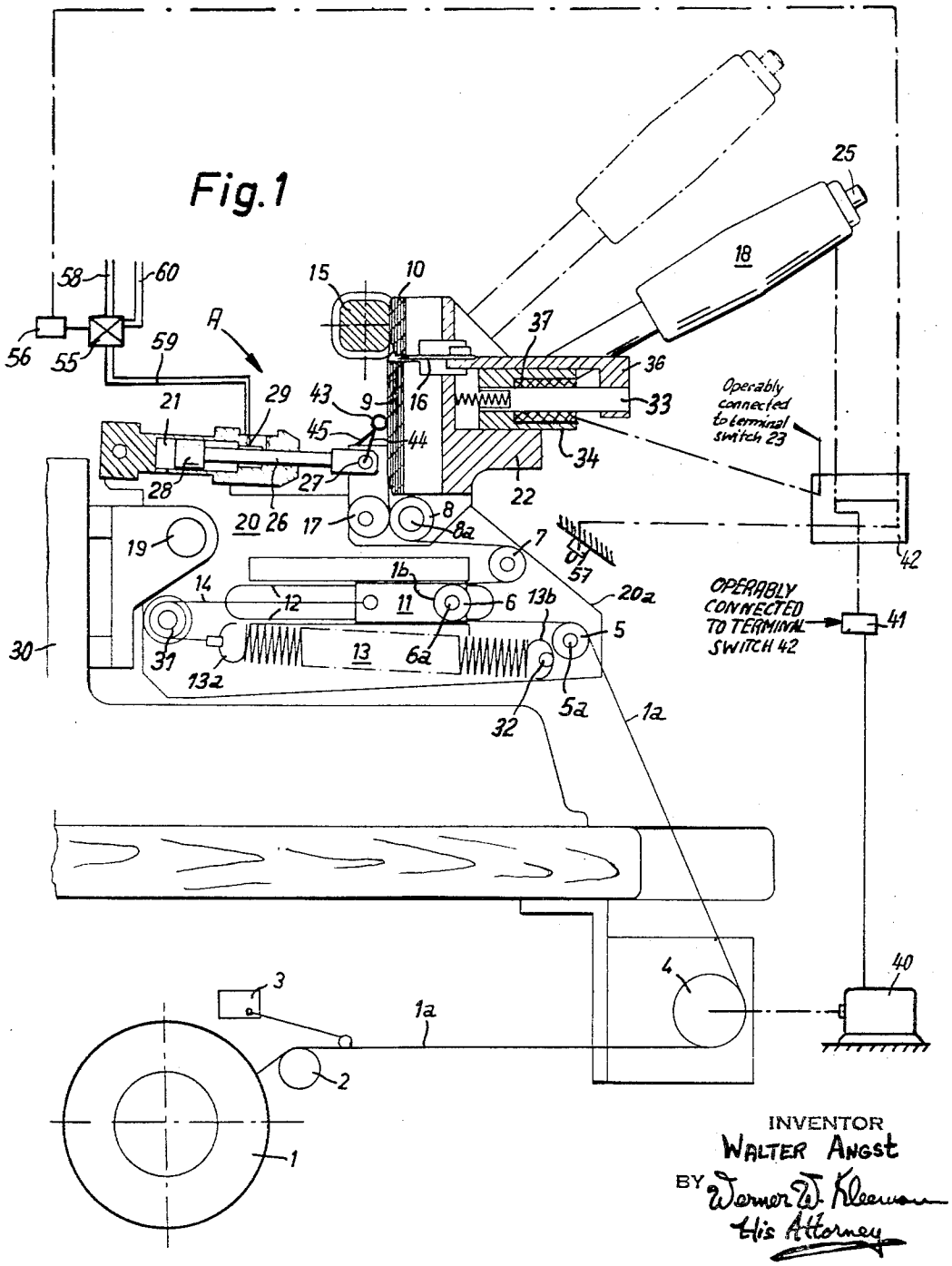

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Fig. 2

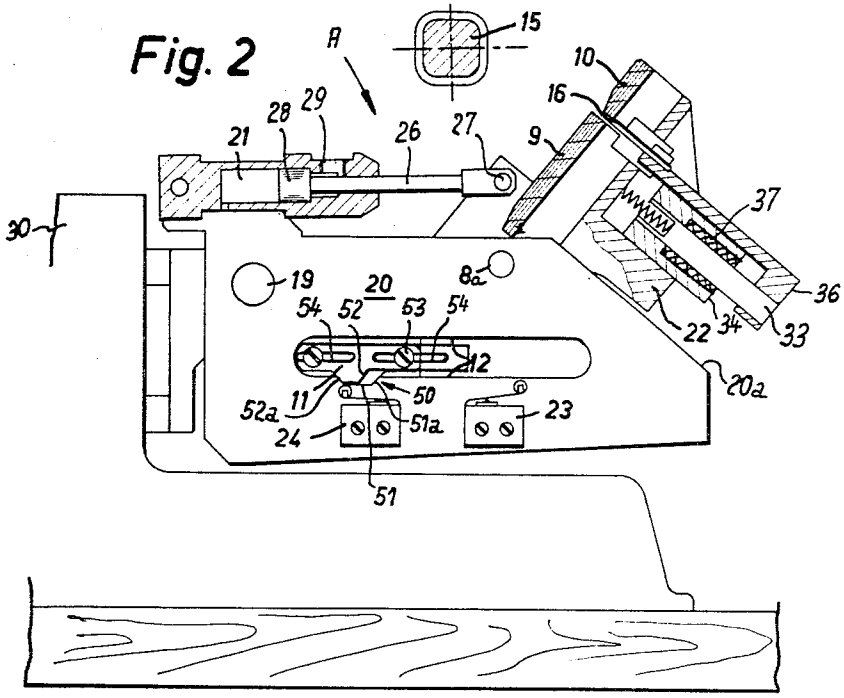
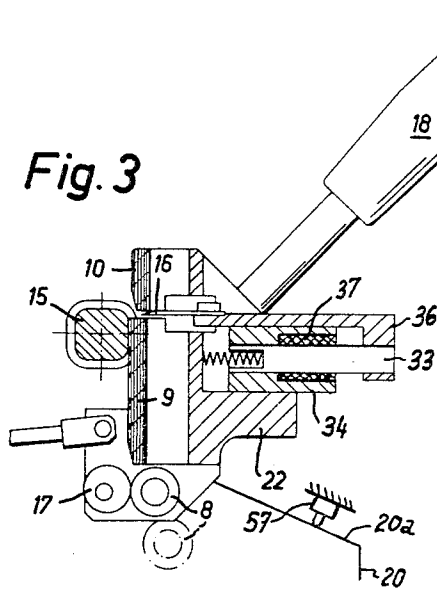


Fig. 3



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United States Patent Office 3,380,873 Patented Apr. 30, 1968

3,380,873

ADHESIVE TAPE APPLICATOR

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Filed Aug. 9, 1965, Ser. No. 478,136
Claims priority, application Switzerland, Aug. 10, 1964, 10,445/64
18 Claims. (Cl. 156—446)

The present invention has reference to an adhesive tape applicator primarily used in conjunction with wire coil winding machines.

Adhesive tape applicators serve for the mechanical enclosing of spools and similar round or noncircular bodies carrying wire coils with self-adhering tapes or bands for the purpose of insulating the spool and protecting the wire coils. These bodies or spools together with their wire coil wrapping will hereinafter be conveniently referred to as coil body or bodies.

Present day adhesive tape or band applicators either form a unit with the winding machine already during manufacture of the latter or provide a device which can be mounted at the winding machine according to requirements. In so doing, the adhesive tape or band is typically pulled off a supply spool over different deflecting rollers, tensioning rollers and measuring rollers, and delivered to the coil body. After the tape winding or wrapping operation has been completed the adhesive tape is automatically cut, the beginning of this tape then brought into contact with the next coil body, whereupon the subsequent work cycle begins.

Conventional adhesive tape or band applicators have the disadvantage that the adhesive tape is directly pulled off the supply roller by the coil body which is to be enclosed or wrapped. Owing to the multiple deflection or turning of such adhesive tape on its way to the coil body and due to the considerable adhesion force of the tape itself, considerably large and as a rule uncontrollable tangential forces are required at the coil body for the wrapping operation. As a result, the coil body can become damaged when working with fine coil formers or sensitive, thin wire coils.

Accordingly, it is a primary object of the present invention to provide an improved construction of apparatus for applying adhesive tapes or bands which overcomes the aforementioned disadvantages.

Another object of this invention is to provide an adhesive tape applicator for coil bodies which is relatively simple and robust in construction, economical to manufacture, and capable of applying an adhesive tape wrapping to the coil body without damaging the latter.

Still a further more specific and prime object of this invention aims at preventing the uncontrolled tangential forces at the coil body during wrapping thereof, by providing a tape withdrawal roller driven by its own motor and means for forming a loaded adhesive tape or band loop of controllable tape tension between the adhesive tape supply roller and the coil body, so that the tangential forces at the coil body can be controlled. As a result, the tangential force for the insulation wrapping or winding required at the spool spindle is thus independent of the withdrawal tension and is in the order of magnitude of the forces necessary for winding of the wire coils, so that there is effectively prevented damage to the coil body and the wire coils.

The inventive adhesive tape applying device or applicator for the wrapping of coil bodies incorporating spools and usually other cylindrical bodies of optional cross-section, is characterized by the features of a motor driven withdrawal roller which pulls the adhesive tape or band from a supply roller, a displaceable member incorporating a tension roller for the adhesive tape which is loaded

by a tensioning element in order to form an adhesive tape loop between the withdrawal roller and the coil body. Additionally, there is provided a pivotable support which can be actuated through the agency of a servo-mechanism for instance. A tape deflecting roller is advantageously located at the pivot axis or shaft of the pivotable support which cooperates with a blocking roller preventing return feed of the adhesive tape, and furthermore, there is provided an elevationally positionable frame which is mounted for raising and lowering movements and which unites the components of the applicator and serves to bring about contact of the adhesive tape with the coil body.

Other features, objects and advantages of the invention will become apparent by reference to the following detailed description and drawings in which:

FIGURE 1 schematically illustrates the construction of an embodiment of inventive adhesive tape applicator where the support is located in a position during winding of a coil body with adhesive tape;

FIGURE 2 schematically illustrates the applicator of FIGURE 1 as viewed from the rear, this figure being turned 180° in the plane of the paper so as to correspond to the spatial orientation of FIGURE 1, the support being rocked away from the coil body; and

FIGURE 3 schematically depicts a portion of the applicator of FIGURE 1, specifically illustrating the support in elevated position, so that the beginning of the adhesive tape can be brought into contact with a coil body for wrapping or winding thereon.

Describing now the drawings, it will be seen that the band or tape *1a* coming from an adhesive tape supply roller **1** which is tensioned in tangential or peripheral direction by a conventional friction brake (not shown), passes over a deflecting roller **2** where a subsequently arranged known tape feeler or monitoring device **3** cooperates with such adhesive tape *1a*. The latter then moves over a motor driven fluted withdrawal or pull-off roller **4**, the tape bearing against the surface of roller **4** at its adhesive side. The drive motor for withdrawal roller **4** is schematically depicted in FIGURE 1 and is designated by reference character **40**. Then the tape *1a* passes over a deflecting or turning roller **5** to a displaceable tension pulley or roller **6**, from here past fixedly mounted deflecting rollers **7** and **8** to both tape press-on or contact shoes **9** and **10**.

It will be appreciated that the deflecting roller **5** is rotatably mounted at its shaft *5a* to a frame **20**. The latter is pivotably mounted at shaft **19** to a stand **30** of the applicator device A so that such frame **20** can be elevationally displaced i.e. raised or lowered, for reasons to be considered shortly. As will be also further explained shortly, frame **20** can be raised by pushing an operating lever **18** upwardly into the phantom line position of FIGURE 1, such lever being mounted at shaft **19**. The shaft *6a* of the previously considered displaceable tension roller **6** is connected with a slide member **11** gliding within an elongated guideway or slot **12** provided at the frame **20**. Slide member **11** is connected via a cable or cord **14** with a slide-loading member, in the case considered such is the one end *13a* of a spring **13**, the other end *13b* of which embraces a pin **32** mounted at frame **20**. The cord or cable **14** passes over a turning roller **31** on its way to the end *13a* of spring **13**. When the adhesive band or tape *1a* is withdrawn from its supply roller **1** by means of the withdrawal roller **4** driven by motor **40**, the spring **13** displaces the slide member **11** together with the tension roller **6** to the left of FIGURE 1 and, thus, forms an adhesive tape or band loop, generally indicated at *1b*, and from which this tape *1a* is pulled-off by the coil body **15** to be wrapped against the resistance of the

spring 13. By referring to FIGURE 2 it will be seen that a pair of terminal switches 23 and 24 actuated by adjustable cam means 50 provided at the slide member 11 limit both terminal or dead-center positions of slide member 11. As will also be explained in greater detail hereinafter, terminal switch 23 actuates a cutter knife 16 for cutting the tape 1*a* whereas terminal switch 24 deenergizes a relay 41 controlled by a control mechanism 42 in order to stop the driving motor 40 for the withdrawal roller 4. In the exemplary embodiment, the cam means 50 can be formed of two overlapping plate members 51 and 52 fixed by screws 53 or otherwise to the slide member 11. The rearmost plate 51 of FIGURE 2 has a cam surface 51*a* which acts upon terminal switch 23 controlling the cutter 16. On the other hand, the forwardmost plate 52 has a cam surface 52*a* for actuating the terminal switch 24 controlling stoppage of the drive motor 40 for the withdrawal roller 4. It will be seen that plate 52 is provided with two elongated slots 54 through which piercingly extend the screws 53, so that the cam surface 52*a* can be selectively axially positioned with regard to the slide member 11. As a result, it is possible to control and vary the moment that the drive motor 40 is stopped, and, thus, the amount of tape 1*a* withdrawn by roller 4 from the supply roller 1. Consequently, this expedient thus also enables selective varying of the length of tape 1*a* to be wrapped onto the coil body 15.

Due to the described arrangement of the, in this case, spring-loaded adhesive tape loop 1*b* between the withdrawal roller 4 and the coil body 15 controllable conditions result for the tangential force at this coil body 15. The wrapping or winding operation only requires small tangential forces in the order of magnitude of those required for the wire coil wrappings, so that the drive of the spool or body supporting spindle used during wire wrapping can be also directly employed for the insulation wrapping. Hence, there is dispensed with the otherwise required additional drive for the spindle and the complications attendant therewith.

After winding of the coil body 15 has been completed the adhesive band or tape 1*a* is cut by an electromagnet-actuated knife or cutter 16 displaceably mounted at a support 22 mounted for instance to be pivotable about the pivot shaft 8*a* of the deflecting roller 8. In the illustrated embodiment, the cutter knife 16 is supported at a bracket 36 having an electromagnet core or armature 33 slidably extending through a block 34 arranged at the pivotable support 22 and carrying the windings 37 of the electromagnet. It will be recalled that terminal switch 23, actuates the cutter knife 16, specifically by energizing the windings 37 via a suitable supply source (not shown) so that core 33 is displaced to the left of FIGURE 1, to thus cut the tape 1*a*.

It is to be understood that during such time after cutting of the tape 1*a* has occurred and the band end is pressed against the coil body 15 due to small rotation of the latter, it is necessary to prevent the new band end from moving backwards so that it is possible to form a new tape loop 1*b*. The means which prevent such return movement of the tape comprise an eccentrically mounted return feed locking or blocking roller 17 pressed by means of a non-illustrated spring against the deflecting roller 8. Upon rotating the return feed locking roller 17 in the direction of the tape movement i.e. upwards, a space or gap is formed between this roller 17 and the deflecting roller 8 through which a new band can be introduced. In order to provide proper contact between the beginning or leading end of the tape and the next coil body the tape must lie flat against the lower contact shoe 9. This can be achieved by sucking the tape thereagainst or by mechanical expedients. For example, in FIGURE 1 there is shown a roller 43 articulated by a lever 44 to the support 22 and urged by a blade spring 45 against the tape 1*a*. It is also possible to provide a control installation by means of which it is possible to pre-select a number of different predetermined tape winding lengths and during operation it can be adjusted by means of a selector switch, or enables an automatic adjustment of the winding length according to a programmed plan.

Contact of the leading tape end with the next coil body 15 to be wound can be realised by raising the frame 20 by upwardly pressing the manual lever 18 mounted at the shaft 19. At the same time, a servo-control for displacing or rocking the support 22 and which incorporates, for instance, an air cylinder 21 having therein a slidable piston 28 connected by its support actuating piston rod 26 at pivot pin 27 to the pivotable support 22, has its cylinder 21 supplied with pressurized air, or any other suitable fluid medium, through the agency of a valve 55 opened by a relay 56 operatively connected with the control device or mechanism 42. Specifically, a terminal switch 57 operably connected with the control mechanism 42 is mounted in the path of movement of the frame 20 so that when this frame is raised by upwardly pivoting the manual lever 18 this terminal switch 57 is actuated, whereby control mechanism 42 energizes relay 56 in a manner to open the valve 55. Thus, air is admitted from an inlet supply conduit 58 leading to a suitable source (not shown) through the valve 55 and conduit 59 to the inlet or port 29 communicating with the cylinder 21. As a result, the support 22 is pivoted upwards into the position of FIGURE 3, the beginning of the tape being pressed against the coil body 15 to be wound. When the manual lever 18 is pressed downwards the band or tape 1*a* then sticks to the coil body 15. Upon placing the coil body 15 into rotation there subsequently occurs winding or wrapping of the tape 1*a* about this coil body, the slide member 11 moving to the right, specifically for such time until the terminal switch 23 closes. Closing of the terminal switch 23 which is operatively connected with the control mechanism 42 causes energization of the windings 37 of the electromagnet and thus actuation of the cutting knife 16, so that the tape 1*a* is cut. After the still remaining tape end has also been wound onto the coil body 15 the button or knob 25 at the end of the lever is actuated. This enables the pressurized air or otherwise to escape from the cylinder 21 due to the control mechanism 42 now de-energizing the relay 56 so that such air moves from the cylinder 21 via the port 29, conduit 59, valve 55 and outlet conduit 60. Consequently, the support 22 which is braced by a non-illustrated spring rocks away from the coil body 15 into the position of FIGURE 2. At the same time, there can be initiated withdrawal of the adhesive tape 1*a* from its supply roll 1 and, thus, formation of a new band or tape loop 1*b*, specifically by having the control mechanism 42 energize the relay 41 to place the drive motor 40 for the withdrawal roller 4 into operation. This operation is terminated, as already explained, through closing of the terminal switch 24 by means of the slide member 11, which has now again moved to the left. The inventive tape applicator is now ready for carrying out a new work cycle. It is here indicated that the use of the servo-mechanism employing a compressible medium i.e. air for instance, provides a resilient arrangement for the piston rod 26 actuating the support 22, so that non-circular bodies can be also wrapped.

By way of completeness there will now be considered the operation of the inventive tape applicator A from the time that it is in a condition for carrying out the aforementioned new work cycle. At this time, the slide member 11 has formed a tape loop 1*b* since it is at the left of FIGURE 1, and the support 22 is tilted in the position of FIGURE 2. First, it is necessary to raise the frame 20. This is done by upwardly pivoting the manual lever 18 into the phantom line position of FIGURE 1. As a result, the terminal switch 57 is closed and the control mechanism 42 actuates the valve relay 56, whereby the valve 55 feeds pressurized air from the conduit 58 through

the conduit **59** and the port **29** into the cylinder **21**, the support **22** being pivoted into the position depicted in FIGURE 3. By referring to this figure, it will be clearly seen that the frame member has its inclined surface **20***a* bearing against the terminal switch **57** to actuate the latter so that the just-explained operation occurs. When the support **22** is in the position of FIGURE 3 the leading tape end is pressed against the coil body **15**. Now, the manual lever **18** is rocked back from its phantom line position of FIGURE 1 into the full line position, so that the frame member **20** is lowered and the upper shoe **10** bears against the coil body **15**. The coil body **15** is then placed into rotation and winds the tape **1***a* onto it, the slide member **11** during such time moving continuously towards the right of FIGURE 1 until it contacts the terminal switch **23**. When this happens, the cutter knife **16** is actuated to cut the tape **1***a*. Now, the button **25** at the manual lever **18** is actuated and such causes the control mechanism **42** to act upon the valve relay **56** so that the valve **55** is positioned to allow the pressurized air to escape via the port **29**, the conduit **59** and the outlet conduit **60**. Consequently, the support **22** rocks away from the coil body **15**. Operation of the push button **25** also causes the control mechanism **42** to actuate the relay **41**, so that the drive motor **40** is started and the withdrawal roller **4** pulls more tape off the supply roller **1** until a new tape loop **1***b* is formed, the slide **11** again moving to the left of FIGURE 1, the cam surface **52** actuating the terminal switch **24** to cause the relay **41** to de-energize and to cut-off this drive motor **40**. Having now formed a new tape loop **1***b* the applicator A is again ready for applying tape to a new coil body **15** in the manner already described.

It is remarked that the inventive adhesive tape applicator A can be used individually or in groups whereby a plurality of coil bodies can be simultaneously wrapped or wound. In the last-mentioned instance the individual tape applicators A are arranged next to one another upon the common shaft **19** and their actuation occurs simultaneously by means of the manual lever **18** seated at this shaft **19**, which, however, could also be mechanically operated in any suitable manner. However, when only a single adhesive tape applicator is available it is also possible to wrap in succession a number of coil bodies simultaneously seated at the spool spindle, in that, after each winding operation, the applicator A is displaced along the shaft **19** through the spacing between neighboring coil bodies.

Instead of the tension roller **6** located at the slide member **11** it can also be mounted to a lever such that shaft **6***a* of this tensioning roller **6** describes an arc, and tensioning of the slide or lever, as the case may be, can take place by means of any optional resilient element, or also by a weight instead of the spring **13**.

While there is shown and described present preferred embodiments of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practised within the scope of the following claims.

What is claimed is:

1. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, comprising a tape supply source, a driven tape withdrawal roller for pulling the tape off said supply source, displaceable means cooperating with said tape withdrawal roller for forming a tape loop between said tape withdrawal roller and the body to be wound with tape, means for loading said displaceable means, a pivotable support including means for pressing the tape against the body to be wound, means for pivoting said support, means for preventing return feed of the tape, and a frame mounted for raising and lowering movements cooperating with said support to enable the tape to be brought into contact with the body to be wound.

2. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** further including a deflecting roller for the tape mounted at said frame between said tape withdrawal roller and said displaceable means.

3. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** wherein said displaceable means includes a tension roller.

4. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **3** wherein said means for loading said displaceable means comprises a resilient element.

5. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **3** wherein said frame is provided with an elongated slot, said displaceable means including a slide member arranged to slide in said slot, said slide member carrying said tension roller.

6. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** wherein said means for preventing return feed of said tape comprises a tape deflecting roller and a return feed blocking roller cooperating with said tape deflecting roller.

7. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **6** wherein said tape deflecting roller and said return feed blocking roller are mounted to said pivotable support, said tape deflecting roller being located at the pivot axis of said pivotable support.

8. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **7** wherein said return feed blocking roller is an eccentrically mounted roller.

9. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** wherein said pivotable support is carried by said raisable and lowerable frame.

10. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **9** wherein said means for pivoting said support comprises a servo-mechanism.

11. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** wherein said means for pressing the tape against the body to be wound comprises at least two elevationally spaced contact shoes carried by said pivotable support.

12. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **11** further including cutting means for cutting the tape arranged between said two elevationally spaced contact shoes.

13. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **12** including means for forcing the tape snugly against the lowermost contact shoe.

14. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** including means for enabling adjustment of different tape wrapping lengths.

15. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** further including an operating lever for raising and lowering said frame.

16. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** wherein said means for pivoting said support includes an actuating rod, resilient means cooperating with said actuating rod so that due to the flexibility of said actuating rod it is possible to also wrap non-circular bodies with tape.

17. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, as defined in claim **1** including a shaft for mounting said frame for raising and lowering movements, a plurality of tape applicators mounted next to one another upon said shaft, and a common actuating lever for operating said plurality of

tape applicators so that a plurality of bodies can be simultaneously wrapped with tape.

18. Adhesive tape applicator for wrapping tape about a body, particularly coil bodies, comprising a tape supply source, a driven tape withdrawal roller for pulling the tape off said supply source, a frame mounted for raising and lowering movements to enable the tape to be brought into contact with the body to be wound, displaceable means including a tension roller movably mounted at said frame and cooperating with said tape withdrawal roller for forming a tape loop between said tape withdrawal roller and the body to be wound with tape, means for loading said displaceable means, a pivotable support including means for pressing the tape against the body to be wound carried by said frame, means for pivoting said support, and means for preventing return feed of the tape.

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